Health and Health-care Use by New Zealand Vietnam War Veterans and Their Wives: An Examination of Andersen's Model of Health-care Utilization

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ABSTRACT

Previous research has found that the debilitating physical and psychological sequelae of combat stress experienced by Vietnam War veterans extend also to their wives. The present study has broadened the focus by applying the Andersen model of health services utilization to health-care used by a community sample of 281 couples comprising New Zealand Vietnam war veterans and their wives who had each completed one postal survey. Andersen (1968) proposed that utilization was a function of three components: predisposition, enablement and physical-need. Predisposition represents sociocultural and personal variables such as ethnicity and health beliefs that increase the likelihood of utilization. Enablement represents familial and medical resources such as income and health insurance which facilitate access to health-care. Physical-need represents perceived or diagnosed need for health-care. The present study modified Andersen's model to include two further components, psychological-need and multiple-need. Psychological-need represents variables such as distress and trauma, while multiple-need represents co-existing physical-need and psychological-need. The model was applied to a total of thirteen health-care measures which were categorised as either 'contact' or 'volume' measures. Contact measured whether a service had been used, while volume measured the amount of contact with a service. Seven measures tapped professional care (treatment by hospitals, general practitioners (GPs) and other professionals), and six tapped self-care (treatment by prescriptions, bedrest or reduced activity). Although veterans reported greater health-need than their wives, they were less frequent in their use of a range of services, including GP services. Five hypotheses tested core propositions of the model. Results supported one hypothesis; namely, that physical-need was more important in explaining the frequency of GP-service use than the likelihood of its use. The other four hypotheses received either limited or no support. Two hypotheses tested the modified model and received limited support. Psychological-need and multiple-need enhanced the explanation of five and two services, respectively. No evidence was found that poor psychological functioning or co-

existing health problems were associated with use of GP services. There was evidence that psychological-need was associated with use of hospital services. Findings suggested that veterans and their wives who did not possess specified enabling resources had impeded access to GP-care. Overall, predisposing characteristics accounted for most of the explained variance across the thirteen measures of health-care, and enabling resources accounted for the least. Discussion focused on the need for future research to refine health-care measures so that the reasons for use or non-use of specific services are explicit, to use longitudinal designs in order to examine the process of health-care, and to more clearly explicate the Andersen (1968) model in terms of theoretical relationships among predictors.

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"Life is a mystery
Everyone must stand alone
I hear you call my name and it feels like home."

(Madonna, *Like a Prayer*, 1987)

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CHAPTER ONE

Introduction

1.1 Chapter overview

The two respondent populations of the present thesis, Vietnam War veterans and their wives[1], are introduced in this chapter. The war veterans' research literature and the more general health-care utilization research are also introduced. The rationale for the present research is presented and illustrated with examples which span the New Zealand and international literature. The examples highlight the need for, firstly, research on Vietnam War veterans' and their wives' use of health care and, secondly, for extending one of the most frequently applied conceptual models of health care. The chapter concludes with an overview of the content of the thesis.

1.2 Vietnam War veterans and their wives: Health and health-care

1.2.1 Vietnam War veterans

A large body of research has documented the adverse physical and psychological health effects of military combat on Vietnam War veterans. The major analytic focus of the research has been on the effects of two 'military experience' variables; namely, traumatic stressors (i.e., combat exposure) and post-traumatic stress disorder (PTSD). Thus, the research typically involves health status comparisons between veterans who meet diagnostic criteria for PTSD and veterans who do not[2]. The American National Vietnam Veterans Readjustment Study (NVVRS) reported that the current PTSD prevalence among community dwelling male veterans was 15%, but among veterans exposed to high levels of military combat, the current prevalence was 35.8% (Kulka et al., 1990). New Zealand research has classified at least 10%

[1]In this thesis, 'wife' also encompasses any female respondent living in a de facto relationship with a veteran respondent.

[2]Henceforth, these two categories of Vietnam war veterans will also be referred to as PTSD-veterans and non-PTSD-veterans.

of Vietnam War veterans as having PTSD[3]. Other psychological disorders such as generalized anxiety and depression are often diagnosed concurrently with PTSD (Boscarino, 1995; Kulka et al., 1990).

Research has found that veterans with PTSD have suffered higher levels of physical illness and disability than non-PTSD-veterans; specifically, PTSD-veterans reported a greater susceptibility to a range of physical illness symptoms which included hearing loss, skin ailments, headaches, and gastrointestinal diseases (Eisen, Goldberg, True & Henderson, 1991; Waigandt, Evans & Davis, 1986). In a comparative study of New Zealand Vietnam War veterans with and without post-traumatic stress disorder, PTSD cases reported lower self-ratings of health, twice as many physical symptoms, almost twice as many chronic health problems and almost five times as many disability days (Vincent, Chamberlain & Long, 1994). Other research comparing the effect of different levels of combat exposure has found that high-combat-exposed veterans currently engaged in a greater range of health-risk behaviours and were more likely to rate their health as poor (Waigandt et al., 1986).

The NVVRS study found that two groups, high-combat-exposed veterans and PTSD-veterans, were significantly more likely than other Vietnam veterans to have utilized mental health care at some time in their lives (Kulka et al., 1990). The study also found that PTSD-veterans were more frequent than non-PTSD veterans in their consumption of outpatient medical services. Other research has found that PTSD-veterans had higher rates of hospitalization and medication use than non-PTSD veterans (Shehan, 1987; Long, Chamberlain & Vincent, 1992;

[3]A necessary pre-condition for the diagnosis of PTSD is exposure to an overwhelming and fear-inducing event in which there is either the threat of, or actual, serious injury or loss of life (e.g., experiencing or witnessing violent assault) (Norris, 1990). Beyond this precipitating event, the following symptoms characterize the PTSD response: Repeated distressful re-experiencing of the trauma through flashbacks or nightmares; emotional closing-off or numbing which is often accompanied by avoidance of trauma-specific stimuli, and heightened autonomic arousal such as being easily startled (American Psychiatric Association, 1994).

Vincent, Long & Chamberlain, 1991). The research literature suggests that the health effects experienced by Vietnam War veterans also impact negatively on marital and family relationships (Carroll, Rueger, Foy, & Donahue, 1985; Jordan et al. 1992; Roberts et al., 1982). Compared with non-PTSD veterans, PTSD-veterans have reported more problems with self-disclosure, expressiveness to their wives, physical aggression and marital adjustment (Carroll et al., 1985), more family violence (Jordan et al., 1992) and more difficulties with marital intimacy and sociability towards people in general (Roberts et al., 1982).

1.2.2 Wives of Vietnam War veterans

Research has seldom, if ever, investigated the susceptibility to psychological problems, including PTSD, of the wives of Vietnam War veterans, although more general aspects of the wives' mental health have been assessed. Broad consensus exists in both the sparse empirical literature and the more plentiful qualitative literature regarding the adverse impact of the veterans' stress-related disorders on their wives' mental health. Findings suggest that the wives of PTSD-veterans have been at greater risk of poorer psychological functioning than wives of non-PTSD veterans (Jordan et al., 1992). In addition, compared with other wives, wives of PTSD-veterans have reported less happiness and life satisfaction, and greater demoralization (Beckham, Lytle & Feldam, 1996; Kulka et al., 1990).

1.2.3 Health-care use

The health-care focus of the present thesis has the potential to serve several distinct but inter-related aims. One concerns its capacity for identifying 'predictors' (i.e., variables that are significantly associated with health-care utilization). Another aim involves its explanatory usefulness; that is, any conceptual model needs to move beyond identifying factors which underlie the uptake of health services. Any model which predicts health-care, attempts also

to maximise understanding by 'linking' predictors within a coherent explanatory framework. A further aim involves ascertaining whether those who need health care, receive it. The model of health-care applied in the present research and introduced below, also provides the basis for determining whether social structural and economic barriers hinder people's access to health-care. In this regard, once predictors of health-care have been identified, they can be evaluated in terms of whether they (1) represent personal or societal factors underlying health-care and (2) help or hinder access to health-care (Andersen, 1968). Personal factors comprise characteristics such as sex (i.e., gender), age, and ethnicity. Societal factors include the availability of characteristics which depend on the socio-political system, and include household income and community health-care resources, among others. Factors such as age and ethnicity may become the focus of proposals and programmes aimed at helping specified groups obtain health-care (Wolinsky & Johnson, 1991). Societal factors, on the other hand, may provide the justification for more far-reaching development and implementation of policies within the health-care system itself (Andersen, Kravits & Anderson, 1975; Wolinsky et al., 1989). In addition to its more practical application, the present research aims to test and develop a particular conceptual model, taking into account a range of theoretically-linked variables.

In health-care utilization research, conceptual models have supplied the rationale for variables that are assumed to underlie health-care. These models explicate relationships both within groups of predictors and among groups of predictors, and their relationship to health-care use. Although health-care models have been widely applied to various subject populations, they have been applied infrequently to specific population minorities such as military personnel[4].

[4]Several studies have surveyed use of ***mental*** health-care by Vietnam veterans, but few have included multivariate analyses of factors determining health-care use in general, and particularly, their use of medical services.

The model of health-care that provides the conceptual framework for the present study is Andersen's (1968) model and its later revisions (Andersen & Newman, 1973; Andersen, 1995). The present research cites Andersen's (1968) model, rather than later conceptions of the model because the "modifications really only represent a modest revision of the behavioral model of the use of health services" (Wolinsky, 1990, p. 84). This model suggests that health-care is the outcome of the following factors: physical health status, the predisposition to use health-care and the ability to access required health-care services[5]. A large number of variables have been examined in the prior Andersen-based research. The most frequent finding is that 'physical-need' variables (i.e., bodily symptoms and illnesses) are the strongest predictors of health-care across a diverse range of population groups. The research has also identified several complex interactions of the respondent population's demographic composition on health-care. For example, significant sex-, age- and ethnic-differences have been found in the use of health-care (Kandrack, Grant & Segall, 1991; Nelson, 1993; Wolinsky & Johnson, 1991). Moreover, there exists a separate but relevant literature on the predictive salience of psychological constructs (e.g., health attitudes), psychosocial characteristics (e.g., social contact networks), family resources (e.g., welfare recipiency) and community resources (e.g., availability of medical care services). A small number of studies have also assessed the contribution of 'psychological-need' (i.e., underlying psychological problems) to use of health care. In one of them, Cheng's (1992) study of older American women, psychological distress significantly increased the amount of explained variance in health-care above that which had already been explained by physical health need and demographic variables.

Research on war veterans' health-care utilization parallels the findings of the civilian (i.e.

[5]Chapter 2 describes in greater detail Andersen's (1968) model.

general population) research. In a study on patterns of medical health care among veterans from several different wars, Wolinsky, Coe, Mosely and Homan (1985) found that physical-need variables were the most important predictors of health-care, while socio-demographic variables formed a second level of importance. In a recent American study of male and female Vietnam War veterans, physical-need emerged as the strongest predictor of use of in- and out-patient medical services and of mental health services (Stern, Taft, King, King & Meehan, 1996). In particular, poorer physical-health contributed to more frequent use of health care, while having PTSD was indirectly associated with use of primary health-care through its association with poorer physical health. No income differences in use of inpatient care were found, but veterans on higher incomes were more likely than those on lower incomes to use outpatient services.

1.3 The present study

The primary aim of the present study is to apply Andersen's (1968) model of health-care services to the health-care behaviour of New Zealand Vietnam War veterans and their wives. This study will contribute to the empirical evidence for Andersen's conceptual framework. The present study incorporates as well a range of psychological variables such as traumatic stressors, post-traumatic stress disorder and psychological wellbeing which have their origins in research that has developed independently from that of health-care utilization. For example, the usefulness of Andersen's (1968) model in explaining medical health-care following exposure to traumatic stressors has been infrequently examined in the prior research, yet there is a large body of literature documenting the salience of such psychological variables to health care. Thus, the present study has the potential to extend the knowledge regarding the contribution of psychological variables to the predictive capacity of the Andersen model.

While research has highlighted the continuing physical and psychological problems faced by Vietnam War veterans, surprisingly few studies have examined the impact of these problems on their use of health services. In addition, even fewer studies to date have examined whether veterans' and their wives' use of health-care has been hindered by barriers within the health-care system itself. Therefore, the present research will also contribute to the knowledge and understanding of the relationship of biopsychosocial variables to health-care use by Vietnam War veterans. The usefulness of this knowledge extends beyond immediate concerns about the veterans' health status and health-care needs. Currently, a sizeable proportion of New Zealand Vietnam War veterans has reached or is nearing retirement. For men in general, retirement is a stressful life stage, and one that is often accompanied by problems involving declining physical health and role adjustment (Verbrugge, 1989). Given the adverse health effects that already exist for many veterans, questions arise about any additional demands their combat exposure may place on their post-retirement health-care use. To what extent will the reported health disadvantage of these veterans lead to even poorer health in later years beyond that of normal age-related health decline, and what will be the impact on health-care?

In an earlier time of steadily expanding and less costly health-care, there were few concerns about the impact of increased demand on the health system's ability to deliver medical services. However, in this present time of cost-containment and reduction in the availability of existing health services, concerns about the effects of increased demand are rather more commonplace and urgent. The need exists, therefore, for investigations into the veterans' health status and health-care as they reach later stages of the life cycle.

Very little is known about the physical health and health-care use of wives of Vietnam War veterans. Given the burgeoning research interest in women's health in recent decades, the

virtual absence of research on the wives' health and health-care is perhaps more striking than the dearth of research on their husbands' health-care. Despite indications of wives having poor psychological health, they have attracted little systematic research interest. Therefore, the present research will contribute important knowledge on their health status and health-care use, and also data on their health and health-care vis-à-vis their husbands'. The negative impact of the veterans' war experiences on marital relationships has been previously documented, as discussed earlier, although direct comparisons of health-status have not as yet been undertaken. It is likely that veterans' war experiences will exacerbate any health differences. An important confound in any comparison is gender which could account for differences, since differences in health status between men and women have been previously demonstrated (Kandrack et al., 1991; Ministry of Health, 1993; Verbrugge, 1989)[6].

Prior applications of Andersen's (1968) model have examined the contribution of physical-need to the use of health-care, with few studies extending the inquiry to also include the contribution of ***psychological*** need. In the war veterans' literature, the effects of traumatic stressors on specific aspects of health have been well researched, but only a small number of studies has examined the effects of traumatic stressors on the use of health-care. Similarly, numerous studies, both civilian- and military-based, have examined the relationship of psychological-need to health-care. Few of these studies, however, have been conducted within conceptual frameworks. Consequently, the usefulness of the Andersen model in explaining the use of health-care by trauma-exposed populations is of substantial theoretical interest.

Given the importance of PTSD as a predictor of health status among Vietnam War veterans, PTSD may also emerge as an important psychological-need predictor of health-care. More

[6]A review of research on sex differences in health status is provided in Chapter 3, Section 3.3.1.

importantly from a model-building perspective, psychological-need could significantly increase the amount of explained variance in veterans' and their wives' health-care over that already explained by variables in standard applications of Andersen's (1968) model. Furthermore, few studies have investigated the moderating role of psychological-need on the association between physical-need and health-care. Indeed, given the traumatic exposure experienced by identifiable populations such as war veterans, the absence of research on the moderating role of psychological-need is perplexing. The present research, by extending Andersen's model to include psychological-need, will contribute in the first instance to the development of the model, and in the second, to theories on the relationship of psychological functioning to health-care in the Vietnam-war veteran population.

1.4 Outline of chapters

The following chapters review more closely specific aspects of the literature that is relevant to the present study. Chapter 2 provides an overview of several conceptual models of health-care, and sets out the rationale for selecting Andersen's (1968) model in the present research on Vietnam War veterans and their wives.

Chapters 3 through 5 review the health-care utilization literature. In their emphasis on the empirical status of Andersen's model, each of these three chapters focuses on a distinctive area of the vast research. Chapters 3 and 4 both cover the civilian health-care literature. While Chapter 3 concentrates on studies which have adhered to the core components of the 'Andersen' (1968; 1995) model, Chapter 4 concentrates on studies which have included other components. Consequently, the literature reviewed in Chapter 4 extends beyond the Andersen-based literature to also include studies on the health-care effects of psychological variables (e.g., stressful life events and psychological distress).

Chapter 5 covers the literature on war veterans and wives of war veterans. It reviews three overlapping strands of war veterans' research: studies on the health of New Zealand Vietnam War veterans, studies on the health and health-care of American war veterans, and studies which have investigated the contribution of traumatic stressors and PTSD to specified health-outcomes in war-veteran populations. Chapter 5 also reviews the research on the psychological health of wives of Vietnam War veterans.

In Chapter 6, the rationale, scope and objectives of the present study are specified, along with the research hypotheses. Chapter 7 reports the methodology, while Chapter 8 describes in detail the present sample. Results of the present study are reported in Chapters 9 and 10, and Chapter 11 discusses the present research findings, and their implications for New Zealand Vietnam War veterans and their wives, the Andersen model of health-care use, and for future research.

The following chapter examines several conceptual models of health-care use, and in particular, Andersen's (1968) model. Concepts relating to types of health-care, including distinctions between 'elective' and 'non-elective' health-care and between 'formal' and 'informal' health-care are described.

CHAPTER TWO

Conceptual Models of Health-care

2.1 Chapter overview

This chapter describes several models of health-care utilization whose common focus is the explanation of people's health-care behaviours. The health-care models of Suchman (1967), Anderson and Bartkus (1973) and Antonovsky (1972) are considered first. The latter two models represent individual-level explanations of health care, while Suchman's represents a societal-level explanation. This chapter leans towards models which incorporate these two categories because of the present focus on contributions from both societal and individual factors underlying health-care. Next, the health-care treatment-compliance research of Becker and associates is considered (Janz & Becker, 1984), with an emphasis on the links between treatment compliance studies and health-care utilization studies. Lastly, the model of health-care applied in the present study, Andersen's (1968) conceptual framework, is presented. The three components of the model (i.e., predisposition, enablement and need) are introduced, and their proposed links to health-care outlined.

2.2 Introduction

Research on people's responses to perceived and actual illness symptoms, and perceived threats to their health is vast, encompassing numerous well-established areas of inquiry (Andersen & Newman, 1973; Wolinsky, 1990). Two distinct but related areas bear upon the present study: health-care utilization research and research on patients' compliance with treatment-regimens. Although not overtly focused on health-care as an end in itself, treatment-compliance research has included broadly the same individual-level variables that have been examined in health-care utilization research.

2.3 Health-care models

Researchers first attempted to systematically model the determinants of health services utilization in the 1950s. For more than two decades, attention was confined to primary medical care (e.g., care provided by family physicians or general medical practitioners)[1]. The question about the extent to which use of health-care is based on factors other than actual health-need has since generated an enormous volume of research. Repeated documentation that many seriously ill people do not seek medical treatment and that most people who consult a doctor have relatively minor disorders, has long suggested that use of health services is neither inevitably nor solely determined by diagnoses health-need (Antonovsky, 1972). Furthermore, the research has also been driven by concerns about whether people across all social and ethnic groups have equal access to required health-care (Stoller, 1982; Wolinsky et al., 1989). Over the decades, two broad questions have linked the various attempts to explain patterns of health services utilization: Why people react so differently to identical health complaints, and why the same person who experiences similar symptoms chooses treatment one time but not another (Andersen & Newman, 1973). Underlying these questions is the assumption that use of health-care can be explained as an outcome of empirically verifiable causes; that is, it is a predictable rather than a random outcome of human behaviour. In concert with the empirical investigations of health-care behaviour, several different conceptual frameworks have been developed.

2.3.1 Macro-level models

Models of health care can be classified as either 'macro-' or 'micro-' in their perspectives. Macro-perspectives emphasize proposed causal roles of broad, impersonal structures and

[1]In the present study, the labels physician, doctor and general-practitioner (GP) are treated as synonymous. Preference, however, has been given to the abbreviation for general practitioner, GP, because it is a well-known and convenient shorthand.

influences such as social and economic structures (Suchman, 1967) or ethno-cultural factors (Maclachlan, 1958). In explaining patterns of health services use, the macro-perspective assigns societal and demographic factors causal priority over personal, individual-level variables and subjective interpersonal processes. Suchman's (1967) conceptual framework is an example of a macro-perspective model.

Suchman, 1967. Suchman proposed that social group membership was the primary determinant of the types of health services that people utilized. Two societal factors, in particular, account for people's care-seeking decisions; the first pertained to the group's social structure, the other to its health orientation. **Social structure** is conceptualised as a network of socialisation factors which include group cohesion, integration and ethnocentrism. **Health orientations** comprise its beliefs about medical care. Suchman (1967) characterises group beliefs as popular, in which lay remedies and folk practitioners' methods predominate, or as scientific, in which case professionalised medical care predominates. By this model, the group's social structure and health orientation shapes beliefs about illness behaviour and treatment-seeking behaviour. In turn, the group's social structure and health orientation are shaped by its economic status (e.g., access to material resources) and sociocultural composition.

Because macro-level models concentrate on the structural determinants of health services utilization, they leave unanswered questions about everyday, individual-level factors that may influence the use of health-care. Micro-level models have expanded the range of variables to include individual and familial determinants of health-care.

2.3.2 Micro-level models

Micro-level models, in contrast to macro-models, take as their point of departure individual factors that condition and underlie people's responses to illness symptoms. Individual factors encompass dispositional characteristics (e.g. temperament) and cognitive processes (eg, people's interpretations of illness symptomatology). In Rosenstock's (1966) socio-psychological model, for example, the two preconditions for seeking health care involved intra-individual characteristics; specifically, people must not only be psychologically prepared to seek treatment in response to suspected illness symptoms but must also believe that the sought treatment is worth seeking. Few, if any, models of health-care have focused solely on micro-level factors to the exclusion of macro-level factors. An overview of two different models which have included both macro- and micro-level variables into their explanatory framework is now provided.

Anderson and Bartkus, 1973. Anderson and Bartkus's (1973) model is concerned with identifying factors which influence people's eventual choice of health care from among alternatives. Salient factors involved in the decision-making process include the initial perception of symptoms, the inclination to seek treatment, an appraisal of the value of seeking help, others' (e.g., family members) appraisal of the need to seek help, the range of available alternatives and the ability to meet treatment costs.

Antonovsky, 1972. A further example of a model whose dual emphasis is on macro and micro perspectives is Antonovsky's (1972) model of general medical practitioner (GP)-use. The impetus for developing the model was Antonovsky's interest in the extent to which immigrants' non-medical needs motivated their use of GP care and, in turn, the extent to which the medical care system met those needs. The model encompasses characteristics of

the patient, the medical institution and the sociocultural environment. Patient characteristics deemed most relevant to the question of utilization are latent needs (i.e., non-medical), intolerance of ambiguous symptoms and an inclination to seek treatment. Characteristics of the medical institution are primarily those pertaining to the doctors' ability to meet patients' latent needs; hence they include the doctor's interpersonal manner and ability to respond to patients' socioemotional needs. Socio-cultural characteristics of the model include the larger community's attitude toward and facilitation of medical services use, absence of stigma for a required treatment, cultural pressures to have specific types of problems diagnosed and the availability of functional alternatives to medical care. Antonovsky (1972) proposed that long-term use of GP services was determined largely by the doctor's practical capacity for meeting the diverse social and psychological needs of patients. Early research on the model with Jewish survivors of concentration camps confirmed that latent psychological need was a determinant of ongoing physician contact (Mann, Medalie, Lieber, Groen & Guttman, 1970).

2.3.3 Summary of health-care models

A theme common to the various models of health care is the pivotal role of people's beliefs about health and health-care. Depending on whether the perspective is macro or micro, these beliefs are conceptualised at the societal or individual level. Suchman (1967) proposed that health-care use is constrained by socioeconomically-influenced group beliefs about illness and medicine. Although not emphasizing beliefs, Anderson and Bartkus's (1973) micro-level framework articulates the cognitive decision-making process assumed to underlie the choice of health care. Antonovksy's (1972) conception of care seeking behaviour emphasizes the importance of historically-specific non-medical needs that underlie people's use of GP care. A second theme of the models is their attempt to explain the relationship of material resources to health and health-care (Antonovsky, 1972; Wolinsky, 1990).

2.4 Treatment-compliance models

Just as models of health care emphasize the salience of people's beliefs as predictors of health care, models of medical-treatment compliance also emphasize the role of beliefs in people's compliance with 'doctor's orders'. Compliance research has focused, not so much on health care as an end in itself, but on identifying factors which influence people's compliance with medically-prescribed treatment. It emphasizes ongoing contact with medical professionals (Becker et al., 1977). Notwithstanding the somewhat different outcomes of interest, treatment-compliance research has relevance for the present study because the literature suggests that broadly similar factors underlie use of health-care and compliance with health-care. The most obvious point of similarity is the explanatory role of health beliefs in health-related behaviours. Rosenstock's (1974) Health Belief Model, for example, views treatment-compliance behaviour as an individual-level decision-making process whose overall goal is determining whether treatment-compliance is worthwhile.

The Health Belief Model. The most widely researched model of treatment-compliance is the Health Belief Model (HBM), a model which emphasizes the role of people's health and illness beliefs (Rosenstock, 1974; Becker, 1974). The HBM proposes that people want to avoid illness and that their beliefs about whether specified actions will prevent illness will determine the level of compliance with a medical regimen. The model conceptualises compliance as a four-dimensional process. The first dimension, **perceived susceptibility**, involves personal beliefs about whether specific bodily symptoms require medical attention. The second dimension, **perceived severity**, centres on the estimated health consequences of the symptoms. **Perceived costs and benefits**, the third dimension, refers to the accessibility and effectiveness of treatment. Treatment compliance will be low when treatment is perceived to be difficult or slow in producing desired effects. The final dimension, **perceived barriers**,

represents practical constraints to successful compliance. These relate to the treatment and include its cost, risks (e.g., side effects), unpleasantness and inconvenience. According to the HBM, both internal (symptoms) and external (medical health messages) cues are necessary agents in treatment compliance. In a meta-analysis of 16 studies involving the HBM, while all four dimensions contributed to health-care use, costs and benefits had significantly higher effect sizes than severity and the other two dimensions (Harrison, Mullen & Green, 1992)[2].

2.4.1 Summary of treatment-compliance models

The Health Belief Model views people's compliance with a treatment regime as an outcome of a multi-dimensional decision-making process. At the core of the model are beliefs about illness, personal illness susceptibility, perceived severity, treatment ease and effectiveness, and finally, perceived or actual barriers to treatment within the health-care system itself.

Although addressing concerns about different health outcomes, treatment-compliance models and health-care models have a common interest in factors that influence people's contact with the health-care system. Both approaches examine non-medical as well as medical-need factors that underlie people's health behaviour. The specific links between the Health Belief Model and health-care models - and, in particular, Andersen's (1968) model - are as follows: People's personal health beliefs, the impact of attitudes and values on their response to illness symptoms and their perception of the health-care system.

[2]The inclusion criteria in the meta-analysis were studies that had measured all four dimensions. Of the 442 studies applying the Health Belief Model, Harrison et al. (1992) found that only 16 met the criteria.

2.5 Andersen's (1968) health-care model

Since its initial formulation over thirty years ago, Andersen's (1968) behavioural model has become the most widely cited and researched model in health-care research (Strain, 1991; Wolinsky & Johnson, 1992; Bazargan, Bazargan & Baker, 1998). Wolinsky (1990) has suggested several reasons for the continued research interest in the model. First, the model is an eclectic blend of several perspectives. A wide range of prior research and existing explanatory frameworks was drawn upon in formulating the model. The main influences span medical-sociology, economics and psychology. Second, the model is reported to be useful for assessing the equity of distribution of health services within specified populations (Wolinsky et al., 1989). Third is the ease of application of the model to health survey data. Wolinsky refers to the "considerable intuitive appeal" of the model (Wolinsky, 1990, p. 76) as a further reason for its continued popularity. A related reason for its widespread use stems from repeated findings identifying a large number of health-care predictors (Andersen, Kravits & Anderson, 1975). Andersen's model provides a functional system of classification within which numerous variables can be meaningfully organised.

2.5.1 Justification for the model

Andersen (1968) argued that people's use of health care constitutes behaviour that can be studied in the same way as behaviours such as those involving work and household roles. The literature refers to Andersen's framework as a ***behavioural*** model, a description that emphasizes Andersen's view that health-care use is "another form of human behavior" (p.3)[3]. Consequently, Andersen's research went beyond treating health and illness behaviour as primarily the outcomes of biology and disease. Health-care behaviour also had important

[3]The model is behavioural because it bases the explanatory account on observable phenomena, in contrast to approaches which explain health-care behaviour in terms of either cognitive processes or macro-level factors.

social and psychological dimensions which included whether and to what extent specific bodily symptoms are experienced as possible illnesses, and appropriate behavioural responses to those experiences. From a theory-building perspective, Andersen (1995) has more recently argued that any understanding of people's health-care behaviour requires an account of subtle and pervasive socio-psychological influences.

In addition to the theoretical justification for viewing health-care use as a behaviour, Andersen (1968) also argued for the practical application in studying health-care patterns: "Considerable differences remain among various segments of the population with respect to the type and quantity of health services they use. The problems of distribution are magnified by rising expenditures for medical care" (p.3). More than three decades later, present widespread concerns about the equitable distribution and availability of health-care resources strengthen the practical case for studying the determinants of health care.

From time to time, Andersen and his colleagues have revised the behavioural model, with most changes involving relatively inconsequential aspects of the framework (Wolinsky, 1990). Two revisions, however, have involved important modifications; namely, the unit of analysis has shifted from the family to the individual, and there has been an increased stress on societal determinants of health care. The shift from family-unit to individual-unit analyses was prompted by concern that aggregate measures may conceal health and health-care differences within households. In addition, the individual focus enabled an assessment of patterns of health and health-care between specific groups such as ethnic minorities and the elderly. The majority of applications of Andersen's model since the early 1970s have used the individual rather than the household as the basic unit of analysis. The second fundamental change has involved a more theoretically-focused examination of societal characteristics. As shown in

Figure 1, the societal characteristics critical to health care behaviour are medical technology and social norms. These are seen as having a direct impact on the individual's health care and an indirect impact through their influence on the health care system. The way in which the resources within the system are organized and distributed affects the individual determinants (i.e., the three components) of health care.

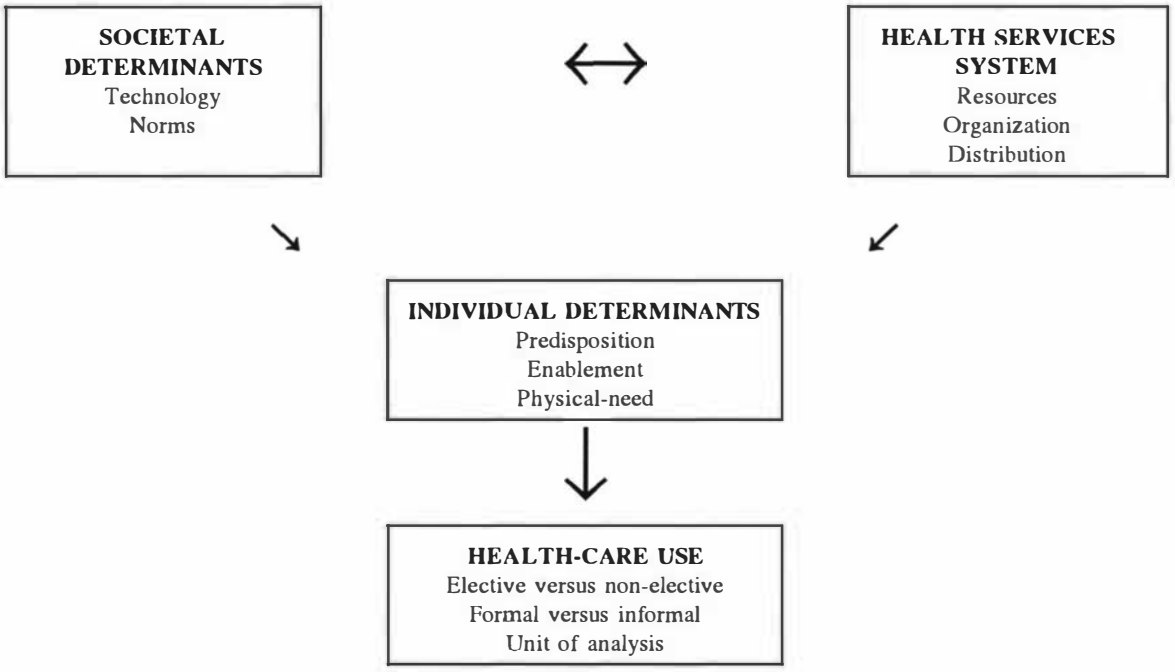

Figure 1: Framework for organising the societal and individual determinants of health-care use (adapted from Andersen & Newman, 1973 and Andersen, 1995).

2.5.2 Main influences on the model

Andersen's model was influenced by two established approaches to modeling health care. The first approach involved research whose initial emphasis was on people's treatment inclinations in the early stages of illness leading up to their contact with the health-care system. This consumer-oriented approach later shifted its emphasis to more economic variables such as household income, medical insurance, medical costs and access to health care. The second approach that influenced Andersen's model involved socio-psychological aspects of illness behaviour such as people's perceived need for care, and their estimates of the costs and

benefits of undergoing treatment. This second major influence also included the social structural influences on people's attitudes to the use of scientific medicine.

In drawing upon the extant health services research, Andersen clarified conceptual distinctions between social-psychological factors and economic factors, incorporated individual-level health and illness perceptions, used the family as the primary unit of analysis and applied the model to several different categories of health-care (e.g., hospital, private GP and dental care).

2.5.3 Components of the model

Andersen proposed that three components contributed to people's use of health-care[4]; these were 'predisposition', 'enablement' and 'need'. These represent the core components of the model and are depicted schematically in Figure 2.

Figure 2: The core components of Andersen's model of health-care utilization (adapted from Andersen, 1968).

2.5.3.1 The predisposing component

Predisposition consists of factors or variables that exist prior to the onset of illness symptoms. It represents those variables which predispose or incline people to use health care. Consequently, predisposing variables influence response to health-need, perception of need and use of health-care. The predisposing component comprises three separable dimensions. The first, **demographic**, includes age, sex, marital status and living arrangement. These represent personal-level influences on health care. The second dimension, **social structural**,

[4]Andersen (1968) has referred to health-care utilization as the fourth component of the model. However, the present thesis refers to health-care utilization as an ***outcome*** of the three components (i.e., predisposition, enablement and physical-need), reserving the word 'component' for the ***'input'*** elements (i.e., underlying explanatory factors) of the model.

includes education, ethnicity, employment status, occupational status and social contact networks. Social structural variables represent influences on health care beyond the individual and family such as socio-economic status. Studies have differed widely regarding both the breadth and depth of demographic and social structural variables that have been analysed in the health-care research. Some studies, for example, have included measures of family size and residential mobility, and a few have included measures of religious affiliation. Recent studies have considered the dimension of social structure itself as comprising multiple facets, each of which is considered a potential predictor of health care (Nelson, 1993; Wolinsky & Johnson, 1991). **Health beliefs**, the third dimension of predisposition, involves people's health-related values, knowledge and attitudes. Measures of health beliefs have varied across studies. In some studies, health beliefs measures have comprised health worries and perceived health control, whereas in others measures have included items on medical skepticism and personal health practices. One aspect of health beliefs has been devoted to measuring the impact of 'patient' **satisfaction with health care** on subsequent health-care contacts (Robbins et al., 1993; Strain, 1991; Penchanksy & Thomas, 1981). Research on the relationship between health-care satisfaction and health-care access has led in recent years to the integration of health-care models with patient-satisfaction models (Robbins et al., 1993; Gribben, 1992). The integration has yielded more complex findings on relationships among predictor variables, and, in terms of Andersen's model, some ambiguity over conceptual distinctions between satisfaction, a predisposing health-care predictor, and medical access, an enabling health-care predictor.

To summarize, predisposition refers to the individual's state of readiness to seek health care. In the model, predisposition is subdivided into demographic characteristics (ethnicity and marital status), social structural background (e.g., social support network and employment

status) and health beliefs (e.g. health worries). Andersen conceptualised this component as comprising both immutable (e.g., sex and age) and mutable characteristics (e.g., education and health beliefs), all of which combine to 'predispose' the individual to use health care.

2.5.3.2 The enabling component

Enablement consists of variables that facilitate people's access to and use of health care. Representing the economic dimension of Andersen's (1968) model, enablement is further divided into family and community resources. Family resources include finances, insurance coverage and home and vehicle ownership. Community resources include the doctor-to-population ratio and the volume and range of available health and medical services. The number and scope of additional measures of enablement has varied substantially across the research. Home ownership, residential longevity, access to private transport and welfare recipiency are all variables included in the more recent research (Wolinsky & Johnson, 1992; Nolan, 1994). Andersen's model does not preclude any of the non-need components having an impact on another variable. For example, educational attainment (a predisposing variable) may constrain future earning potential, and a larger-sized family may place greater demands on family resources than a smaller family[5].

In summary, enablement represents family and community (i.e., medical) resources which 'set limits' on the types of health-care available for utilization.

[5]Even though the resource-strength of enabling variables may depend on predisposing variables, the enabling component is still viewed as exerting an independent effect on health-care use.

2.5.3.3 The need component

The need component comprises factors most closely linked to health-care use. Because they represent actual or perceived need for health care, need factors provide the most immediate impetus for contact with health services. From its initial formulation, the behavioural model has conceived the need component as involving physical health need. Accordingly, the research has focused almost exclusively on physical health status, leaving indeterminate the status of other types of need that are not easily classifiable as manifestations of physical health. These include, but are not confined to, psychosocial and psychological-need. For example, among their large number of studies applying Andersen's model, Wolinsky and associates have used a measure of mental health in at least one study (Wolinsky et al., 1983). However, this did not represent a sustained attempt to more fully incorporate psychological-need into the model. Thus, among the research on Andersen's model, there is not much empirical justification for including measures of psychological-need. However, given the voluminous literature which exists on the physical health consequences and health care outcomes associated with poor psychological health, the present study argues for the inclusion of measures of psychological need in the model. Andersen distinguished 'perceived' need from 'medically-diagnosed' need. Perceived need is a broad category encompassing people's own estimations of their health status. These estimates, also referred to as 'self-reports' may or may not be based on actual health status[6].

Compared with predisposition and enablement, greater consistency exists across the literature in the use of physical health measures. Given the behavioural model's major interest in the use of ***medical*** health-care, the need predictors have usually been confined to different aspects

[6]In the present study, the label "perceived need" is used simply to describe self-reports of general health, and does not imply a substantive contrast with "actual" (i.e., real, existing) need.

of ***physical*** health. These have included medical- or self-reports of somatic symptoms, chronic ailments and physical impairments. Self-ratings of general health have also been used in the majority of studies.

Subsection summary: Core components of the model. Predisposing and enabling variables exist prior to perceived physical-need. They influence people's awareness of and response to the need for health-care. Predisposing variables encompass demographic, social structural and attitudinal factors underlying health-care utilization. Enabling variables encompass underlying economic factors, both familial and medical. In the initial and subsequent formulations of the model, Andersen (1968; Andersen & Newman, 1973) has not stated whether non-need components[7] should be taken into account before considering the health-care impact of phyiscal-need[8]. Most of the recent multivariate studies have observed the following 'entry-order' of components into analyses: Predisposition has been analysed first, enablement second and physical-need, third (Bazargan et al., 1998; Nelson, 1993; Wenzel et al., 1995; Wolinsky & Johnson, 1991), and this is the order also followed in the present study.

2.5.3.4 Health-care use

The last component of Andersen's (1968) model represents actual use of health care services. By this model, service use is the outcome of the predisposing, enabling and need components. The most frequent types of health services investigated in the research applying Andersen's model have been physician-based care and (to a slightly lesser extent) hospital-based care. In the earliest Andersen-based research, measures of health care comprised numbers of physician and dentists visits, and nights in hospital over a preceding twelve-month period

[7]The phrase 'non-need components' refers collectively to the predisposing and enabling components.

[8]The order in which components have been entered into analyses in the present study is of critical importance, as is explained in Chapter 9.

(Andersen, 1968; Andersen & Newman, 1973). Measurement of services later expanded to include several other specific health-care services including health-care from other medical professionals such as medical specialists, use of Accident and Emergency services, use of outpatient or clinic services and nursing home admissions (Wolinsky & Johnson, 1991).

Further distinctions have included contact and volume measures of health care. For example the literature distinguishes between 'GP contacts' and 'GP visits'. 'GP contacts' refers to whether or not people have visited a GP over a specified time interval, whereas 'GP visits' specifies the number of visits ***among those who have had contact***. Researchers have used the contact/volume distinction to investigate two differently-composed samples. Users and non-users of health-care comprise the first sample. Data from this sample addresses such questions as what the predictors of health-care ***contact*** (and non-contact) are, and how they differ across different groups (e.g., men and women, Maori and nonMaori). Users alone comprise the second type of sample. Data from the users sample addresses such questions as what the predictors of ***frequency*** (and infrequency) of health-care use are, and how they differ across different groups[9].

2.5.3.4.1 Elective versus non-elective health-care

Andersen characterized the decision by patients to seek health care as either elective or non-elective. 'Elective' care signifies the use of health services that are 'prompted' by the patient's own decision to seek health-care. 'Non-elective' care signifies aspects of the health-need (e.g., its painfulness or severity) that prompt the patient to seek specified medical-care.

[9]With few exceptions, Andersen-based studies have applied contact measures to the entire sample (i.e., consumers and non-consumers of health-care) and confined volume measures to consumers alone (Andersen, 1968; Andersen et al., 1975; Wolinsky, 1978; Wolinsky et al., 1989; Mutchler & Burr, 1991; Stoller, 1982; Nelson, 1993; Cheng, 1992; Wolinsky & Johnson, 1991; Wolinsky & Johnson, 1992).

It further signifies that the major decision to obtain specified treatments rests primarily with health-care providers, as, for example, when a GP refers a patient to the services of a medical specialist. The two sorts of decisions - elective and non-elective - represent end points on a treatment continuum which contrasts the level of patient-choice for mandatory versus non-mandatory health-care categories. Andersen proposed that patient-discretion would be lowest for hospital services, moderate for physician services and highest for dental services.

2.5.3.4.2 Formal versus informal health-care

Formal health-care consists of professional care and includes such medical services as those provided by GPs and hospitals. Informal-care consists of 'home-based' (i.e., personal, familial) responses to perceived or actual sickness, and includes taking prescription medications, having bedrest and cutback-days (i.e., reducing usual activities).

In earlier applications of Andersen's model, bedrest and cutback-days were viewed as symptoms (i.e., predictors) of health-need and, accordingly, were included in the need component of the model (Andersen, 1968; Andersen & Newman, 1973). Since the late 1970s, however, these variables have been conceptualised as forms of health-care (Mechanic, 1979). Mechanic (1979) proposed that bedrest and cutback-days were more usefully viewed as responses to perceived illness-symptoms rather than as symptoms themselves. Wolinsky et al. (1984) suggested two possibilities about informal care which promised to further enhance its usefulness as a subcluster of health-care. The first was that informal care may substitute for formal care. The second possibility was that informal care was the first step in health-care use that leads to formal contact. Both possibilities extended the application of the model, and, among other things, allow comparisons between models of formal and informal health-care (Wolinsky & Johnson, 1991).

The elective-non-elective continuum and the formal-informal subclusters contrasted. The elective versus non-elective distinction is most clearly seen in comparisons between formal and informal health-care. Health-care involving hospitals, GPs and other medical services is less elective than that involving prescriptions, bedrest and cutback-days. However, the elective versus non-elective distinction is also possible ***within*** the formal and informal subclusters. For example, hospital-care is less elective than GP-care, which in turn is less elective than dental-care (Andersen, 1968). Similarly, because of its link to professional care, prescription use is less elective than bedrest, which in turn is less elective than cutback days[10].

2.5.4 Hypotheses derived from Andersen's model

Across the literature, three core hypotheses have been derived from Andersen's model:

I. Volume of health care will be a function of predisposition, enablement and need. Each component will contribute independently to an explanation of differences in people's use of health care.

II. The components will vary in their explanatory capacity, with need being the most important because of its direct link with use.

III. Each component's contribution will vary as a function of the type of service, and the level of discretion people have in choosing a service, in particular. Thus, need would dominate explanations of hospital care, while predisposition and enablement would dominate explanations of dental care.

[10]Bedrest implies more serious physical-need than does cutback-care because it involves a more complete reduction in usual activities (Wolinsky & Johnson, 1991).

Subsection Summary: Health-care use. Medical care is the outcome of predisposing, enabling and need characteristics, according to Andersen (1968). Use of some types of health-care entails greater patient initiative than other types. The greater the diagnostic seriousness of health problems, the less elective treatment is, and the greater the role of the health-care professional in allowing access to the required care. Formal health-care encompasses professional care, while informal-health care refers to self-treatment which may substitute for or preceed use of formal care. The elective-non-elective distinction is possible between formal and informal subclusters and also within these two subclusters.

2.5.5 Summary of Andersen's model

Andersen's model explains the use of health-care as an outcome of three distinguishable types of influences referred to as "components". The first, predisposition, exists prior to health-need, and encompasses personal, demographic and social structural variables that incline the individual towards health care. The second component, enablement, represents an 'economic' dimension and indicates the extent to which both family and community resources facilitate access to health care. The third component, need, represents physical health-need and is the prime impetus for the individual to make use of health care. The amount of discretion the patient has in choosing to receive treatment differs widely across different categories of health care, and use of informal health care may be the first step in the (eventual) use of formal health care. Andersen (1968) hypothesized that the predictive capacity of the predisposing, enabling and need components would vary as a function of health-care service. The need component was expected to be more important in explaining GP- and hospital-use, but less important in explaining dental-care. The more elective a service was, the greater the explanatory role of the non-need components of the model (i.e., predisposition and enablement) (Andersen & Newman, 1973).

2.6 Chapter summary

Several models of health-care utilization were outlined in this chapter. The models were discussed in terms of their capacity for providing either individual-level or societal-level explanations of health care. The links between health-care models and treatment-compliance models were considered, with the discussion focussing on the influence of the Health Belief Model (Rosenstock, 1966) on Andersen's (1968) model. Andersen's model was described in detail, including the rationale for its providing the conceptual framework for the study. Andersen conceptualized the predictors of health care as comprising three separable but interlinked components, predisposition (the personal inclination to use health-care), enablement (resources facilitation) and need (the impetus for health care). Core hypotheses from the model were presented, including the basic proposition that the predictors of health care vary depending on the health-care category.

The next chapter is the first of three which outline the empirical literature on Andersen's model. Chapter 3 surveys standard applications with general populations, Chapter 4 includes the civilian research which has focused on psychosocial health-care predictors and Chapter 5 brings together several research strands on the health and health-care of war veterans and their wives.

CHAPTER THREE

Empirical Research on Andersen's Health-care Model

3.1 Chapter overview

This chapter, organized around three main sections, surveys the empirical research on Andersen's (1968) model of health-care utilization. Each section corresponds to one of the three components of the model. Many of the studies reviewed in this chapter have been explicitly based on either the conceptual framework developed by Andersen and his associates or on revisions of that framework. Other studies have also been included that, whilst not based upon the model, have relevance for both its empirical status and the formulation of hypotheses in the present study. Altogether, the three sections cover a wide range of research whose common focus has been investigating the determinants of health-care. While each section will focus on its corresponding component, there will be some overlap with the other sections. For example, a study may have included an increased range of predisposing predictors, but the findings may also have implications for the other components of the model.

3.2 Introduction

Studies applying Andersen's (1968) behavioural framework have organized their respective analyses around four major blocks of variables. The first three represent predictors of uilization of health services; these correspond to the need, enabling and predisposing components. The fourth block represents measures of health-care, the outcome variable of prime interest in testing Andersen's model.

The early research applying Andersen's model can be characterized as having investigated the influence of relatively straightforward demographic and structural factors on health-care. Increasingly, the research has investigated the impact of more complex psychosocial factors, including social contact networks and 'patient' satisfaction with specific medical services. The purpose of including psychosocial variables has been twofold: first, to see whether other

variables besides those suggested in Andersen's (1968) behavioural framework increase the explained variance in health-care and, second, to clarify relationships among the various predictors. In this regard, recent studies have examined regression-model-derived additive as well as interactive effects of predictor variables on health-care (e.g., Wolinsky et al., 1989). While additive effects relate to the presumed direct and independent impact of predictors on health-care, interactive effects relate to regression coefficient differences across specified populations. For example, an additive model would test the effect of income on a sample's health-care, while an interactive model would compare the impact of income on use of health-care by groups within that sample[1].

3.3 Effect of predisposition on health-care

Predisposing variables have generated the most interest among researchers in recent years primarily because these variables represent social structural and demographic factors which historically have been associated with differential access to goods and services. The central issues raised in the more recent predisposing-focused research have concerned whether and how much patterns of health-care vary according to demographic group membership. Comparisons of health-care have been made across groups based on age, gender, ethnicity, education, employment status, marital status and social support. Attitudinal aspects of predisposition such as health beliefs and satisfaction with GP care have also been investigated.

The general findings on the effect of predisposition on health-care are presented first, followed by studies which have focused in greater depth on selected aspects of predisposition or that have undertaken controlled multivariate analyses. In Andersen's (1968) representative

[1]The interaction-effects model incorporates tests of equality between coefficients to determine if there are significant differences in the impact of a variable on subgroups' use of health-care. It addresses questions about whether subgroups have similar or different patterns of health care use.

national study of 2,367 American families, family size and age of the oldest family member were strong predictors of GP and hospital care, although measures of perceived need were stronger predictors. Data were responses to household in-person interviews. Using a similar methodology, Andersen et al.'s (1975) study of 3,800 Americans incorporated medically-evaluated measures of need. While no predisposing variables predicted hospital admission, age was a strong predictor of length of hospitalization and of number of GP visits. The positive association between age and visits was largely due to greater levels of illness in the older age groups. While family size did not influence adults' GP contact, it influenced children's GP contact, with larger families having the least GP contact. Andersen et al. found that the larger-family reduced-GP-care association was more pronounced among low income families, older children and families living in inner city or rural areas. Hershey, Luft and Gianaris (1975), whose data were responses to household interview surveys of 299 rural Californian families found that higher educational attainment was associated with a greater likelihood of annual medical checkups compared with others. After statistically controlling for health status, Hershey et al. found that women were no more frequent in their use of medical care than men.

In a study of health services utilization patterns in North and South America, England, Finland and Eastern Europe, involving over 14,000 respondents, Kohn & White, (1976) found that women's rates of physician use were higher than men's. Age differences, though, were even larger than sex differences. However, while volume of visits increased with age, GP-visit frequency was not highest in the oldest age groups. In Wolinsky's (1978) study of a representative sample of all-age Americans, younger married adults with smaller sized families were more likely than all others to use GP care[2]. Those who used dental care were

[2]It is not clear from Wolinsky (1978) whether adults' GP-visits also included those made on behalf of their children.

more likely than non-users to have high educational attainment and incomes. Stoller (1982)[3] found that almost half of the explained variance in an older sample's GP contact was accounted for by predisposing variables. Education was the most important single predictor of GP contact in her study: more education was associated with a greater likelihood of having had past-year GP contact. This finding is consistent with the well-established relationship of education with patient compliance (Becker, 1974).

Compared with the younger 'old' adults (i.e., 65 - 74 age group) older 'old' adults (i.e., 75 years and older) in Wolinsky and Johnson's (1991) study had fewer bedrest days, but were more likely to be placed in nursing home-care. Older women had fewer bedrest days, fewer hospital admissions, shorter hospital stays and fewer physician visits than older men. These findings are consistent with women's better overall health than men's in the middle- to older age groups. Health worries were positively related to use of several health services. Older adults who reported at least some control over their health were less likely to die within two years of the initial survey interview than those who reported no control.

Summary of general findings on predisposing predictors on health-care. Age, sex, education and family size have been repeatedly identified in the literature as significant contributors to health-care. A more detailed overview of studies that have concentrated on specific predisposing variables now follows.

[3]For a description of Stoller (1982) see Section 3.5.1

3.3.1 Sex

The literature has repeatedly shown that women are more frequent users of formal health-care than men, and in particular, of primary care services. This difference remains even after women's obstetrics-related medical care is excluded from comparisons (Verbrugge, 1989). The literature on sex differences in health status reviewed in Verbrugge (1989) documented women's greater morbidity for both acute and most of the chronic but non-fatal illnesses, and men's greater morbidity for fatal chronic illnesses. Verbrugge (1989) summarized the main findings as follows:

> "For the great majority of population health indicators, women's rates exceed men's. The exceptions are higher males' rates for impairments, life-threatening chronic illnesses, and long-term major disability due to chronic conditions" (p. 283).

Five explanations for sex differences in health status have been advanced in the literature. The first relates the differences to intrinsic **biological differences** between males and females. By this explanation, health tendencies, including patterns of morbidity and mortality are primarily the product of biology. The second explanation involves **acquired risks** of illness and injury. Thus, differential exposure to the social milieu - lifestyle, health practices, and work and leisure activities - gives rise to health differences between the sexes. The third explanation emphasizes psychosocial aspects of **illness behaviour**. Men's and women's different illness behaviour (i.e., responses to illness symptoms) results in differential health outcomes (Mechanic, 1979). The fourth account of sex differences centres around **health-reporting** behaviour. This account proposes that sex differences in health status are magnified by men's and women's different interests in and propensities for talking about their health symptoms

(Shapiro, 1984). The fifth explanation concerns the impact of **prior patterns of health-care** on current and future health. Thus, for example, regular (or, as the case may be, irregular) health-care has a cumulative effect on health.

The literature is in broad agreement about several sex differences in health; namely, that men are more vulnerable to biological risks and use fewer health services than women, and that women's illness symptomatology is heightened by their illness behaviour and health-reporting behaviour. The literature further shows that males and females are vulnerable to different sorts of acquired risks. For example, men engage in a greater level of smoking and alcohol consumption than women, whereas women engage in less strenuous activities, report greater levels of stress and role pressures than do men (Verbrugge, 1989). Research comparing the impact of men's and women's health status on use of health-care is now presented.

Verbrugge, 1989. Verbrugge compared sex differences in the impact of health status on morbidity and health behaviour. The aim of the comparison was to ascertain the extent to which the differences in health were associated with acquired risks, illness behaviour and health-reporting behaviour. Data were derived from a regional multistage probability sample of American metropolitan households. Face-to-face interviews were conducted with one randomly selected adult from each household, yielding a metropolitan sample of 302 men and 412 women. Of these, 243 men and 346 women also kept daily standardized personal health records to supplement the interview data.

Because analyses involved a large number of predictor and health outcome variables, only the main findings will be outlined. Bivariate analyses between predictors and health status variables confirmed women's poorer health on most indicators and their overall greater use

of health services. However, when health-risk factors such as smoking, job hazard, non-employment and stress were held constant, the difference narrowed substantially between mens' and womens' consumption of health services. In addition, although most of the reversals were non-significant and small, analyses revealed a consistent male health-disadvantage. Health indicators that were now worse for men than women included number of chronic problems and chronic symptoms, heart trouble, restricted activity days and curative medical visits (i.e., visits in response to diagnosable medical need). For both men and women, physical illness symptoms were the strongest predictors of health-care. Other important (but lesser) predictors were older age, non-participation in the work-force and stress. A third level of important predictors were income, high valuation of health and health insurance. Verbrugge concluded that the evident male disadvantage in health - once predictors were statistically controlled - may be due to biological rather than social or environmental factors.

Kandrack et al., 1991. Kandrack et al. examined the contribution of socio-demographic variables to differences in men's and women's health status and health behaviours. Data were responses from structured face-to-face interviews with a regional American household sample of 293 women and 232 men. Health behaviours included beliefs about perceived health-control and preventive health practices, the use of informal social networks for health concerns, use of cutback days and GP services[4].

No sex differences were found in either self-reported health or preventive health beliefs, but women reported a significantly greater number of social contacts than did men. Sex differences were found in the source of support: men were more likely to turn to their

[4]Analyses did not involve age-based sex comparisons as, for example, those between older men and older women.

spouses, while women were more likely to turn to their friends and children. Women reported significantly more cutback days (i.e., illness-related reduced activities) than men, but no differences were found in illness attitudes, physical-health or medication use. Differences were found, however, in health-care use. Compared with men, women had a greater number of cutback days, and consumed more medical services than did men. Sex, however, accounted for only 3% of the explained variance in past-year GP visits. Other socio-demographic variables explained a significant but relatively smaller amount of the differences between the sexes' health attitudes and health-care. Analyses were conducted to see whether there were any main or interaction effects of sex, marital and employment status on various health-related outcomes. Significant main effects were found for marital and employment status on the use of social networks. Married, employed adults had larger social networks than unmarried, unemployed adults. Marital status had no impact on the number of illness-disability days, but significant main effects of sex and employment were found for total disability days. In comparison with men, women had a higher number of cutback days.

To summarise Kandrack et al.'s (1991) findings: although no important sex differences in physical-need status were found, women had a greater number of cutback days and consumed more GP services than did men.

Bernard, Hayward, Rosevear and McMahon, 1993. Bernard et al. monitored admissions to a metropolitan hospital in the midwestern United States to determine the extent of sex differences in length of hospital stays, use of intensive care and ancillary services expenditure (e.g., radiology, nuclear medicine, respiratory supplies). Data comprised medical records of 19,387 patients admitted and discharged over a three year period. Significant sex differences were found: On average women were hospitalized almost one quarter of a day longer than

men, and women were also less likely to be placed in intensive care. Costs of ancillary care were greater for men primarily because of their greater use of intensive care. Women's less frequent use of intensive care could not be attributed to their having different diagnoses because comparisons were based on similarity of diagnosis. However, Bernard et al. suggested that differences in illness severity may have accounted for men's more frequent use of intensive care. While the data did not permit an exploration of this possibility, research suggests that men's chronic illnesses, on average, are of greater severity than women's (e.g., Verbrugge, 1989). Women's slightly longer hospital stays were attributed to their being less likely than men to receive care from their families when they returned home. Bernard et al. explained the findings in terms of women's fixed role obligations in which they are more likely to give than to receive home-care. The finding that married men had the shortest hospital stays of all groups concurs with the fixed-role-obligation explanation for women spending, on average, one-quarter of a day longer in hospital. Findings by Bernard et al. (1993) and Verbrugge (1989) parallel American survey research data which has shown that women comprise 60% of GP-visits and men, 60% of hospital admissions (The American National Center for Health Statistics, 1992).

Summary: Sex. Two main trends have emerged in the research. First, women utilize a greater range of primary medical care services even after obstetrics care has been removed from the comparisons. Some research has shown that, once important health predictors are held constant, sex differences in health become smaller, and some patterns reverse to show that men pay more curative GP visits than do women. Other research suggests that health-care differences remain even when physical-need status is held constant. Second, findings show that men use more hospital-care resources than women.

3.3.2 Ethnicity

Questions regarding whether and how much ethnic differences exist in the use of health-care have been explored in several studies. Andersen (1968) found no ethnic differences in the health-care patterns of black and white Americans. However, in a later study, Andersen et al. (1975) found that while black Americans reported fewer and less severe illness symptoms than white Americans, their GP visits were prompted by more serious illnesses. The more indepth research on ethnicity and health-care is now considered.

Wolinsky et al., 1989. These researchers evaluated the health status and health-care of older adults from five ethnic groups[5]. Data were pooled from several annual Health Interview Surveys to provide sufficiently large samples and a disproportionate sampling method was used in order to obtain approximately 1,000 cases "representative of each subpopulation" (p. 419). The sampling method yielded the following sample composition: 877 Puerto-Ricans; 1003 Cubans; 1,026 Mexican-Americans; 1,128 black Americans and 93,491 white Americans[6]. Wolinsky et al. found numerous ethnic differences across different types of GP and hospital care. White Americans' physician use was less dependent on medical need in comparison with the other ethnic sub-populations. Among the minorities, need explained 2.6 to 3.5 times more of the variance in physician contact than it did for white Americans. The overall model worked best for the non-white ethnic groups' GP care, suggesting a relatively greater predictability of GP utilization among minority older than white older. For example, the model accounted for 32% of the variance in Puerto-Ricans' and 15% in white Americans' GP care. On the other hand, the model worked best in explaining white Americans' hospital care; their need and enabling variables accounted for substantially more of the explained

[5]Although groups were designated by their country of origin, they were American citizens.

[6]Wolinsky explained that "because our focus is on the comparison of parameter estimates across ethnic subpopulations, the data are not differentially weighted" (p.420).

variance than that of the other ethnic groups. Findings supported Andersen's (1968) proposition that hospital care was largely a need-based service for all ethnic groups except Cubans whose hospital care was more dependent on predisposition.

Several interactive effects (i.e., between-sub-population differences in regression coefficient sizes) of ethnicity on health-care were found. Firstly, the only ethnic group whose GP visits significantly increased with age were black Americans, indicating a greater severity of illnesses among black older than among the other subgroups. Secondly, Puerto-Ricans and Mexican-Americans were more likely than the other three subgroups to visit the doctor in response to limited physical activity. Thirdly, Puerto Ricans and black Americans were hospitalized for longer intervals than the other subgroups given comparable levels of self-reported illness. This pattern suggested a greater severity of admission illness for Puerto Ricans and blacks relative to other ethnic groups. Finally, white Americans spent a significantly greater number of nights in hospital compared with the other sub-populations, given similar levels of functional disability. This finding was explained as a likely consequence of white Americans relatively higher socio-economic status in which their medical insurance may have enabled longer hospitalization.

In summary, Wolinsky et al. (1989) found that overall health-care use by older ethnic minority adults was more need-based than white Americans' health-care. They concluded that this ethnic difference reflected basic socio-economic differences; that is, American whites had greater resources to draw upon in their use of health-care than did the other ethnic groups.

Mutchler and Burr, 1991. In a data set obtained from structured household interviews, Mutchler and Burr assessed the relationships among ethnicity, socio-economic status, health

status and health-care in a nationally representative sample of 8,955 white- and 848 black older Americans. On the basis of prior studies, the researchers expected that ethnic health differences would be primarily related to socio-demographic status. If the effects of ethnicity disappeared once socio-economic status was held constant, it would suggest that class differences had superseded ethnic differences in use of health-care.

Mutchler and Burr found that black older reported poorer perceived health, lower socio-economic status, more visits to health professionals and fewer nights hospitalized than did white older. Once socio-economic variables were held constant, even larger perceived health differences were found between black older's and white older's self-rated health. Within ethnic-group comparisons showed that black older Americans who had health insurance, more education and higher income were more frequent users of GP care and spent more nights in hospital than their lower socioe-conomic peers. The initial finding that black older spent significantly fewer nights in hospital than white older became non-significant once socio-economic variables were controlled. For both black- and white older, medical need, income and health insurance emerged as the most important predictors of hospital use.

Mutchler and Burr also found that, once health status was held constant, a comparable link was found between socio-economic status and health-care by black and white older adults. However, a significant difference remained in the effect of income on length of hospitalization: Higher income was associated with more nights in hospital for white older but fewer nights for black older. Findings concurred with prior research showing that health status and health-care are strongly linked to socio-economic status.

Mutchler & Burr suggested that black Americans' negative perceived health may reflect not

just socio-economic disadvantage, but health practices, diet, and stress from minority group status. They added that their findings may be a conservative estimate of group disadvantage since "most of the effect of low socio-economic status on health has already taken its toll prior to the later ages" (p.353). The association between ethnic group and health status, Mutchler and Burr cautiously concluded, may be in part due to socio-economic factors.

Summary: Ethnicity. The research has identified ethnic group membership as an important predictor of health status and health-care. The broad findings have suggested that patterns of health-care vary by ethnic group, and that ethnicity exerts its influence through its links to socio-economic status. Black Americans utilize GP care more frequently than do white Americans. Findings do not unequivocally suggest that ethnic minorities fail to access required care; however, it appears that white Americans' health-care is less dependent on need than that of other ethnic subgroups.

3.3.3 Marital status and living arrangement

The extent to which marital status and household size (i.e., number of persons sharing the same dwelling) influences health-care use has been examined in several studies. Stoller (1982) reported that older adults living alone or with non-family members visited the GP more frequently than older adults who lived with family members. Cafferata (1987) investigated the joint influence of marital status and living arrangement on uptake of formal and informal health-care in a national random household sample of 4,560 older American adults. In research prior to Cafferata's, the finding that older married couples utilized fewer health services than older divorced, separated, widowed and never-married people was linked to their marital status. Specifically, being married was viewed as having health-protective effects which led to less need for physician care than the non-married status. An alternative

explanation proposed that those who shared a dwelling could receive care from others as a substitute for GP care; hence they would be less likely to seek physician care than individuals who lived alone. Cafferata's results supported the alternative explanation: While older adults who lived with others were less likely to consult a physician than those who lived alone, they had a greater number of bedrest days. This finding suggests that they may have received care from household members when they were sick rather than receiving GP-care. Married and non-married adults who lived with others reported a significantly higher number of bedrest days than people who lived alone or in couples-only households. Cafferata (1987) described the effect "modestly significant" but theoretically substantive (p. 617).

Building on their earlier cross-sectional study, Wolinsky and Johnson (1992) prospectively examined whether recency of widowhood had an impact on patterns of health-care among the older. Recency of widowhood had neither a direct nor an indirect effect on health-care for widows or widowers. Rates of health-care remained virtually unchanged from the pre-widowhood to the post-widowhood period two years later. Over the same period, there was a significant but substantively small increase in the probability of nursing home placement and death. There were insufficient cases to determine whether there were sex differences in those probabilities. Wolinsky and Johnson concluded that widowhood did not result in substantive changes in physical-need or health-care use among older adults.

Summary: Marital status and living arrangement. Research suggests that the relationship between marital status and health-care among the older is moderated by household-living arrangement. That is, compared with those who live alone, adults who live with others have reported fewer GP visits, but a greater number of bedrest days.

3.3.4 Social contacts[7]

Conceptual distinctions between social contacts and social support

A distinction is drawn in the present study between measures of social contact and measures of social support. Measures of social support assess functional aspects of contacts; that is, they concern the confidant and affective needs that are provided by contacts with other people. By contrast, measures of social contacts assess structural aspects of contact; that is, they enumerate the availability and frequency of contacts with other people[8]. As such, social-contact items represent "the availability of social networks as a potential resource to provide social support" (Nelson, 1993, p. 231). Therefore, the extent to which the contacts ***fulfill*** affective and confidant support-needs cannot be deduced from contact items.

The impact of social contact networks on health-care use is a relatively recent topic of investigation in the research applying Andersen's (1968) model. Wolinsky and Johnson's (1991) study appears to be the first to have included social contact items within the conceptual framework. The beneficial influence of social support on health outcomes other than health-care has been well documented, and in particular the important role of functional measures of support established. Data on the link between social support and health-care has yielded somewhat contradictory results, with positive, negative and no association between the two variables. Broadhead, Gehlbach, deGruy and Kaplan (1989) cited research that found "increased medical use in an older population with poor [confidant] social support" but no statistically important association using an alternate social contact scale (p. 222). In other

[7]Andersen did not incorporate social contact into his model (Andersen & Newman, 1973; Andersen, 1995). In Wolinsky and Johnson's (1991) research, social contact items were included as measures of social structural predisposing variables.

[8]Notwithstanding this conceptual distinction in 'types' of contact, researchers tend to term as 'social support' even social contact items (e.g., Nelson, 1993 and Wolinsky & Johnson, 1991). In effect, distinctions between actual and potential support become blurred. In the present thesis, measures of social contacts, and not of social support, have been used.

research cited by Broadhead et al., people who had more contacts were more frequent consumers of health-care, whilst other research showed the opposite (i.e., more contacts, less health-care). Broadhead et al. stated that the confusing results were due in large part to the term 'social support' becoming overly general in meaning and that, when the structural-functional distinction was maintained, results were more consistent. For example, people with supportive networks (as measured by functional items) may receive encouragement to seek health-care for their health concerns. Conversely, people with few social contacts (as measured by structural items) may have sought health-care in response to or as a substitute for lack of social support. Therefore, the predictive usefulness of social-contact items depends on knowledge of their confidant and affective benefits.

3.3.4.1 Ethnic and sex differences in social contacts

Since sex and ethnic differences have been found in the impact of social contacts on health status, the question arises about whether these differences also exist in the relationship of sex and ethnicity to health-care. Nelson's (1993) study bears upon this question.

Nelson, 1993. In a national population survey of 5095 Americans aged 55 and over, Nelson investigated whether sex and ethnicity moderated the effect of social contacts on GP-care. Nelson's study was a secondary analysis of national household interview data obtained in household interviews from the American Health Interview Survey (National Center for Health Statistics, 1984, cited in Nelson, 1993). While older adults' use of social support networks had been well-studied - and, in particular, the health-effects of social support - Nelson noted that the effect of social contacts on their health-care had been largely overlooked. The diverse literature Nelson reviewed showed that, in general, having supportive relationships was associated with lower illness rates, faster recovery and more health-protective behaviours. The

literature reviewed also pointed to sex- and ethnic differences in the social-contacts health-care association.

In Nelson's review, some studies concluded that black Americans made greater use of social support networks (e.g., extended families) than white Americans, while other studies found no clearcut differences between the two ethnic groups. Regarding differences in health-care, Nelson cited research which had found that black Americans were less likely than white Americans to use hospital or mental health-care, but they were more frequent in their use of GP care. In her review of the literature on sex differences in social contacts, Nelson reported that women's social ties were broader and more intimate than men's, although findings were mixed regarding whether women had a greater number of social contacts. The eight items Nelson used to measure social contacts in her investigation were taken from the prior research. Respondents indicated whether they had living siblings or children, telephone contact with relatives or friends, met with relatives or friends and attended church. One item also concerned whether respondents lived alone. In order to assess the effect of specific contacts on health-care, Nelson analysed the items individually rather than as a summed index of social contacts.

On the basis of the literature, Nelson had two expectations. First, that social-contact variables would increase the amount of explained variance in older adults' health-care[9] and second, that their effects would vary by sex and ethnicity. Results confirmed the first expectation: social-contact items increased the explained variance for all health-care measures; however, increments resulting from the inclusion of these variables were small.

[9]Because of an absence of both a universal definition and a measure of social support in the literature (leading to inconsistent findings in the literature), Nelson simply stated that social contacts would make a difference to GP-care, without hypothesising the direction of the association.

Nelson's second expectation was also confirmed, although the direction of effects was not consistent. Some significant effects were found for black Americans, but not white Americans, and vice versa. Similarly, some significant effects were found for women but not men, and vice versa. It was difficult for Nelson to interpret the pattern of results and to state unequivocally whether the patterns were important.

Summary: Social contacts. Measures of social contacts have increased the explained variance in GP- and hospital-care. Research on structural social contact (i.e., availability and frequency of contacts) has also found that social-contact variables are important predictors of health-care. In addition, research has shown that GP-care increases for some types of social contact but decreases for others, while the direction of the effect (i.e., greater or lesser care) has varied with sex and ethnicity.

3.3.5 Health beliefs

Health beliefs, the third dimension of predisposition, comprise health-related attitudes, knowledge and values that have been considered important predictors of people's health behaviour (Andersen & Newman, 1973). Compared with the other two dimensions of predisposition - demographic characteristics and social structure - health beliefs have been somewhat overlooked in the research literature (Andersen, 1995). In the earlier research that investigated the health-beliefs health-care association, only very small correlations have been found. Kravits (1975) advanced two explanations for the low correlations: firstly, attitudes may be irrelevant because the main determinant of health-care, and mandatory treatment in particular, is physical-need and not personal attitudes; secondly, general population health beliefs may be too diverse and thus may obscure substantial associations between group-specific attitudes and rates of health-care. More recently, Strain (1991) suggested a third

possibility for the absence of a strong association between attitude and health-care: the lack of comprehensive service-specific measures in the existing research. Findings of the research which has focused on health beliefs are now presented.

Andersen et al., 1975. Andersen's representative sampling of Americans' use of health services has been one of only a handful to have found a substantial health attitude and hospital-care association. Health worry emerged as the variable most closely associated with length of hospital stay, accounting for 11% of the variance in length of hospitalization. Other health beliefs, although less strongly correlated with hospital stay, still predicted length of time in hospital. Health beliefs were assessed by scales that measured respondents' views on the value of health-care, their symptom knowledge and the remedial action they would take in response to five different groups of symptoms.

Kravits, 1975. In a further analysis of the same data set as Andersen's, Kravits investigated the extent to which health beliefs were associated with GP- and dental care. Based on the literature, Kravits expected that the attitude-health-care association would be stronger for discretionary than mandatory health-care. She further hypothesized that this association would be more evident for black than white Americans because blacks faced more barriers to health-care[10]. Medical records and patients' reports of reasons for dental care were classified as mandatory or discretionary by a panel of five physicians. The 10-item Health Opinions Questionnaire first used in Andersen (1968) tapped the extent to which respondents agreed

[10]The full hypothesis reads as follows: "Correlations between attitudes and preventive health care should be higher for blacks than for persons in the mainstream of American medical care and that the differences between racial groups should persist even when income is controlled. Poor blacks should be the group for whom the influence of attitudes is most pronounced since they have the most barriers to overcome in obtaining care" (p.76). Kravits did not elaborate upon the hypothesized links among low income, attitude and health care. Hence, the question of how black Americans' health attitudes might overcome financial and other barriers to health care, for example, was not addressed.

or disagreed with GP-positive[11] and GP-negative items. For the general sample, there was a weak association between attitudes and discretionary care. However, results showed that black Americans, regardless of income level, had more skeptical attitudes toward medical care and used GP care less frequently than white Americans. Further analyses revealed that the effect of attitudes was more substantial for two subgroups: older individuals (irrespective of ethnicity) and high-income black Americans. The correlation between health attitudes and use of dental care was strongest among poor older. In this older group, pro-health attitudes were significantly and strongly associated with use of dental care. Kravits' suggested that the strong association between high income and less medical care by black Americans was due to their having to pay for discretionary care, whereas black Americans on lower incomes were entitled to welfare and Medicaid in their use of discretionary care.

Strain, 1991. Strain's study on the relationship between older Canadians' health beliefs and their health-care is one of a few published studies to have focused on the attitude-health-care relationship. Research cited by Strain found that people's beliefs influence their sense of control over their health and health behaviours, including medical-care use (Janz & Becker, 1984, cited in Strain, 1991). Strain expected that high health-care values would be associated with different health-care patterns than low health-care values. Strain also expected that there would be a negative association between medical skepticism and use of health-care. Two components of health beliefs were assessed: general health-related beliefs and health maintenance practices. The former were measured by scales of medical skepticism and health locus of control (i.e., attitudes to health and illness); the latter, by the value older people attached to specific health-maintenance practices such as diet, nutrition and regular exercise.

[11]Examples: GP-positive: "The care I have generally received from doctors in the last few years was excellent"; GP-negative: "Most doctors are more interested in their incomes than in making sure that everyone receives adequate medical care".

While results confirmed the negative association between medical skepticism and GP-care, no relationship was confirmed between locus of control and use of GP-care. Strain suggested that the lack of a relationship could be due to the differing reasons for GP-visits: Patients with an external locus of control may visit in response to illness symptoms, whereas those with an internal locus may visit for preventive purposes. Thus the visits may be prompted by different concerns, but the number of visits for the two loci would be the same. Strain's (1991) data, however, did not permit an exploration of the possible reasons for the visits.

Strain found that measures of physical need were the most important determinants of GP visits, accounting for 21% of the total explained variance. Health beliefs emerged as the sole significant measure of predisposition, accounting for an additional 3% of the explained variance. Need variables and health beliefs also emerged as strong predictors of general health-care use, with need again the stronger predictor (26% versus health beliefs' 4%). A weak correlation was found between medical skepticism and hospital care. The weak correlation was seen by Strain as reflecting the mandatory character of hospital admissions; that is, irrespective of health beliefs, people exercised relatively little choice in hospitalization decision. Medical skepticism would be expected to exert a stronger influence on discretionary rather than mandatory medical care.

Summary: Health beliefs. In the main, the literature reports quite small correlations between attitudes to health and volume of health-care. Some studies have found larger correlations between health beliefs and discretionary health-care; in addition, specific subgroup differences have been found in the attitude-health-care association. Kravits (1975), for example, found that skeptical older adults used fewer GP services than skeptical younger adults, and that skeptical black Americans utilized fewer GP services that skeptical white Americans.

Moreover, studies that have linked attitudes to specific types of health services have found stronger attitude-health-care associations (Andersen, 1975). Beliefs have emerged as significant predictors of health-care, yet relative to other predisposing variables such as sex and age, and to need variables in particular, their contribution to the explained variance in health-care has been of secondary importance.

3.3.5.1 Health-care satisfaction

Andersen's model conceptualised health-care satisfaction as a predisposing characteristic; specifically, it was viewed as a 'subtype' of health belief (Andersen & Newman, 1973). As with health beliefs, satisfaction is assumed to reflect intra-individual attitudes that influence people's health-care use. However, in the complex literature on patient-satisfaction, satisfaction has been construed as both a predictor and an outcome of health-care. Thus, in terms of testing Andersen's model, the conceptual ambiguity means that a measure of satisfaction could conceivably be classified as either belonging to the predisposing or the enabling or neither component. In addition, satisfaction has been increasingly conceptualised as a multi-dimensional construct in its own right. Therefore, before reviewing the relevant research, some conceptual clarification is required.

Satisfaction as a predictor and an outcome of health-care. Most research on the relationship of patient satisfaction to health-care has been conducted independent of Andersen's or any other model of health-care. Satisfaction has been investigated both as an outcome and an input variable, although seldom by the same researchers. Outcome research has measured patient satisfaction as an effect of characteristics of health-care providers. It addresses the question of how provider-characteristics influence patient-satisfaction. Input research, on the other hand, has gone one step beyond this, viewing patient-satisfaction itself as having an effect on

health-care use. Thus, health-care use is analysed as an effect of satisfaction. Research on satisfaction as an input variable (i.e., predictor) is more relevant to Andersen's model because the model itself has treated satisfaction as an input variable.

Satisfaction and health-care access. In addition to the distinction noted above, definitional overlap exists between satisfaction, an attitudinal dimension of predisposition, and health-care access, a multi-dimensional subcomponent of enablement. Access-to-health-care research examines the impact of specific access-variables on health-care. The access literature takes as one of its main assumptions that equitable access will facilitate use of health-care, which will lead to increased patient satisfaction and, in turn, increased willingness to use health-care. Thus, access research views satisfaction as an access-dependent variable[12].

Models of satisfaction have been developed which articulate dynamic interrelationships between satisfaction and health-care. By these models, health-need brings people into contact with the health-care system, and if the experience meets patient expectations, treatment regimens are more likely to be followed. This also increases the likelihood that future illness episodes will lead to health-care (Roghmann, Hengst & Zastowny, 1979). The converse is also expected: Patients who are dissatisfied with health-care, are less likely to return. Thus, from a theoretical perspective, patient-satisfaction can be viewed as having an impact on the use of health-care.

[12]See Section 3.4.2.1 for a review of the access-to-health-care literature

3.3.5.1.1 Satisfaction as a multi-dimensional construct

Attempts to clarify relationships between satisfaction and health-care have led researchers to conceptualise satisfaction as a multi-dimensional construct. Satisfaction may vary depending on which characteristics of health-care providers are being investigated. For example, some research distinguishes between 'instrumental' (e.g. competence of care) and 'expressive' (e.g. physician style) dimensions of satisfaction while other research emphasizes 'general' and 'specific' dimensions. General satisfaction describes patient attitudes to the overall provision of various health services while specific satisfaction concentrates on patient-attitudes to a specific health-care provider (e.g., a patient's regular GP). Within the general-specific dimensions, a negative and a positive sub-cluster have been identified (Roghmann et al., 1979). For example, findings suggest that people may be satisfied with a GP's technical competence, but dissatisfied with the GP's personal manner.

Roghmann et al., 1979. Roghmann et al. investigated the relationship of health-care provider qualities to satisfaction and health-care in a stratified sample of 311 women whose children's medical costs were reimbursed by Medicaid. The purpose of the study was to test a dual dimensional model of satisfaction that had been advanced in earlier research and also to ascertain the predictive utility of the two dimensions for health-care. The dimensions were "general glorification" (i.e., positive stereotypes of doctors), and "latent resentment" (criticisms of doctor competency and practice style). Findings confirmed the dual-dimensional factor structure of satisfaction. Bivariate analyses of demographic and health-care variables showed the following: Larger family size and poorer family health were positively correlated with health-care; more education was associated with more private GP visits and fewer clinic visits, while being black was associated with fewer GP visits and more clinic visits. Demographic variables were not strongly correlated with satisfaction. Moreover, with one

exception, no strong associations were found between general positive satisfaction and clinic-based health-care.

In a re-analysis examining specific health-care providers, Roghmann et al. (1979) found provider effects on both health-care and satisfaction. The findings did not form a consistent pattern, but overall, showed that some districts had above average clinic care and below average private-GP care, while other districts had different or opposite patterns. Similarly, patterns of general and specific satisfaction varied by district.

In summing up the patterns of patient satisfaction with specific health providers, Roghmann and associates concluded that satisfaction scores were consistent with an earlier study's proposition; namely, satisfaction would be linked to the quality of the interaction between health providers and patients, while demographic variables (e.g., education and family size) would be linked to the quantity of interactions (i.e., number of visits) (Cafferata & Roghmann, 1978, cited in Roghmann et al., 1979).

In additional analyses, Roghmann and associates investigated the impact of satisfaction on the use of specifc health-care providers. The major aim of these analyses was to see the extent to which patient-satisfaction could improve on the prediction of utilization by demographic and health-need variables. Satisfaction added an average of 10 % to the explained variance in use of specific providers, a finding that supported the view that attitudinal variables would contribute to the explained variance in use of health services use. Roghmann et al. (1979) concluded that "the substantive relationships [between satisfaction and health-care] are certainly not as simple and clearcut as our initial conceptualization and the review of the literature indicated" (p. 476).

Zastowny, Roghmann and Cafferata, 1989. Zastowny et al. examined two aspects of the satisfaction-health-care association; namely, whether the association was bi-directional and depended on specifc health-care providers. Thus, satisfaction was analysed first as an outcome variable (i.e., an effect of health-care) and then as an input variable (i.e., a predictor of health-care). Participants in this study were 400 New York Medicaid families chosen by stratified sampling procedures. Demographic and health-related data were obtained via household interviews and health-care data were past-year medical claims records. In addition to the general-specific dimensions of satisfaction, Zastowny et al. (1989) focused also on the instrumental-expressive sub-cluster. The researchers expected that specific negative-satisfaction would decrease health-care, whereas specific positive-satisfaction would increase health-care. They further expected that instrumental dissatisfaction would be less important in predicting decreased use than would expressive dissatisfaction. This expectation was based on the assumption that patients would be less likely to criticise a GP's medical expertise than their interpersonal style.

When satisfaction was the predictor and all clinics analysed collectively, instrumental and expressive satisfaction were not significantly associated with type of health-care. However, health-care was significantly associated with health status and several demographic variables. For example, white Americans were more likely to use private GP-care than black Americans, who were more likely than whites to use clinic care. When clinics were analysed separately, significant provider effects were found in two out of five clinics.

Robbins et al., 1993. In this regional study of 100 American adults randomly assigned to medical-centre doctors, researchers expected that satisfaction would be positively associated with amount of doctor-provided information, but negatively associated with amount of

medical history-taking. The videotaped content of the GP visits was coded using an existing standardized measure (Bertakis & Callahan, 1992, cited in Robbins et al., 1993). Prior to the visit, patients completed a pre-visit questionnaire on general GP-satisfaction. Following the visit, patients completed a GP-specific questionnaire. Robbins et al. found that visit-specific satisfaction was significantly related to several physician style behaviours: health education, physical examination, discussing treatment effects and history taking. As expected, history taking was negatively associated and the other three styles were positively associated with satisfaction. Visit-specific satisfaction was also significantly related to pre-visit satisfaction. Thus, patients dissatisfied with prior general GP-care were also dissatisfied with current GP-care. Results, therefore, are congruent with the view that health-care satisfaction reflects stable, personal characteristics of patients (Andersen & Newman, 1993).

Summary: Satisfaction with health-care. Research on patient-satisfaction has enlarged the understanding of the complexity of the satisfaction-health-care association. The literature presents no clearcut conclusions about the effects of satisfaction on health-care and vice versa. For example, in studies by Roghmann et al. (1979) and Zastowny et al. (1989), demographic variables were the only predisposing variables to significantly predict health-care use when health-care providers were considered collectively. Yet when they were considered separately, some evidence of provider-effects were found; however, effects were inconsistent in terms of increasing or decreasing use of health-care. Results suggest that more information on provider-characteristics and type of treatment is needed.

One consistent finding across the research involving more complex models is satisfaction (as a predisposing variable) being a stronger predictor of health-care than health-care is of satisfaction (e.g., Zastowny et al., 1989). Findings also support the conceptualization of

satisfaction as a multi-dimensional construct, because the impact (or absence of impact) of satisfaction on health-care has depended on the dimension of satisfaction being examined (e.g., general versus specific). While research has pinpointed specific GP-practice styles that impact on satisfaction levels, it suggests that satisfaction may also be a stable attitudinal response across different health-care providers. For example, Robbins et al. (1993) found that 'prior' satisfaction with general health-care was strongly correlated with patients' satisfaction with their present health-care provider.

3.3.6 Summary of effect of predisposition on health-care

The more in-depth research attention given to predisposing variables in recent years has confirmed their predictive importance and reflects also the ongoing attempt to clarify their relationship to various health-care services. ***Predisposing demographic*** variables include sex and age. The literature documents women's greater use of GP care, even after reproductive health-care visits have been excluded, and men's greater use of hospital care. There is a trend towards increasing health-care as adults progress through the life cycle; however, older adults are not necessarily the heaviest adult users of health-care. Indeed, some research has identified adults in their mid- to late fifties as the heaviest users of health-care. Many studies have found that, once health status is held constant, sex and age differences in health-care narrow substantially. ***Predisposing social structural*** variables include education, ethnicity, living arrangement and social contacts. Higher educational attainment and living alone have been positively associated with the use of GP-care. Research has shown that ethnic groups have differential patterns of health-care use. The direction of the differences is not consistent across the ethnic groups, but in general, non-black ethnic minorities (e.g., Cuban-Americans) on average have fewer health-care contacts than white Americans. Black Americans, and in particular those of poorer socio-economic status - are more frequent users of GP care than

white Americans. Some research evidence suggests that white Americans are hospitalised for relatively less serious health problems than ethnic minorites, and that they remain in hospital longer, once health status has been controlled. Evidence also suggests that black Americans' and Puerto Rican Americans' hospital care is associated with more serious illnesses than other ethnic groups', and their hospital stays are longer. The effect of social contact has been found to vary with ethnicity and sex, with social-contacts increasing GP-care for some groups, but decreasing it for other groups. However, it is difficult to summarize the research on ethnicity and health-care because of the often inconsistent and sometimes contradictory findings. ***Predisposing attitudinal*** variables include health beliefs and health-care satisfaction. Research has found that people's health attitudes and their level of satisfaction with GPs can be useful predictors of health-care, particularly of elective care. Studies that have investigated specified dimensions of satisfaction have found tentative support for the view that patients' satisfaction with GP-care is moderately stable across GPs; that is, prior GP-satisfaction (or dissatisfaction) predicts current satisfaction (or dissatisfaction). On the other hand, research also provides some support for the view that health-provider characteristics influence patient satisfaction.

3.4 Effect of enablement on health-care

Material resources that facilitate people's use of health-care fall under the enabling component of Andersen's (1968) health-care model. The resources are of two kinds: familial and community. Evaluations of family resources have been based on household incomes, having private health insurance, possession of material assets and welfare recipiency. Evaluations of community resources have been based on ratios of GPs and hospitals to population as well as on characteristics of the health-care system itself. Enabling variables extend beyond the individual, representing the economic element of Andersen's scheme. Research findings on the effect of enabling variables on health-care are now presented.

3.4.1 Family resources

Three enabling variables - health insurance, regular source of medical care and welfare recipiency - emerged as significantly related to the use of hospital and GP services in Andersen's (1968) study. These variables, however, were less strongly related to health-care than need and predisposing variables. In later research, Andersen et al. (1975) found that regular source of care was an important determinant of GP-contact, primarily through its association with need measures; that is, people in poorer health were more likely than others to have a regular GP[13]. Overall, though, enabling variables in these two studies contributed little to the explanation of GP care.

Andersen et al. (1975) cited 1963 American health data that identified income as an important predictor of GP care. In the ensuing years of expanding government-funded health-care programmes, income ceased to be a strong determinant of who received health-care. Hershey et al. (1975), however, found that income continued to be significantly and positively associated with GP-visit frequency, although not with hospital-based care. Wolinsky and Johnson (1991) investigated the effects on health-care of health insurance (Medicare) and service-cost subsidy (Medicaid)[14] in an older sample described above. Insurance had a significant impact on GP-contact but on no other service, including frequency of GP-contact: Those with insurance were more likely to have had past-year GP contact than those who were uninsured. Wolinsky and Johnson concluded that this finding "probably reflects the reduction, if not elimination, of the limited financial barriers to access for physicians' services in this [older adult] sample" (p. S353). Conversely, those who received a service-cost subsidy were more likely to have had bedrest, home help, hospital- and GP-care, and they were also more

[13]No analyses involving interactions were performed to determine whether the association between poor health and having a regular GP was moderated by socio-economic status.

[14]Similar to the New Zealand Community Services Card, Medicaid is issued to low-income elderly Americans.

frequent in their use of GP-care than other older adults. Wolinsky and Johnson cautiously suggest that those applying for subsidized visits may have more serious health-needs than others. The findings of one study that expressly focused on the impact of service-cost subsidy on rates of health-care use in a general population are now reported. In a recent study involving about 1,000 older low-income black-Americans, health insurance was an important predictor of GP-care but not hospital-care (Bazargan et al., 1998)[15].

Nolan, 1994. Nolan investigated whether free primary health-care for low income families in Ireland resulted in disproportionate health-care use across income levels. The sample of 3,294 households was drawn from representative sampling methods. In addition to information on a range of socio-economic factors (e.g., income, age, sex, education, occupation, and employment history), information was also obtained on physical- and psychological-health and health insurance. A 12-item modification of the General Health Questionnaire was used to measure psychological distress. Nolan found three significant bivariate relationships: GP visits per annum were associated with age (e.g. 15-24 year age group: 2 visits per annum versus 55-74 year age group: 6), sex (women's 4.7 visits versus men's 3.8 visits) and welfare recipiency (low income group's visits: 6.8 versus high income groups's visits: 2.8). Physical illness, but not psychological distress, was strongly related to age. The incidence of both physical illness and psychological distress was substantially higher in lower socioe-conomic groups. Results suggested that, while older adults, women and those entitled to welfare visited their GPs more frequently than others, the variation in GP visits across the socioeconomic groups reflected in large part differences in health-need. That is, since poorer people were in poorer health relative to others, they were more frequent consumers of GP-care.

[15]This study is outlined in Section 3.5.1.

Summary: Family Resources. Findings on the impact of income and health insurance on health-care are somewhat mixed. Some studies have found a positive insurance-health-care association. Most research, however, has found only weak associations between the two. Findings are more consistent regarding the association between welfare-recipiency and increased health-care; that is, compared with others, those who receive reduced-cost GP care tend to visit the GP more frequently.

3.4.2 Community resources

In Andersen's (1968) framework, population density and the health-service-to-population ratios are viewed as factors contributing to the use of health-care. In their assessment of community variables associated with health-care use, several studies have routinely included GP- and hospital-bed-to-population ratios. For example, in Stoller's (1982) sample of older adults, two community-resource variables predicted GP care: lower GP-to-population ratios and inconvenient location of the medical care were associated with fewer GP visits.

3.4.2.1 Health-care access

A substantial literature has been devoted to questions about whether and how much the health-care system itself facilitates people's access to health-care. The research overlaps with the broad field of patient-satisfaction research[16]; in fact they can be viewed as different sides of the same coin. The simplest expression of the overlap proposes that unimpeded access to health-care increases patients' satisfaction with health-care. In other words, access (as an enabling variable) may impact on health-care-satisfaction (a predisposing variable) which, in turn impacts on frequency of health-care use.

[16]Section 3.3.5.1 reviews research on the health-care-GP-satisfaction association.

3.4.2.1.1 Health-care access as a multi-dimensional construct

Prior to the 1980s, research on health-care access was characterised by a lack of consensus regarding both the meaning of access and areas within the health system to which it applied (Penchansky & Thomas, 1981). In their proposition that access is a multi-dimensional concept, Penchansky and Thomas investigated the relationship of specific aspects of the health-care system to patient satisfaction. They developed a 16-item scale of patient satisfaction based on prior research. The scale was keyed to specific health-access characteristics such as the convenience of the location of health services and the extent to which costs prevented patients from accessing required care. In order to ascertain its factor structure, the scale was completed by 287 spouses of employees of a large corporation in New York. Using the principal axis method, Penchansky and Thomas factor-analysed the 16 items which yielded five factor loadings[17], each of which corresponded to a separate dimension of health-care access.

The first dimension, ***availability***, referred to whether an existing service was equipped to meet specific health requirements. For example, was the medical treatment adequate? The second dimension, ***accessibility***, involved the question of whether the required health service was conveniently located for patients. For example, how far did patients have to travel to obtain health-care? ***Accomodation***, the third dimension, involved the extent to which the available resources and facilities were organized to meet patients' needs. Were patients able to receive care when they need it, for example? The fourth dimension, ***affordability***, concerned whether patients could afford health-care. The final dimension, ***acceptability***, dealt with how well service providers qualities met patients' expectations of appropriate provider-qualities (e.g.,

[17]The researchers explained that the five factors were then rotated simultaneously using the varimax algorithm. "Each of the first three factors explained almost 12 percent of the item variance while factors four and five explained only 7 percent and 5 percent of the variance respectively (p.131)".

age, sex) of the health provider. Penchansky and Thomas (1981) found that satisfaction was positively related to the number of access-dimensions that met patients' needs. A study which applied Penchansky and Thomas's concept is now described.

Gribben, 1992. Gribben investigated the health-care impact of three dimensions of access. Dimensions were accomodation (i.e., waiting-time to see the GP), accessibility, (i.e., mode of travel to visit the GP), and affordability (i.e., whether GP fees had ever prevented GP-visits). Data were interview responses of 290 adults who were randomly-selected from South Auckland, New Zealand electoral-rolls. Physical-need (i.e., self-rated health) accounted for most of the explained variance in GP-visit frequency, with two enabling variables, years with current GP and waiting-time also contributing a significant but smaller share. Time with current GP was negatively associated with visit-frequency while waiting-room time was positively associated. These two findings were contrary to that reported in the literature[18]. Other access-variables (e.g., GP-fee) had no impact on visit frequency.

Summary: Community Resources. Despite expectations, there is an absence of evidence regarding the negative impact of health-care barriers on access to medical services. Some studies (e.g., Stoller, 1982) have found that people who do not have a regular GP, consume fewer GP-services than those with a regular GP. However, other access-barriers such as GP-fees and geographical distance from the GP have been only weakly associated with health-care use.

[18]Beyond suggesting that the adult sample may not have been representative of the general population, Gribben does not attempt to explain the discrepant findings.

3.4.3 Summary of effect of enablement on health-care

Two major groups of enabling variables have been investigated in the research: Family and community resources. Family resources, the first group, have included income, private medical insurance and welfare recipiency. Contrary to expectations, in most studies neither health insurance nor income have emerged as strong predictors of health-care; nor have they added much to the explained variance in health-care. In several studies, welfare recipiency has emerged as a significant predictor of health-care; specifically, those who receive reduced-cost GP-visits have been more frequent consumers than others. Several studies have shown that the relationship of subsidised-costs to health-care is primarily through the relatively poorer health status of those from lower income groups.

Community resources, the second group of enabling variables concern specific aspects of the health-care system itself. Some research evidence suggests that people in populations with lower GP-to-population ratios are less frequent consumers of GP care. However, most research has found little or no association between these ratios and volume of GP care. Moreover, despite the evidence supporting the multidimensionality of access, research has found only a modest impact of the various dimensions on actual use of health-care. Nonetheless, some access variables are significantly associated with GP care. For example, having a regular source of medical care such as a "family" doctor has emerged as an important predictor of access in several studies (e.g., Andersen, 1968; Stoller, 1982).

3.5 Effect of need on health-care

Earlier sections detailed empirical research on the contribution of non-medical variables to Andersen's (1968) model. Irrespective of the range of non-health variables (i.e., predisposing or enabling) entered into the model, a recurrent finding has been the continued domination

of physical-need in explaining the variance in health-care use. Thus, when socio-economic variables have been controlled, studies have found that the contribution of physical-need to health-care use remains strong.[19] In this section, studies which have investigated the impact of physical-need on health-care are reviewed, with general findings preceding the specific.

3.5.1 Physical-need

The strongest predictor of past-year hospitalization and GP contact in Andersen (1968) was number of cutback days[20]. In a later study, Andersen et al., (1975) again found that cutback days and also health worry were the strongest predictors of hospitalization. Severity of diagnosis was the single best predictor of GP visit-frequency, while cutback days, health worry and number of symptoms were the strongest predictors of past-year GP contact. Consistent with these findings, Hershey et al.(1975) found that the number and severity of illness symptoms and the number of chronic illnesses were the primary predictors of GP and hospital care.

Wolinsky, 1978. Wolinsky drew upon American Health Interview Survey data from 1971, 1972 and 1973 (American National Center for Health Statistics, 1973, cited in Wolinsky, 1978) in an evaluation of the determinants of health-care use. Wolinsky described the subsequent sampling procedures as follows: "The complex sampling design is such that fifty-two weekly replication samples are drawn which may then need to be aggregated and that the respondent weighting procedures provide[d] nearly perfect microcosms of the United States" (p. 386). A range of physical-need measures was used, including self-perceived health and

[19]With the inclusion of larger and more diversified measurement sets in analyses, fewer studies than previously have focused predominantly on the impact of physical-need on health-care. Thus, the current section is brief (in relation to need's importance as a health care predictor) because the prior two sections have also included findings confirming the importance of need.

[20]Cutback days is now viewed as a type of health-care itself. See Chapter 2, Section 2.5.3.4.

chronic and nonchronic illnesses[21]. Physical-need accounted for most of the explained variance in health-care. Regarding frequency of being hospitalized, chronic illnesses had a positive effect and nonchronic illnesses a negative effect. The opposite pattern was found for GP-care: fewer chronic illnesses but more nonchronic illnesses were positively associated with GP-visit frequency. Those who had past-year GP-care also reported poorer perceived health, more impaired physical activities, were younger, married and had smaller-sized families.

In a later study, Wolinsky and Coe (1984) analyzed Health Interview data from 15,899 community-dwelling older adults. Need contributed almost two thirds of the explained variance in frequency of GP-visits and just over three quarters of the explained variance in number of nights hospitalised. Findings were consistent with Andersen's (1968) proposition than need would increase in predictive importance for the more mandatory health services such as hospital care.

Stoller, 1982. Stoller investigated the impact of the three components of Andersen's (1968) model on health-care used by a regional sample of 753 older American adults who were selected through a probability sampling method. Data were responses to semi-structured in-person interviews. Stoller's measures of need included: three items asking about whether in the past year participants had health worries, bedrest days and cutback days; a 16-item symptom checklist and questions about whether participants were currently experiencing serious illness symptoms. Predisposition measures included several items about health-care attitudes and demographic and social background characteristics. Enablement measures asked about family and community resources (e.g., convenience of accessing needed health-care;

[21]Wolinsky did not define chronic, but referred the reader to the Health Interview Survey Procedure (1975, cited in Wolinsky, 1978) for details of the independent measures.

GP-to-population ratio). Stoller found that total number of symptoms was the strongest predictor of GP-contact, but that GP-to-population ratio and convenience of GPs' location were the strongest predictors of GP-visit frequency: Those who lived in populations with fewer GPs and those who found it inconvenient getting to the GP made fewer visits that other older adults. Women were significantly more likely than men to have had GP contact, but there were no sex differences in GP-visit frequency. The most important overall predictor of GP contact was education, and of GP-visit frequency, having Medicare or Medicaid. More years of education was associated with an increased likelihood of GP-contact, and having health insurance was associated with a greater number of visits.

Stoller (1982) reported that the model explained 13% of the variance in the likelihood of GP-contact. Of this total, predisposing variables accounted for almost half, enablement almost one-third and need almost one-quarter. The model explained 22.3% of the variance in GP-visit frequency, with need and enablement accounting for almost half each of the explained variance, and predisposition very little. Stoller suggested that the greater contribution of predisposition to GP-contact than to GP-visit frequency supported the view that the initial contact during an illness episode is largely patient-initiated, whereas follow-up visits are largely influenced by the GP. Stoller's study is one of the few to have found non-need components (i.e., predisposition and enablement) accounting for the larger portion of explained variance in health-care.

Wolinsky et al., 1983. In the study by Wolinsky et al., a methodology similar to Stoller's (1982) was used to investigate the predictors of formal and informal health-care in a randomly selected metropolitan sample of 401 older adults. Wolinsky et al. had two reasons for expecting that Andersen's (1968) model would be a more robust predictor of informal than

of formal health-care: First, from a theoretical view, bedrest and cutback days are more immediate responses to illness than use of formal types of health-care; second, informal care may be the first step in treating ill health, with later steps involving formal care. Measures of informal care included bedrest and cutback days and those for formal care included hospital and GP care.

In addition to measures of health status, Wolinsky et al. (1983) used self-report scales of nutritional risk, adequacy of sensory functioning and psychological-health. The use of a measure of psychological-health (a 16-item revision of Lawton's (1975, cited in Wolinsky et al. 1983) Philadelphia Geriatric Center Morale Scale represents one of the earliest attempts to conceptually integrate the dimension of mental health status into the framework of Andersen's (1968) model. The model explained more of the variance in the use of informal than formal care[22]. Nutritional risk emerged as the strongest contributor to the explained variance for informal and formal care.

Wolinsky and Johnson, 1991. In a more recent study of older adults health-care, Wolinsky and Johnson examined the impact of physical-need, demographic and social structural variables on health-care use. Data were sourced from the Health Interview Survey of 5,151 adults aged 65 years and over (American National Center of Health Statistics, 1984, cited by Wolinsky & Johnson, 1991). Informal care comprised bedrest and use of home help services, while formal health-care comprised use of GP and hospital services. Among the measures of need were scales tapping various physical disabilities, including the Activities of Daily Living (ADL; Katz et al., 1963) scale and the Nagi (1976) disability scale.

[22]Variance explained in disability days and cutback days was 26% and 29% respectively compared with the variance explained in the four formal non-dental care health services range: 12% to 23%. Variance explained in dental care was 35%.

Wolinsky and Johnson (1991) found that self-rated health and number of chronic illnesses were the strongest health-care predictors. Poor self-rated health and limitations with basic daily activities (e.g., bathing, dressing) were associated with use of home help services. Limitations with household activities (e.g. light and heavy housework) were associated with more bedrest and home-help care. Limitations with cognitive-based activities (e.g., eating, managing money) were correlated with more bedrest and an increased likelihood of being hospitalized, but they were not associated with the use of home-help. Use of a larger range of health services were associated with lower rather than upper body limitations.

In line with the literature, need contributed over half of the explained variance in bedrest, GP-visit frequency and home-help care. Need contributed the same amount as predisposition (almost one half each) to the use of hospital care[23]. The model explained more of the variance in informal- than formal-care[24]. However, despite the inclusion of a more comprehensive measurement set than used in prior research, the model did not explain a larger total amount of variance in health-care use; in fact, the model only explained 7% of the variance in GP-contact, and about 10% of the variance in hospital-care.

Bazargan et al., 1998. These researchers recently investigated the differential impact of the Andersen (1968) components on health-care used by 998 low-income, black Americans aged 62 years and over. The community-dwelling regional sample was randomly selected from senior city centres. Health-care consisted of A&E, inpatient-, and GP-services. Measures of predisposing and enabling characteristics paralleled those used in prior research (e.g.,

[23]Wolinsky and Johnson (1991) explain the larger-than-expected contribution of predisposing variables as follows: "... in addition to their net effects, [predisposing variables] receive credit for their joint effects with the enabling and need characteristics, and are thus somewhat inflated" (p. S350).

[24]Variance explained in informal health-care ranged from .149 to .252 and variance explained in formal health-care ranged from .054 to .173.

Wolinsky & Johnson, 1991). The measure of perceived control over health was the 18-item Multidimensional Health Locus of Control (Wallston, Wallston & DeVellis, 1978, cited in Bazargan et al., 1998). Physical-need was measured by a standard rating of self-perceived health, and 13 dichotomous measures in which respondents indicated the presence or absence of specific medically-diagnosed chronic illnesses. Unlike prior research in which the unit of analysis was a summed scale of chronic illnesses, Bazargan et al. analysed the health-care impact of each chronic-illness. Also measured was the extent to which chronic illnesses limited respondents' daily activities.

Bazargan et al. (1998) explained 55% of the total variance in GP-care, an amount unparalleled in the literature. They also found that predisposition was more important than need in predicting A&E-care, but that physical-need was more important than predisposition in predicting hospital- and GP-care. Indeed, physical-need emerged as a more important GP-care predictor (32%) than the two non-need components combined (23%). No predisposing demographic variables were related to A&E- and hospital-care. However, with the exception of age, demographic variables had an impact on GP-visits. Having more years of education, being male, and living alone were each associated with more GP-visits. Health locus of control was the most important predictor of the three types of health-care; that is, those most likely to use health-care believed their health was the responsibility of medical professionals.

3.5.2 Summary of effect of need on health-care

Numerous studies have identified physical-need as the most significant and the strongest general predictor of health-care use. While the research has been primarily on older adults (i.e. aged 55 years and over), research on more general populations is also in broad agreement regarding the effect of physical-need across both formal and informal health services.

3.6 Chapter summary

Studies which have examined the relationship both among health-care predictors and between those predictors and health-care outcomes have shown that specified predictors seldom have an inevitable or straightforward health-care impact. In addition, two further themes have emerged from the utilization research. The first theme involves the individual contributions of the three components to the explained variance in health-care use. With few exceptions (e.g., Stoller, 1982; Wolinsky and Johnson, 1991), measures of physical-need have contributed the largest explanatory share, with measures of predisposition and enablement forming a second tier of importance. A second theme concerns the large amount of variance in health-care that eludes explanation. While a few studies have accounted for 40% and more of total variance (e.g., Andersen, 1968; Bazargan et al., 1998; Cheng, 1992), most studies have accounted for substantially smaller amounts. The inclusion of more comprehensive measurement sets and the more refined measurement of multi-dimensional concepts have yielded small increments in total explained variance. Main findings for each components health-care impact are now outlined.

Summary of the effects of predisposition on health-care. A positive association exists between **age** and medical health-care. Many studies have concluded that age has its association with health-care primarily through illness; that is, healthy older adults have not used services more frequently than the unwell. Evidence indicates middle-aged adults and younger married couples with smaller-sized families have been the most frequent users of medical services. Data on **ethnic differences** has shown that, unlike the older from other ethnic groups, black older adults' medical care increased significantly with age. The older adults in older populations have not necessarily been the heaviest users of health-care. For example, Wolinsky and Johnson (1991) found that adults aged 75 years and older had fewer

bedrest days and hospital admissions than older adults who were under 75 years. Data on **sex differences** has shown that women are more frequent consumers of GP services than men, even when obstetric visits are excluded and illness levels are held constant (Kandrack, 1991; Nolan, 1994; Verbrugge, 1989). Studies on sex-differences in hospital services have found that men incurred more ancillary care costs and were more likely to be placed in intensive care than were women (Bernard et al., 1993). Among older populations, however, research has shown that women used fewer formal and informal health-care services than did men (Wolinsky & Johnson, 1991). **Educational attainment** is positively associated with use of GP services (Hershey et al., 1975; Stoller, 1982; Wolinsky, 1978). In comparative analyses of ethnic groups' health and health-care, white Americans' GP use was been less need-dependent than other ethnic groups. Mixed findings exist for the relationship between black Americans self-reported health and medical care. Wolinsky et al., (1989) reported that blacks had fewer and less severe illness symptoms than whites. In Mutchler and Burr (1991) blacks had poorer health than whites of similar socio-economic background, and they were more frequent users of GP care. Differences in health-care disappeared once socio-economic variables were held constant. White Americans' longer hospital stays have been linked to higher socio-economic status, while black Americans' longer hospitalizations have been linked to the greater severity of their hospital-admission illnesses (Mutchler & Burr, 1991; Wolinsky et al., 1989). People who live in households with others (irrespective of marital status) have tended to use fewer formal but more informal care services. Findings show that widowhood is not associated with an increase in health-care. People who live alone consume more formal (Cafferata, 1987; Nelson, 1993), and/or fewer informal health services (Wolinsky & Johnson, 1991; Cafferata, 1987; Nelson, 1993).

The impact of **social networks** on health services use have tended to vary according to both

the specific dimension of social support being tapped (structural versus functional) and group membership. Thus, gender-, ethnicity-, and age-based differences have been reported in the research. For example, one study (Nelson, 1993) found that past-year GP-contact was less likely for black older females who had recently seen their relatives, but more likely for black older males who had recently seen their relatives. This study also found no association between recency of seeing relatives and GP-contact for white older adults males and females. However, white older adult males who had living siblings were less likely, but white and black females with living siblings were more likely to have had past-year GP-contact.

Some evidence exists for the influence of **health beliefs** on the use of health services. In Strain (1991), medical skepticism was associated with fewer GP visits, and health-maintenance behaviour was a strong predictor of GP and general health-care. Research evidence also supports two propositions about health-care **satisfaction**: First, that satisfaction is a significant, albeit modest contributor to the explained variance in health-care and, second, that complex reciprocity exists between satisfaction and patterns of health-care (Roghmann et al., 1979; Robbins et al., 1993).

Summary of effect of enablement on health-care. Compared with the research on predisposing variables, research on the health-care impact of enabling family resources is more clearcut in its conclusions. With some notable exceptions (e.g., Stoller, 1982), most studies have found that **medical insurance** is not a significant predictor of either health-care contact or volume. Recent investigations have further found that **household income** may exert its influence over health-care through **service-cost subsidy**; that is, those on low incomes who have access to reduced-cost health-care have been more frequent consumers than high-income earners (Bazargan et al., 1998; Wolinsky & Johnson, 1991). Comparative analyses have

shown that medically-insured black Americans with more education and higher incomes are more frequent consumers of GP-care and have longer hospital stays than other blacks. However, other research (Kravits, 1975) has found that higher-income black Americans were more medically skeptical than lower income blacks and made fewer past-year GP-visits. A range of studies have found an association between having a **regular source of care** and increased use of GP-care. Health-access variables have contributed very small amounts to total explained variance (e.g., Gribben, 1992). Some support has been found for **health-provider characteristics** having significant impact on health-care use.

Summary of effect of need on health-care. With few exceptions, studies confirm the dominance of physical-need in accounting for variability in people's health-care use. The extent to which there have been health-need differences across demographic groups (sex, ethnic, income) has varied from study to study, but findings confirm the predictive importance of physical-need (e.g., Bazargan et al., 1998; Kandrack et al., 1991; Nelson, 1993; Wolinsky et al., 1989).

The focus of the literature reviewed in this chapter has been on the health-care impact of ***non***-psychological variables. The following chapter presents the literature on the impact of psychological variables on health-care.

CHAPTER FOUR

Psychological-need and Health-care

4.1 Chapter overview

The literature on psychological-need (i.e., mental-health problems) and use of health-care is reviewed in this chapter. Most of the literature bears only tangentially on the question of the impact of ***psychological***-need on ***medical***-care. Therefore, this chapter focuses on the relatively less abundant literature on the impact of psychological-need on medical-care use. Two broad areas of research are reviewed. The first concerns the health-care impact of specific events in which events have been conceptualized as either 'life-change' stressors or traumatic stressors. The second literature involves the health-care impact 'psychological distress'.

4.2 Introduction

A voluminous literature has accumulated over the past several decades on the relationship of psycho-social factors to mental-health functioning. Over that time, investigations have branched into more specialized areas of inquiry whose diverse emphases are not easily integrated into behavioural accounts of health-care utilization. Attention has focused on the health of specified population groups, and has included representative sampling of general populations as well as clinical populations. In this research, the focus has been primarily on the impact of psycho-social factors on the use of mental-health services and not on use of medical-services. Andersen's (1968) framework is silent on the question of the predictive utility of psychological-need in explaining use of medical care, although the potential salience of psychological characteristics as predictors of health care has recently been acknowledged (Andersen, 1995)[1]. Andersen and his colleagues (1975) had earlier explored the question of psychologically-related medical care, but the psychological variables were not incorporated

[1]Andersen (1995) considered psycho-social health-care predictors to be indicators of predisposing rather than of need characteristics. However, in line with the prior empirical research reviewed in this chapter, psychological-need has been classified as an indicator of need.

into the behavioural model. In fact, relatively few studies on the health-care consequences of psychological-need have organized the relevant psychological variables into an overall conceptual framework. Fewer still have explicitly related mental health variables to Andersen's (1968) scheme (an exception is Wolinsky et al., 1983). Accordingly, not much is known about the relationship of psychological-need to the three components of Andersen's model, and its contribution to health-care use.

4.3 Stressors, health and health-care

Research on the health impact of stressors (i.e., specific stressful events or situations) has been organized around two sorts of events. The first, referred to as 'life change' events, concerns relatively common events, and the second, less common but extreme events. Before considering these, two closely-linked concepts relevant to the research will be clarified.

4.3.1 Stress and distress differentiated

Most of the recent studies on psychological-need and health-care use have drawn upon two inter-related concepts, stress and distress. Stress refers to 'objective' ***features of events*** experienced by people, while distress refers to people's ***reactions*** to those events (Cohen & Williamson, 1991). Stress, whether stemming from 'life-changes' or traumatic-events, does not inevitably lead to distress. Rather, distress arises when the event exceeds people's ability to cope with events. Since stress and distress refer to "different stages of the same underlying process" (Williamson & Cohen, 1991, p.5), they share some conceptual overlap, as when indicators of stress (e.g., characteristics of the event) and of distress (e.g., negative affective reactions to events) both serve as measures of psychological distress. Research on the psychological-need impact of life-changes is now considered.

4.3.2 Life-changes events

The basic premise of life-changes research is that the stress accompanying everyday changes or disruptions in daily routine may precipitate the onset of physical- and psychological-health problems (Holmes & Rahe, 1967; Williams, Ware & Donald, 1981). Life events changes represent personal, social and environmental disruptions such as divorce, separation, residential change, job loss or change, retirement, death of family member and changes in finance. Although within the realm of normal human experience, the events are potentially distressing and have been identified as factors which increase the use of mental-health care (Koss, Woodruff & Koss, 1990). Sarason, Johnson and Siegel (1978) proposed an additive model of life events in which, not just the type of changes, but also their frequency over a given interval, had the potential to compromise health status. Several studies have since found that the more life changes people experience in a given time interval (e.g., one year), the greater their susceptibility to a host of stress-related problems (Koss et al., 1990; Rubio & Lubin, 1986). While the literature on the physiologic and psychological health-effects of life changes is vast, relatively little exists on the use of medical-care following life change events. Studies whose focus has been on the health impact of life-changes are now considered.

Siegel, 1990. In Siegel's one-year prospective panel study of 938 elderly Americans, the effect of life-changes on GP-visit frequency was examined. Siegel cited research reporting a positive association between life-changes and use of medical-care and other research which found beneficial health-effects of pets (i.e., companion animals). Siegel hypothesized that companion animals would moderate the relationship between stress and GP-visits. Baseline telephone interviews sought information on chronic health problems, demographic characteristics and social support networks. Measures of life events changes and depressed mood were taken at baseline, six months and twelve months. Depressed mood was measured

by the Center for Epidemiologic Studies Depression Scale (Radloff, 1977, cited in Siegel, 1990). Life events were measured by a ten-item checklist sourced from the gerontological literature (Kahana & Kahana, 1983, cited in Siegel, 1990). The items represented changes found to be among the most stressful for elderly populations. After controlling for demographic and health variables, Siegel found that pet owners reported fewer GP visits than did non-pet owners. In addition, while a positive relation was found between the number of life-changes and the number of GP-visits for ***non***-pet owners, no such relation was found for pet owners. Thus, among the elderly pet-owners, having several compared to few life-changes did not result in a significantly greater number of GP contacts.

Cheng, 1992. Cheng's research, based on self-administered questionnaire data, investigated whether psycho-social variables, including a life-changes measure, enhanced predictions of GP care by 227 elderly women who lived alone. The sample comprised widowed, separated, divorced and single women. Literature cited by Cheng pointed out that elderly adults were more likely than the non-elderly to visit GPs in response to psychological and emotional need. Cheng hypothesized that elderly women would utilize GP-care in part because of loneliness and stress. Stress was measured by a life-changes checklist adapted from the Life Experiences Scale (Sarason et al., 1978). Items included such occurrences as a death in the family or major changes in finances. Loneliness was measured by a ten-item scale developed to measure the extent to which people were distressed by loneliness. Measures of somatization and physical-need (e.g. number of limited activities of daily living) were also employed. Physical-need accounted for the greatest proportion of the explained variance in GP visits; that is, poor self-rated health, chronic illnessess and limited activities accounted for 31% of the variance in GP-visits. Findings confirmed Cheng's expectation that elderly adults visited GPs in response to their psychological-need. The measures of life-changes stress and loneliness

enhanced the predictive utility of the model by 13% and successfully identified the more frequent consumers of GP-care, after controlling for the effects of health status.

Summary: Life-changes events. Research on the relationship of life-changes to health-care has found a significant and positive association with other psychosocial variables. In Seigel's (1990) comparative analysis of pet- and non-pet-owners, the relationship between life changes and health-care was confined to non-pet-owners, and in Cheng's (1992) study, number of life-changes and loneliness were both important predictors of health care.

4.3.3 Traumatic events

Traumatic events are distinguished in the literature from 'life change' events (i.e., relatively more commonplace events) because of the formers' extreme characteristics (e.g., sudden, life-threatening). Definitions of traumatic events have sometimes differed from study to study, but most have in common the notion of sudden, violent and potentially life-threatening events caused by natural forces, machinery or living things. Norris (1990) defined a traumatic event as "a violent event ... that (a) is marked by extreme and/or sudden force, (b) involves an external agent, and (c) is typically capable of arousing intense fear or aversion" (p. 1706)[2].

Concern regarding the effects of trauma on human health and wellbeing predates - and extends beyond - psychological research on the topic. The impetus for the psychologically-oriented research on trauma stemmed from reports throughout the 1960s and early 1970s on somatic symptoms suffered by military personnel serving in the Vietnam war (Kulka et al., 1990). Soldiers who otherwise appeared to be healthy developed disabling physical and

[2]The use of the event as a central defining element of the trauma has since given rise to the phrase 'event-defined trauma' (Friedman & Schnurr, 1995).

psychological symptoms either during or after combat. These symptoms appeared to result from war-zone stress and were similar to medically-based reports of psychological 'states' suffered by soldiers throughout the first and second World Wars (Krupnock & Horowitz, 1981). In the more than 25 years of combat trauma research, a large body of data has accumulated on the extent and character of the health effects suffered by Vietnam war veterans. While the research has investigated general health and use of medical-care, the major focus has been on mental health functioning and mental health care. In concert with the empirical research, clinical treatment of Vietnam veterans led to the emergence of a specific diagnostic classification, post-traumatic stress disorder (PTSD; American Psychiatric Association, 1980). As a diagnosis, PTSD now also includes long-term psychiatric disturbance resulting from exposure to any type of traumatic stress (American Psychiatric Association, 1994). Chapter 5 reviews the war veterans' health and health-care literature.

Civilian research on traumatic events coincided with, but was largely independent from, the combat-stress research. To facilitate the systematic collection of information on traumatic events, researchers have developed checklists of specific traumatic events. These checklists provide an index of the different types of traumas to which populations of interest have been exposed over a given period of time (Norris, 1990). People have been asked whether they had experienced any of a number of different types of trauma such as natural disasters (e.g., floods and earthquakes), violent crime victimization (e.g., grievous bodily assault and rape) and serious accidents (e.g., vehicle and work accidents). As with combat research, civilian studies have focused more on psychological- than physical effects.

Various models of the relationships among traumatic stress and health and illness have been proposed (Ullman & Siegel, 1996). One model proposes that illness stems from alterations

in immune-system functioning (Koss et al., 1990). Another proposes that traumatic experiences lead to an increase in maladaptive health-behaviours (Laws, 1993, cited in Ullman & Siegel, 1996). Most models centre around the notion that physical effects of trauma stem from the development of PTSD symptoms (Breslau & Davis, 1992; Norris, 1990). Studies which have examined the physical-effects, including health-care use, of exposure to trauma in civilian populations are now presented.

Koss et al., 1990. Koss et al. drew upon a worksite-based sample of 2,291 female health-care programme enrollees to examine the contribution of crime-victimization history to use of GP-care. Data were responses to a mailed self-report questionnaire which included a 12-item checklist of crimes suffered by respondents since adolescence. Items included nonsexual (e.g., burglary, assault) and sexual crimes (e.g. rape). Koss et al. used a five-level crime victimization index empirically constructed in prior research (Wolfgang, Figlio, Tracey & Singer, 1985, cited in Koss et al., 1990).

The five mutually exclusive levels of crime victimization, along with the corresponding percentage of women who reported victimization at each level, were: 1) No crime victimization (43.2%); 2) mild victimization, which covered non-contact crimes such as burglary or threatened assault (23.9%); 3) moderate victimization, which involved direct physical contact such as being robbed with force or beaten up (11.6%); 4) severe victimization, which comprised crimes of sexual penetration (13.9%); and 5) multiple victimization which involved experiencing any non-contact crimes and experiencing "on ***separate*** occasions both a completed forcible rape ***and*** a physical assault" (7.4%) (p. 149; emphasis in original).

The nine-item Current Health Scale provided a measure of subjectively perceived current health status (Davis & Ware, 1981, cited in Koss et al., 1990). A ten-item stressful life-changes scale was used to control for recent life events in assessing the health-impact of crime-victimization. Koss et al. found that higher levels of victimization were associated with poorer health. Good health was associated with younger age, lower life-stress and exposure to less severe victimization. Of the explained variance in health status, demographic variables (e.g. age, ethnicity, education, etc.) accounted for 8%, life events changes, 2.7% and crime victimization, 1.8%. Crime victims were more likely than others to have visited the GP and almost all (93%) of the crime victims made at least one doctor visit in the year following the crime.

Norris, Kaniasty and Scheer, 1990. Norris et al. examined patterns of mental- health use following traumatic experiences. The sample of 12,226 households from the state of Kentucky was initially contacted through a telephone random dialling method. The interview comprised questions on socio-psychological status and past-six-months crime victimization and life-changes. Victimization was assessed by an 18-item inventory which coded crimes according to level of violence and recency. Coding was based on the Uniform Crime Reporting Handbook (U.S. Department of Justice, 1984, cited in Norris et al., 1990). Crime victimization at any other time prior to the first six months interval was also assessed. Social support was measured by a 12-item scale tapping directive (e.g., guidance and advice) and non-directive (e.g., concern and acceptance) dimensions of support. Psychological status was measured with a 12-item variant of Rotter's (1966) locus of control scale and several subscales of the Brief Symptom Inventory (Derogatis & Spencer, 1982, cited in Norris et al., 1990). Within a year of victimization, 23% of violent crime victims had contacted mental-health professionals and a slightly smaller proportion, medical doctors (21%). Violence-victims were three times more

likely to use mental-health care than were property-crime victims whose level of care was similar to that of the general American population. Five variables were linked to an increased likelihood of consuming mental-health care: exposure to a violent crime, urban residency, receiving high levels of directive social support and having an internal locus of control and recent victimization.

Norris, 1992. Norris investigated the psychological impact of traumatic events in different demographic groups residing in four southeastern American cities. These cities had borne the brunt of Hurricane Hugo in 1989. A quota-sampling strategy was employed which ensured that the study comprised the census tracts exposed to hurricane damage. Equal numbers of Black- and White Americans, males and females, and young, middle-aged and older adults were also included to further ensure that the four-city samples were of similar composition. Norris was cautious about generalizing results to the general population because of the unknown biases arising from quota sampling. Data were home-interview responses of 1,000 people who answered questions about past-year and lifetime exposure to ten event-defined traumas (excluding Hurricane Hugo). Perceived past-month stress levels were also assessed with two measures. The first, a ten-item adaptation of the Perceived Stress Scale (Cohen et al., cited in Norris, 1992) assessed whether situations were appraised as stressful. The second measure was a subscale of the Traumatic Stress Schedule whose items tap symptoms of stress reactions (eg., emotional numbing, avoidance) (Norris, 1990). In addition, DSM-III-R criteria were used to determine whether participants had developed PTSD symptoms. Exposure to at least one violent event in the past year was reported by 21% of participants.

The most frequently reported events were natural hazards and robbery; the least frequently reported, fire and sexual assault. Lifetime frequencies showed that women were more likely

than men to have been sexually-assaulted, physically-assaulted and injured in vehicle accidents. White Americans were more likely than black Americans to have been robbed and physically assaulted.

Norris also examined whether stress levels varied by trauma-intensity and recency. Stress levels were highest among those who experienced a past-year trauma and lowest among the those with no trauma history. Whereas stress levels of white Americans differed little by trauma-recency however, those of black Americans differed substantially, with the highest levels for the past-year. Females, white Americans and younger participants reported higher stress levels than others. Norris also found that the prevalence of PTSD varied by types of traumatic event. The highest rates were for sexual assault (14%), physical assault (13%) and automobile accidents (12%), while the lowest was for combat (2%). Trauma-recency accounted for only a small amount of the variability in stress rates. The rate of PTSD among women (12%) was just over twice that of men, but no differences in stress by ethnicity were found.

Kimerling & Calhoun, 1994. Kimerling and Calhoun's research compared sexual-assault victims and non-victims on a range of health and health-care variables. The sample comprised 115 female sexual-assualt victims aged 15 to 71 years who were first seen at a metropolitan hospital-based rape crisis centre. These women were compared with a demographically-matched group of women with no history of sexual assault. Kimerling and Calhoun (1994) found that, compared to the non-sexual-assault group, sexual assault victims' psychological symptoms were significantly higher over a one-year period. In addition, while the number of physical symptoms reported by sexual assault victims was initially higher, by year's end group differences were not significant. Initially, there were no differences in GP-visits but

four months post-assault, victims reported a significant increase which continued at the one-year follow-up. Kimerling and Calhoun also found that higher social support, compared with lower, was associated with better health, but no significant interaction was found between social support and health-care use. Almost three quarters of victims sought medical-care, but less than one-fifth of them sought mental-health care, findings consistent with the prior trauma-health-care research (Koss et a., 1990; Norris, 1992).

Ullman & Siegel, 1996. In a regional community survey of 2,364 American residents[3], support was found for the interaction proposition that specific traumatic events would be worse for some groups than others. According to this proposition, health effects of trauma are moderated not just by 'event-characteristics' (i.e, recency, severity and frequency of trauma) but also by ***victims'*** demographic characteristics (i.e., gender, education, ethnicity). In common with the existing research, Ullman and Siegel found that those who had experienced traumatic experiences at least once in their life reported poorer physical health than those without such a history. Providing support for the interaction hypothesis were the findings that the impact of trauma on activity limitations was over twice as large among Hispanics than white Americans and women were more likely than men to report chronic illnesses. The study confirms earlier research that pointed to poorer health among those who had experienced a traumatic event at some stage in their life, and that for some groups, the health-impact of trauma was worse.

Summary: Traumatic events. Studies have documented the adverse health-impact of traumatic experiences. Compared with non-crime victims, crime victims have increased levels of

[3]The researchers employed "two-stage probability sampling stratified by catchment area to obtain a representative sample of Hispanic and non-Hispanic white residents" (Ullman & Siegel, 1996; p. 707).

psychological distess and have been more likely to use mental-health care. Some types of crime are associated with poorer health and higher rates of medical-care use. Other studies confirm a relationship between type of traumatic event and health-outcomes. For example, sexual- and/or violent-assault victims have higher rates of medical-care consumption than do property-crime victims. Therefore, findings suggest that the health-care impact of trauma depends on characteristics of the event and of the individual. Recent findings provide some support for the worse-for-some-than-others proposition; demographic groups such as females and ethnic minorities fare worse following exposure to specified traumatic events than do others. What remains to be resolved, however, is the extent to which these findings generalize to either more genral populations or other event-defined populations such as war veterans. A further issue that awaits clarification is ascertaining the impact of multiple traumatic events (as opposed to a single traumatic episode) on the use of health-care (Horowitz, Weine, & Jekel, 1995).

4.3.4 Summary of stressors, health and health-care

The literature has conceptualized stressors as either 'life-change events', which involve disruptive but relatively common changes, or 'traumatic events', which involve extreme (i.e., life-threatening) experiences. Consensus exists in the literature regarding negative health outcomes associated with life-changes and traumatic events. Research has more recently examined whether aspects of trauma such as its frequency and recency enhances the prediction of health status. Findings suggest that the health-impact of trauma depends on interactions between aspects of the traumatic event, and demographic characteristics of victims. Regarding their saliency in explaining general health status, traumatic stressors remain of secondary importance compared with demographic variables such as sex and ethnicity.

4.4 Distress and health-care

A large number of research findings has found an association between elevated distress levels and greater use of medical-care. Among the explanations for the association have been the following: (1) distress may have caused or precipitated the illness; (2) distressed persons may have a greater inclination to seek medical care; (3) increased health care may have provided a way to cope with stressful situations and (4) psychological distress itself could be a symptom of an underlying physical illness (Andersen, Francis, Lion & Daughety, 1977; Bland, Newman & Orn, 1990; Tesler, Mechanic & Dimond, 1976; Van Hemert, Bakker, Vandenbrouke & Valkenburg, 1993; Vàzquez-Barquero et al., 1992). A review of the research on the distress-medical-care relationship now follows[4].

Tessler et al., 1976. Tessler et al. used baseline data obtained from household interviews to prospectively examine the influence of psychological distress on the uptake of physician services of 506 American adults. Participants were urban-dwelling industrial workers and family members enrolled in a prepaid medical care programme. The socio-psychological and demographic variables in the full model tested by Tesler and his colleagues were not dissimilar from those used in research on Andersen's (1968) model. Psychological distress, conceptualized as "a subjective assessment of personal stress" (Tessler et al., 1976, p. 355), was measured by a variety of items covering stress, recent relationship worries, and uncomfortable feelings. Prior research led Tessler et al. to expect that high levels of psychological distress would be causally connected to greater use of GP-care. One year later, GP-care data for the preceding twelve months was obtained from medical records. Four variables emerged as significant predictors of GP care: sex (i.e., being female), chronic

[4]The literature on distress uses the more technical term 'medical-care' rather than 'health-care and so it is also used in this section.

illnesses, bedrest and psychological distress. Findings supported the expectations: (1) psychological distress was associated with more GP-care; (2) distress accounted for more than 2% of the variance in number of GP-visits and almost 4% of the variance in the number of patient-initiated visits to the GP; (3) the impact of distress on GP care was secondary to the impact of physical-need.

Andersen et al., 1977. In a secondary analysis of data obtained from a national study of 3,880 American families, Andersen et al. investigated the relationship between emotional disorders and health-care. The aim was to determine the proportion of annual GP visits that appeared to stem from psychological need. Health-care data and medical diagnoses were obtained from the primary health-care providers and were assigned to one of five categories by a panel of mental-health professionals. The first three categories comprised psychological categories; these were psychiatric diagnoses (e.g., depression), ill-defined conditions without obvious physiological basis (e.g., migraine headaches), and psychosomatic conditions considered to have a psychological component (e.g., hypertension). The two remaining categories were physical illness diagnoses and preventive care. Although diagnostically crude, the first three categories, compared with the last two, were expected to include those who would more likely seek care because of emotional disorders. Andersen et al. (1977) found that two socio-demographic variables were associated with the psychological categories: sex (i.e., being female) and age (i.e., being older). The psychosomatic category had a substantially greater proportion of adults aged 55 years and over. However, this group also had a greater proportion of patients with illnesses such as hypertension and rheumatoid arthritis. The only ethnic group difference was a higher proportion of black Americans than others in the psychosomatic group, a finding attributed to the greater prevalence of hypertension among black Americans. In comparison with others, patients in the psychological categories did not

have more serious health complaints, but they were more frequent consumers of GP-care even when rating their health as positive, and they also spent more money on prescriptions. These patients, however, also reported a greater number of co-existing medical diagnoses, suggesting that the multiple visits were not related to the same health problem.

Manning & Wells, 1992. Manning and Well investigated whether psychological-need had an independent impact on medical-care from that of physical-need in sample of 4829 enrollees in an American health insurance programme. All enrollees were under the age of 55 years. The researchers also assessed whether two components of mental health status - distress and wellbeing - had separate effects on medical care. Distress was defined as intense negative affective states (e.g., depression and anxiety) and wellbeing, as intense positive affective states (e.g., feeling happy and satisfied with life). These components were measured by the two subscales of the Mental Health Inventory (MHI; Veit & Ware, 1983). Measures of physical-health status were self-rated health, health worries and concerns, number of chronic diseases, physical symptoms and impaired functional activities.

Manning and Wells found that distressed people used a greater volume of outpatient and inpatient medical services than others. However, once physical health variables were held constant, the effects of mental health status were found to be largely due to physical illness. After further controlling for demographic variables and type of medical insurance, the observed effects of mental health measures on the use of outpatient services disappeared, while the observed effects on inpatient services remained significant. Thus, distress continued to contribute to inpatient but not outpatient care.

Manning and Wells also found that distress and wellbeing had opposite partial effects.

Specifically, after "... controlling for level of distress, persons with a ***higher*** level of well-being used more medical services" (p. 548; emphasis in original). When either measure was analysed as the only independent variable, they had similar effects on use, with lower wellbeing or higher distress leading to greater medical-care. However, in multivariate analyses which included physical-need measures, wellbeing and distress had opposite effects. Manning and Wells explained the counter-intuitive results as follows: "Greater psychological distress was still associated with more use ... Because the gross effect of psychological well-being was in the expected direction, i.e., less well-being led to greater use, and because wellbeing and distress are strongly associated, it is clear that the unique effect of wellbeing modifies the main effect of distress. That is, for a given level of psychological distress, those patients who use services have greater well-being" (p.550)[5]. Manning and Wells proposed that, since wellbeing and distress had different effects on medical care, they were separately more appropriate measures of mental health status than when they were summed to form a total MHI score which had been less predictive of medical care.

4.4.1 Summary of distress health-care

Across numerous studies, distress has emerged as a significant health-care predictor. A key finding has been that higher levels of distress have been associated with heavier consumption of medical services, and in particular, GP-care. The distress-health-care relationship has varied according to sex (distressed women have been more frequent health-care consumers than distressed men), age (older distressed adults have been more frequent utilizers than the younger distressed), and ethnicity (no consistent patterns have emerged). After controlling for physical-need, the relationship between distress and health-care has often diminished. Thus,

[5]"One possible clinical interpretation of this result is that psychological wellbeing partly serves as an indicator of an ability to respond to psychological distress by seeking help" (Manning & Wells, 1992, p. 550).

distressed people have also had poorer physical-health than others. The question stemming from these findings that awaits clarification concerns the direction of the relationship between physical health and psychological health.

4.5 Chapter summary

This chapter reviewed two broad areas of research whose common link involved examining the relationship of psychological-need to health-care utilization. The first area involved the health-impact of two types of stressors, life-change events and traumatic events. A relationship exists between the number of changes people experience over a specified interval and their health status. A similar relationship has also been found between traumatic events and health status. The more of either type of event that is experienced, the poorer the health and the greater the use of medical services. Findings further suggest that some traumatic events more so than others lead to greater health-care and that demographic variables also have an impact on health outcomes (i.e., traumatic events have a more harmful effect on some people than on others). The second research area concerned the health-care impact of psychological distress. Distressed people often used GP-care as a response to either an excess of life-changes or a traumatic events history. Demographic variations in the use of distress-related health care have been reported in the literature, but the relationship has sometimes weakened after controlling for physical-need.

This and the previous chapter have reviewed the general-population research on the relationship of specified groups of variables to health-care. The aim of the two chapters has been to provide a chronological and 'progressive' overview of research which has either been guided by the Andersen (1968) model of health-care or has relevance to its empirical status. Chapter 3 reviewed research which investigated the contribution of prediposing, enabling and

physical-need variables to the variability in use of health-care. The current chapter shifted the focus to research which has also included an examination of the contribution of psychological-need to health status and use of health-care. Chapter 5 shifts the focus still further in its review of studies on the health of Vietnam war veterans' and their wives.

CHAPTER FIVE

Health and Health-care of Vietnam War Veterans and Their Wives

5.1 Chapter overview

Chapters 3 and 4 covered the civilian-population research on the determinants of health-care utilization. The present chapter covers the military research on the determinants of Vietnam veterans' health-care utilization. It is organized into two major sections. The first focuses on the Vietnam war veterans' health and health-care research and is subdivided further into three subsections. The first describes findings from prior New Zealand research, the second outlines the American veterans' health and health-care research, and the third subsection reviews the literature on the relationship of combat stress and PTSD to veterans' health status. The second section of the chapter describes findings from prior research on the wives of Vietnam war veterans.

5.2 Research on Vietnam War veterans

The Vietnam war ended in 1975. Over the ensuing years, the personal and familial consequences of combat stress have been investigated in a multitude of international studies. Most earlier research focused on clinical samples of American Vietnam veterans (i.e., those seeking mental-health care). The extent to which these veterans typified the wider population of Vietnam veterans was unknown. In more recent years there has been an upsurge of research on more representative samples of community-dwelling veterans. Variables investigated in the literature have included combat stress, current social support and PTSD. Researchers have attempted to identify factors that account for differences in veterans' health and wellbeing.

5.3 New Zealand Vietnam War veterans health and health-care

In contrast to the early appearance of overseas studies on the health of Vietnam war veterans, research on New Zealand Vietnam War veterans was a relatively late development. Prior to

the 1990s, there had been virtually no studies on the approximately 3,000 New Zealand military personnel who served in Vietnam. However, there were numerous anecdotal accounts through-out the 1980s about re-adjustment difficulties and health problems experienced by many of the veterans. In response to the growing concern over New Zealand Vietnam war veterans, a major research project was set up whose aim was to survey their health-needs. Since 1990 - and prior to the present study - two community surveys of the veterans have been conducted (Vincent et al., 1991; Vincent et al., 1994).

5.3.1 First health survey

Vincent et al., 1991. A quota-sampling method was employed to contact half of the more than 2,000 veterans on a military-provided address list. The questionnaire, which was completed by 573 male veterans, sought information on socio-demographic background, military experience, and physical and mental health. The military experience items included length of time in the military and in Vietnam, number of tours of duty, rank and role in Vietnam, and level of combat stress. Combat stress was assessed by an existing measure developed for use with military personnel (Boulanger & Kadushin, 1986, cited in Vincent et al., 1991). Respondents rated on a scale that ranged from "rarely" to "very often" the extent to which they had experienced each of twelve different combat situations.

There were five measures of physical health. A modified version of the Pennebaker Inventory of Limbic Languidness (Pennebaker, 1982) was used to measure the severity of 28 physical symptoms. An existing chronic-illness checklist (Belloc, Breslow & Hochstim, 1971) was modified to measure sixteen chronic health problems typically reported by Vietnam veterans (Centers for Disease Control, 1988). Cutback days in the past three months was used as a proxy for health-related disability. Perceived health was assessed with a single item self-rating

of health in which veterans compared their health to someone in excellent health. Three aspects of mental health were assessed. These were: psychological wellbeing and psychological distress, which were measured by subscales of the 38-item Mental Health Inventory (MHI; Veit & Ware, 1983) and PTSD, which was measured by the 35-item Mississippi Scale, a measure of combat-related PTSD (Keane, Caddell & Taylor, 1986). Information was also sought on the number of different types of health-care providers veterans had contacted in the previous three months.

In the first survey, 15% of the veterans were classified as having PTSD. On several demographic variables and all physical and psychological variables, significant differences were found between PTSD-classified veterans and non-PTSD veterans. PTSD-veterans were more likely than non-PTSD veterans to be divorced or separated, on lower incomes, unemployed and to have fewer educational qualifications. In addition, PTSD cases reported both a greater number and severity of physical symptoms, more cutback days and poorer overall health than non-PTSD cases. Those with PTSD also reported significantly greater levels of anxiety and depression and poorer levels of positive affect and emotional ties. Compared with non-PTSD veterans, there was a trend for PTSD-veterans to have spent fewer years in military service, a longer time in Vietnam and to have experienced a higher level of combat stress.

Differences were found in the number of contacts with health-care providers in the past three months: PTSD-veterans had almost twice as many contacts as non-PTSD veterans with health-care providers; still larger differences were found in the likelihood of contact with hospital-based and, in particular, counselling-based services; PTSD s were five times more likely to have used Accident and Emergency services and to have been admitted to hospital than non-

PTSD cases and they were also thirteen times more likely to have had contact with a mental health professional (e.g. psychologist or psychiatrist).

5.3.2 Second health survey

Almost three years after the first, a second postal survey of New Zealand veterans was conducted. Respondents included 314 veterans who took part in the first survey and 442 first-time respondents. Similar measures to those used in the first survey were used, but there were also some modifications that preclude straightforward cross-comparisons between surveys. Among the measures of physical-health were chronic illnesses, current physical symptoms, bedrest days and perceived health. There were four measures of psychological health: The Mississippi scale; the State-Trait Anxiety Inventory (Spielberger, 1968); the revised Beck Depression Index (Beck & Steer, 1987) and the psychological wellbeing subscale of the Mental Health Inventory (Veit & Ware, 1983). Findings from the second survey have been reported for the sample of 756 veterans (Chamberlain, Vincent & Long, 1994) and also separately for the subsample of 442 first-time respondents (Vincent et al., 1994).

Chamberlain et al., 1994. The primary aim of Chamberlain et al., was to compare PTSD-veterans and non-PTSD veterans across several aspects of health. Of the 756 veterans, 10% were identified as having PTSD. One demographic and three military variables accounted for the explained variance in PTSD status: Compared with other veterans, PTSD-veterans were employed for fewer hours each week, had a lower military rank in Vietnam, were exposed to heavier levels of combat stress and had spent fewer years in the military. On psychological measures, PTSD-veterans' mean scores indicated poorer mental health status.

In the second survey, analyses of PTSD and ***physical***-health were confined to the 442 first-

time respondents. In addition to more negative perceived health, PTSD-veterans reported more than twice as many physical symptoms, almost twice as many chronic illnesses and almost five times as many cutback days as did non-PTSD veterans.

Vincent et al., 1994. The socio-demographic composition of the 442 veterans in the second survey was similar in most respects to that of the 573 first-survey veterans. Compared with those in the first survey, veterans in the second reported a greater number of physical symptoms and cutback days but somewhat more positive perceived health. However, psychological distress levels in the two samples were similar. Of these first-time respondents, 10% were classified as having PTSD, 20% had moderate to high levels of depression and 44%, moderately high levels of anxiety. Vincent et al. (1994) concluded that, while a notable minority were experiencing serious psychological difficulties, the majority had positively readjusted since their return home from the Vietnam War.

Summary: Health of New Zealand Vietnam War veterans. The major analytic focus of the two New Zealand surveys of Vietnam veterans was on health-comparisons between those with and those without PTSD. Differences between these two groups were found for a range of demographic, military, physical and psychological health, and health-care variables. Compared to non-PTSD-veterans, those with PTSD were more likely to have had 'broken' relationships, lower incomes and education, be unemployed, have spent fewer years in military service, but have had longer tours of duty in Vietnam and higher levels of combat stress, and to currently have worse physical-health, more cutback days and higher levels of anxiety and depression. PTSD veterans also made greater use of health-care services than did non-PTSD veterans, and in particular mental- and hospital-based care.

5.4 American war veterans' health and health-care

Several American studies have examined use of health-care by Vietnam veterans, with most focusing on mental-health rather than medical-care. In addition, available studies have typically comprised 'mixed' veteran-service cohorts (i.e., veterans from World War II, Korea and Vietnam). Thus, despite a large body of literature on veterans' health-care utilization, relatively few in-print studies have been devoted exclusively to Vietnam veterans' use of medical care. The health-care research on Vietnam War veterans is now presented.

Wolinsky et al., (1985). The use of health-care by male and female veterans from different service cohorts (including Vietnam) was compared with that of a general population sample in Wolinsky et al. Between-cohort comparisons were also made. Andersen's (1968) model guided the selection of variables for analysis, sourced from the 1978 Health Interview Survey (HIS) database. HIS data was based on a representative sample of 78,347 non-institutionalized American adults aged 18 years and older (National Center for Health Statistics, cited in Wolinsky et al., 1985). Of the more than 15,800 veterans in the sample, 7% were women. Data was collected by household interviews, with participants providing information on demographic characteristics, current physical-health and past-year health-care. Measures of health status were self-reports of perceived overall health (possible range: excellent to poor), and an inventory of activity limitations. Health-care comprised contact (yes/no) and frequency measures of GP- and hospital-care.

No differences were found between veterans' and non-veterans' physical health status. Wolinsky et al. also investigated veteran-sex interactions on health-care. For GP and hospital contact, no veteran or sex-veteran effects were found, although sex effects were found; that is, men, whether veterans or non-veterans, had a significantly lower probability of GP and

hospital contact than women. Sex and veteran status effects were found for frequency of GP visits. Men reported on average 0.78 fewer visits than women, while male veterans reported 0.17 more visits than male non-veterans. No differences were found in female veterans' and non-veterans' frequency of GP visits. Differences were found between veterans' and non-veterans' hospital stays, with male and female veterans spending an extra two-thirds of a day hospitalized than non-veterans.

In comparisons between veteran-cohorts, some statistically significant health-care differences were found. In summarizing differences, Wolinsky et al. emphasized two points. First, most differences between veterans and non-veterans across predisposing and enabling variables were sex-related. Male veterans use of fewer health services paralleled general population findings in which men consumed less health-care than did women. Second, while most of the differences were significant, they did not represent "a very meaningful difference"[1] (Wolinsky et al., 1985, p.1365). For example, Vietnam veterans averaged one quarter of a GP visit *less* for the year than other veterans.

In terms of the Andersen (1968) model, findings paralleled the civilian literature. Measures of physical-need were the most important predictors of health-care, while several predisposing (e.g., age and sex) and enabling (e.g., having a regular GP and health insurance) variables provided a second tier of predictive importance. The overall fit of the model was also consistent with the existing literature, with more of the total variance explained for frequency than for contact measures. For example, the model accounted for 17% and 8% repectively for measures of GP frequency and contact.

[1]In large samples, statistical significance may result from small effect-sizes of predictor variables (Norusis, 1992a).

The Vietnam Experience Study (The Centers for Disease Control, 1988). This study incorporated a two-stage design to compare current physical-health of 7,972 Vietnam theatre veterans (i.e., who served in military combat zones) with that of 7,364 same-era non-Vietnam veterans (i.e. who served elsewhere during the Vietnam war). In the first stage, which comprised a telephone health survey, almost twice the proportion of theatre veterans than same era veterans (19% versus 11%) rated their general health as 'fair' or 'poor'. For the second stage, a random sample of veterans was selected for medical examinations. Few significant health-status differences were diagnosed between Vietnam veterans and same-era veterans. Kulka et al. (1990) have suggested that the perceived-health item may have confounded physical- and psychological-health. The higher proportion of theatre veterans than same-era veterans appraising their health negatively was possibly an artifact of item non-specificity rather than of a tendency to exaggerate health impairment.

Kulka et al., 1990. Using a large, representative sample of military personnel who served in Vietnam, Kulka et al. (1990) investigated the impact of three characteristics of combat on health and health-care. These characteristics were the level of combat stress, PTSD diagnosis and service-connected disabilities. Data was obtained through structured household interviews of 1,632 male and female American Vietnam theatre veterans. Of these, 344 were randomly selected for follow-up clinical interviews. Kulka et al. compared Vietnam veterans' health and health-care with two other groups' health and health-care: same-era veterans and civilian peers who had not served in the military. Checklists were also used to obtain information on recent life-changes and lifetime traumatic events. Each traumatic event had several probes designed to ascertain whether the event met DSM-III-R criteria for trauma. Key findings reported by Kulka et al. pertaining to traumatic events, PTSD prevalence, physical-health and health-care are now considered.

Traumatic events. Theatre veterans, and in particular, those exposed to high levels of war-zone stress, were significantly more likely than their same-era and civilian counterparts to report having ever experienced a traumatic event. "Three out of four men who were exposed to high levels of war-zone stress in Vietnam also described one or more discrete events that were judged to be definitely traumatic" (Kulka et al., 1990, p.37). PTSD-theatre veterans were more than twice as likely to report exposure to a specific traumatic event than were non-PTSD-theatre veterans. Also, theatre veterans with service-connected disabilites were significantly more likely to report exposure to traumatic events than were theatre veterans without service-connected disabilities.

PTSD Prevalence. In subsequent clinical interviews, Kulka et al. (1990) used a composite method which included the Mississippi Combat-related PTSD scale to determine the prevalence of PTSD. Military variables associated with PTSD included: Serving over four years in the military (but less that twenty), being on tour of duty thirteen or more months, and entering the military before the age of twenty. Demographic variables associated with PTSD were not completing high school, current unemployment, income less than $US20,000 and being separated or in a de facto relationship.

Kulka et al. (1990) estimated that half (15.2%) of the more than 30% of theatre veterans who had developed PTSD continued to meet full diagnostic criteria for it. PTSD prevalence was also significantly higher among those exposed to high combat-stress levels. Ethnic differences in PTSD prevalence were also found. Hispanics (27.9%) had the highest levels, black Americans (20.6) the second highest, and white Americans (13.7%) the lowest. While black veterans' higher PTSD rate was largely explained by greater combat stress, Hispanic veterans' higher rate was not.

Physical health. Veterans were asked several questions about their physical health. For two of the questions, respondents rated their health along a continuum from excellent to poor and estimated how their health compared with same-age others. Checklists were used to assess the current number of chronic illnesses. Few physical health comparisons showed significant differences between theatre veterans as a group and their non-Vietnam peers. However, theatre veterans exposed to high combat-stress levels had significantly higher rates of physical health problems than either Vietnam veterans or non-Vietnam peer groups. Theatre veterans reported more negatively perceived health and a higher number of chronic illnesses than did the other two groups. They also reported higher rates of service-connected physical disabilities than non-Vietnam veterans. Similarly, PTSD veterans reported a greater number of physical health problems than non-PTSD veterans.

Health-care. No significant differences were found between theatre and non-Vietnam peers in current use of inpatient and outpatient medical-care. Neither were differences in health-care found between veterans exposed to high combat-stress and other theatre veterans. PTSD veterans, however, were significantly more likely than non-PTSD veterans to have used outpatient health-services (52% versus 38%). Two factors accounted for differences in use of mental-health care: combat-stress levels and current PTSD. Theatre veterans were as likely as their non-Vietnam peers to have ever used mental-health care. Similarly, no ethnic variations in mental-health care were found. When combat stress comparisons were made, however, differences were found; that is, those exposed to high combat-stress levels were more likely than other theatre veterans to have ever sought mental-health care (41% versus 27%), but there were no differences in past-year mental-health care. PTSD-theatre veterans were also more likely than non-PTSD-theatre veterans to have ever used (62% versus 25%), and to be currently receiving (22% versus 8%), mental health care.

PTSD emerged as the most important predictor of physical health and health-care in Kulka et al.'s (1990) study. Significant health differences were found between PTSD-diagnosed and non-PTSD veterans. Those with PTSD were more likely than others to report poorer physical health and to have had medical and mental-health care.

Romeis, Gillespie, Virgo & Throman (1991). In a secondary analysis of 1982 and 1984 Health Interview Survey data, Romeis et al. compared the use of health-care by 2,181 female war veterans with that by 80,081 civilian women. Using Andersen's (1968) model, Romeis et al. investigated variables that differentiated female veterans' health and health-care from non-veterans. Minor demographic differences were found: veterans were on average younger, had more education and were more affluent than non-veterans. The health status of the two groups was similar. A significant, but small, difference was found in the proportions who had past-year GP-contact (veterans: 79.2%; non-veterans 77%).

In a re-analysis which included veteran-status interaction terms, female veterans with large families were more likely than civilian women with large families to have had GP-contact. In addition, veterans with activity limitations visited the GP more frequently than non-veterans with activity limitations. No other differences were found. Although Romeis et al. did not report the strength of the significant interaction terms, they state that "there were no important changes in the direct effects modeling as a result of including the interaction terms" (p. 934). No substantive differences in predictors and patterns of female veterans' and non-veterans' use of health-care were found.

Wenzel et al., (1995). The relationship between 429 homeless war veterans' biopsychosocial characteristics and their health-care was examined cross-sectionally by Wenzel et al. Health-

care over the six months prior to the veterans' admission to a residential treatment programme included medical, psychiatric, inpatient and outpatient services. In accord with the Andersen (1968) model, Wenzel et al. expected that need would be the most important predictor, with the other components of relatively less importance. In order to clarify the impact of need variables on health-care, Wenzel et al. investigated the impact of co-existing need variables such as psychological status, substance abuse disorder and physical illness on health-care[2]. Wenzel et al. expected that, in homeless populations, the impact of need variables on other need variables, would reduce the likelihood of homeless veterans using health services.

Face-to-face structured interviews were used to obtain information keyed to the three components of the behavioural model. Need comprised physical and psychological dimensions. Physical-need measures included objective disease indicators (e.g., blood tests) and self-reports of chronic illnesses. Psychological-need measures comprised self-reports of the total number of serious psychiatric symptoms ever experienced and interviewers' observations of veterans' behaviour throughout the interview. Veterans also indicated whether they had for at least a one-year period either consumed alcohol to intoxication or used any other substance to excess. Veterans were also classified as suffering from combat stress if they reported at least two of three re-experiencing symptoms (i.e., nightmares, flashbacks, intrusive combat memories).

Need variables emerged as the most important predictors of overall health-care. Chronic illnesses predicted the use of inpatient and outpatient services. One predisposing variable each contributed to the explained variance in inpatient and outpatient medical care: Longer time

[2]Wenzel et al. (1995) further explained that co-existing need variables may be confounded, as when "an association between a particular need factor and service use may be caused by a second need factor (p.1133).

living in the region was positively related to inpatient care, and more education to outpatient care. Wenzel et al. suggested that better educated veterans may have had greater awareness of the need for treatment and were probably also better able to negotiate potential barriers to accessing health services than other veterans. Similarly, those who were residentially stable were seen as having more knowledge about how to access local sources of care (Snider, 1980). Alternatively, these veterans' greater likelihood of using inpatient medical care implies health problems that may have inhibited their moving farther afield.

Combat-stressed veterans were less likely than other veterans to have used outpatient medical care. Psychiatric symptoms and alcohol use were important predictors of psychiatric care, but combat stress was not. The finding that combat-stressed homeless veterans were less likely to utilize outpatient medical services suggested that stressed veterans may have been dissatisfied with the health-care system or unable to cope with the effort involved in accessing these services in their stressed state. Veterans with evidence of liver dysfunction were more likely to have used mental health outpatient services.

Wenzel et al. (1995) found two instances of co-existing need factors inhibiting access to required care. In the first, the chronic-illnesses-medical-outpatient association was stronger among veterans who did not have an alcohol-intoxication history. In the second instance, the relationship between alcohol intoxication and inpatient mental-health care was stronger among those who did not have a substance use history.

Stern et al. (1996). In a secondary analysis of data on 1,632 Vietnam combat veterans from the National Vietnam Veterans Readjustment Study (NVVRS; 1990), Stern et al. (1996) examined the relationship of the Andersen (1968) components to medical and mental-health

care. Demographic and military experience variables served as indicators of predisposition, while income and health insurance represented enablement. Physical symptoms, functional impairment and psychiatric disorders, including PTSD, served as indicators of need.

Need was the strongest health-care predictor. Poorer functional health contributed to greater use of medical-and mental-health care. While PTSD was directly linked to mental health care, it was indirectly associated with medical care through its relationship to physical symptoms and functional impairment: Veterans with a PSTD diagnosis were in poorer physical health than non-PTSD veterans. Those on higher incomes were more likely than other veterans to use outpatient services, and female veterans were more likely than male veterans to use medical- and mental-health care. Exposure to heavier levels of combat was indirectly associated with mental-health care through its association with PTSD. However, combat stress revealed a negative direct effect on medical outpatient care; that is, veterans with heavier combat stress were less frequent users of outpatient care than other veterans.

Summary of veterans' health and health-care. Two aspects of the veterans' research are included in this summary: first, findings relevant to Andersen's (1968) model are compared with those from the general-population-based research. Second, the health and health-care findings for veterans are cross-compared both within the cohort of Vietnam war veterans and also between Vietnam war veterans, and either same-era veterans or civilian peers.

Comparison of health-care findings for veterans and civilians. In its application of Andersen's (1968) model, veterans' research has paralleled the general-population findings. Across different veteran cohorts, studies have found that physical-need variables accounted for most of the explained variance in use of health-care (e.g., Romeis et al., 1991; Stern et

al., 1996; Wolinsky et al., 1985)[3]. Similarly, predisposing variables such as age and sex, and enabling variables such as having a regular GP, have formed a secondary level of predictive importance. Findings were consonant with the propositions of Andersen's model.

Comparisons between veterans and peer groups. Veterans' health research has consisted of within-cohort (e.g., PTSD- and non-PTSD-veterans) and peer group (e.g., veteran cohorts) comparisons. In a comparative analysis of health-care by war veterans and a general-population adult sample, Wolinsky et al. (1985) found no physical health differences, but differences were found in health-care contact and volume. For example, male veterans were more frequent than male non-veterans in their use of GP services; no significant differences were found in female veterans' and non-veterans' use of GP-care. Sex differences were also found: firstly, males, whether veterans or non-veterans, were significantly less likely than female veterans and female non-veterans to have had past-year GP- or hospital-contact; and secondly, males were also less frequent consumers of health-care than females. With the exception of the finding that male and female veterans spent two-thirds of a day more than non-veterans in hospital, no other health-care differences were shared by male and female veterans. Wolinsky et al. also reported that Vietnam war veterans were less frequent in their use of GPs than other veteran cohorts.

The key finding of the Centers for Disease Study (1988) was that almost twice the percentage of Vietnam veterans as same-era war veterans rated their health unfavourably. Kulka et al. (1990) found that Vietnam veterans' health differed systematically according to combat stress

[3] Although using Andersen's (1968) model in their selection of explanatory variables, Romeis et al. (1991) did not report the respective contributions of each of the three components to the explained variance in health care. In describing their results, however, they stated that "the statistically significant [health care] predictors parallel other studies of female health services' use" (p. 934). From this statement, it is assumed that their results were consistent with the general population utilization research in which need has been the most important explanatory component.

and PTSD diagnosis. Combat veterans had significantly poorer physical-health than other Vietnam veterans and same-era war veterans. No significant medical-care differences were found between high-combat veterans and other Vietnam war veterans and civilian peers. However, they found that PTSD-veterans were significantly more likely to have used medical outpatient services and mental health services than non-PTSD veterans. Romeis et al. (1991) found that female veterans and female non-veterans had similar health and health-care use. Wenzel et al. (1995) found that combat-stressed veterans were less likely to have used outpatient medical care. They also found evidence of co-existing need variables which moderated the effect of other need variables of health-care. Stern et al. (1996) found that female Vietnam veterans were more likely than male Vietnam veterans to have used medical- and mental-health care. They also found that combat-stressed veterans were less likely to have utilized outpatient services.

5.5 Combat stress, PTSD and physical-health

The third strand of veterans' research reviewed in this chapter reflects the recent shift in focus from analyzing combat stress and PTSD as predictors of specified health outcomes, to explicating the relationship between these predictors (Friedman & Schnurr, 1995). Research on Vietnam war veterans has repeatedly documented the importance of combat stress and PTSD. As detailed earlier in this chapter, prior research shows that higher PTSD levels and greater combat stress are both linked to poorer physical health. Prior research, however, has seldom taken into account the relationship of these two variables to each other when evaluating their joint impact on physical health. At least two studies on Vietnam war veterans have examined the relationship between these two predictors. In the first study, Eisen, Goldberg, True and Henderson (1991), examined the effects of combat stress on physical

health in a sample of 2,269 pairs of male Vietnam war veterans[4]. Data were responses to telephone or postal surveys which included questions about military experience, physical health and PTSD symptoms. To avoid the possibility that PTSD may have been confounded with reports of physical health, PTSD levels were held constant. Eisen et al. found that combat stress was a significant predictor of physical health status, with a positive association between increasing levels of combat and skin and hearing problems.

In the second study investigating relationships among trauma, PTSD and physical health, Wolfe, Schnurr, Brown and Furey (1994) conducted a series of analyses in which the unique impact of PTSD and traumatic exposure on physical health could be assessed. The sample comprised 109 community-dwelling female Vietnam war veterans who completed a postal questionnaire with items covering socio-economic background, combat stress, PTSD symptoms and physical health currently, before, during and after Vietnam. Separate analyses of the effect of each variable, without adjusting for the other, revealed that both were independently associated with poorer health outcomes, with a larger association found for PTSD than for combat exposure. In a re-examination in which each variable was respectively controlled for the other, there was a marked decrease in the effects of combat exposure on health, but no change in the strong predictive effects of PTSD on all measures of health-care.

Wolfe et al.'s (1994) findings suggest that the effect of combat-stress on physical health is mediated in part by the ***reaction*** (i.e., PTSD) to the stress. Their findings provided the basis for Friedman and Schnurr's (1995) proposition that the psychological reaction to a stressor rather than the stressor itself may be a more potent predictor of physical health. Friedman and

[4]Data were derived from the Vietnam Era (1965-1975) Twin Registry which was "composed of 7375 male-male veteran twin pairs" who both served in the military during the Vietnam war (Goldberg, True, Eisen & Henderson, 1990, p.1227).

Schnurr have proposed that, even when traumatic experiences have not involved physical injuries, physical health has often been compromised by the PTSD reaction[5].

5.6 Summary of research on Vietnam War veterans

The strands of research reviewed in the first section of this chapter comprised New Zealand and American health and health care studies, as well as research on the relationship of PTSD and traumatic events to physical-health. Both New Zealand and American studies report that PTSD-veterans differ from other veterans across a range of demographic, psycho-social, health and health-care variables. PTSD-veterans have poorer physical health and consume more health-care than veterans without PTSD (Kulka et al., 1990; Vincent et al., 1991). When compared with same-era veterans or civilian peers, veterans with high combat stress or who had PTSD were in poorer health. In health-care comparisons, however, few differences have been found between Vietnam veterans as a group and peer-groups (Kulka et al., 1990; Wolinsky et al., 1985).

Two trends are evident from the prior research on veterans' health and health-care: First, PTSD-veterans have utilized health-care more frequently than have non-PTSD veterans and second, veterans ***as a group*** and non-veterans have been highly comparable in both health status and, with few exceptions, patterns of health-care. Indeed, the veterans' research amplifies general-population findings of sex differences in health-care in which men have been less frequent consumers than women (Kandrack et al., 1991; Verbrugge, 1989; Wolinsky et al., 1985). Furthermore, when health-care differences have emerged between male veterans and male non-veterans they have been larger than those between female veterans and female

[5]Some people who develop PTSD have suffered physical injury which accounts for the decline in physical health; however, most cases of PTSD have not involved physical injury (Friedman & Schnurr, 1995).

non-veterans (Romeis et al., 1991; Wolinsky et al., 1985); that is, the health-care impact of combat appears to be greater for men than for women. Hospitalizations for male and female veterans have been longer than those for male and female non-veterans, but the differences, though significant, were small.

Two military variables have emerged across several studies as important predictors of physical health: combat-stress and PTSD. Findings suggest the relationship between combat-stress and physical-health is moderated by PTSD; that is, veterans exposed to high combat-stress levels who subsequently developed PTSD were more likely to have poorer physical-health than high-combat-stressed veterans who did not develop PTSD.

5.7 Research on wives of Vietnam War veterans

While numerous studies have surveyed veterans' perceptions about various aspects of their personal relationships, very few studies have surveyed the perceptions of family members. Similarly, the research investigating veterans' physical-health is abundant while there remains virtually no research on the physical-health of their wives. Moreover, there appears to be no published research on wives' use of health-care. Literature documenting the health of Vietnam war veterans' marital and personal relationships has been sourced almost entirely from the veterans. Research which has examined the psychological-health of wives of veterans is reviewed next.

5.7.1 Wives' psychological-health

Williams, 1980. Williams' psychological profile of wives of Vietnam veterans was one of the earliest published accounts describing the adverse impact of veterans' PTSD symptoms on their intimate relationships. Williams noted that wives of treatment-receiving veterans reported

feeling guilty about family problems, were frequently overwhelmed by their role as the primary caregiver and breadwinner, suffered from low self-esteem and were often physically abused by the veterans.

Coughlan & Parkin's (1987). The unspecified number of participants in Coughlan and Parkin's study were the wives of treatment-receiving veterans. The wives were in their late thirties, had been married to the veterans for ten to fifteen years, and had experienced considerable marital difficulties. Veterans Administration Centre staff assessed the wives individually using a nursing-based theoretical framework that incorporated "subjective" and "objective" components (p.26). Subjective assessment encompassed the wives' self-concepts, their level of social-support and problem-solving abilities. Objective assessment encompassed clinical judgements of the wives' personal care and grooming, self-reported stress symptoms and observations of their behaviour. Coughlan and Parkin reported that the wives' behaviour resembled in many respects their husbands' PTSD symptomatology. Observed behaviours included displays of hostility, withdrawing into tearfulness and lack of concentration, while stress symptoms included headaches, insomnia and racing heart. The wives also presented with health-risk behaviours which included heavy smoking and substance abuse. In addition, marital relationships were said to be characterized by physical abuse by one or both marital wives. Coughlan and Parkin concluded that "inadequate internal psychological resources and lack of external support systems contribute[d] to low self-esteem and a sense of hopelessness" among the wives (p. 26).

Maloney, 1988. Maloney's qualitative study involved in-depth interviews with a convenience sample of six female wives of Vietnam veterans. Data were obtained by means of guided interview; that is, "interviewees were free to depart from the interviewer's questions, and new

questions were provoked by prior narratives" (p. 131). The wives' husbands had been exposed to combat stress in Vietnam and had developed PTSD. Of the husbands, four were unemployed and two were in part-time employment. Five of the wives were in full-time employment and one wife worked from home. Maloney identified five major themes in the wives' transcripts. These centred around wives' feelings towards their own parents, children and husbands, and the prominent role of alcohol and physical abuse in the wives' lives. Wives saw their husbands as not having grown up (i.e., being immature). A secondary theme to emerge in the transcripts involved the wives recognizing in themselves PTSD symptoms.

Verbosky & Ryan, 1988. Verbosky and Ryan conducted a retrospective descriptive study of 23 female wives of treatment-receiving veterans. The aim was to investigate the impact of the veterans' PTSD symptoms on their wives. The women were participants in a therapy group specially organized for wives. Data collection utilized content and process notes taken during therapy sessions. Presenting problems comprised an inability to accept the veterans' increased dependence on alcohol and other substances, concerns about the physical abuse they suffered from the veterans, fears of PTSD symptoms displayed by their husbands (especially behaviour provoked by flashbacks) and the critical decision wives felt they had to make about whether to leave their husbands. Verbosky and Ryan concluded that the wives tended to overcompensate for the veterans' shortcomings, displayed similar patterns of behaviour to their husbands and that the veterans' PTSD symptoms had a profoundly adverse impact on the wives.

Kulka et al., 1990. The National Vietnam Veterans Readjustment Study included 376 wives of veterans (1990; NVVRS). Wives were randomly drawn from all cohabiting veterans with a diagnosis of PTSD and a representatively-weighted subset of veterans who did not have

PTSD. The socio-demographic composition of veterans who participated in the NVVRS was highly representative of the population of American Vietnam war veterans. Therefore, the sample of wives was probably a closer representation of the wider population of female wives of Vietnam veterans than treatment-seeking samples in the prior research.

Face-to-face interviews were conducted by means of a semi-structured interview schedule. The schedule included several measures eliciting information on wives' mental health. The first comprised two items about happiness and life satisfaction. The second measure was the 27-item Psychiatric Epidemiology Research Interview Marital Dissatisfaction Scale (Dohrenwend, 1982, cited in Kulka et al., 1990). Jordan et al., cited evidence for the scale's utility in screening psychological problems in community samples. The third measure was a four-item index of social support derived from prior research. The Brief Michigan Alcoholism Screening Test was used to assess alcohol problems. Evidence was cited for the test's sensitivity in discriminating problem-drinkers from others. For the fifth measure, wives indicated whether they had ever felt on the verge of a nervous breakdown. This item had been an important predictor of mental-health care in prior research cited by Kulka et al.

For data analytical purposes, wives' responses were assigned to one of two groups, and then cross-compared: Wives of PTSD-veterans were compared with wives of non-PTSD veterans. Three significant socio-demographic differences were found between the two groups: Compared with the wives of non-PTSD veterans, (1) A larger proportion of wives of PTSD veterans were in de facto relationships; (2) they had also cohabited with their husbands for a significantly shorter period of time and (3) had significantly lower levels of education. Aside from these differences, the demographic composition of the two groups of wives was similar. Significant differences were found between the two groups on three of the mental

health measures. Compared with wives of non-PTSD veterans, wives of PTSD-veterans were more than twice as likely to report low levels of happiness and satisfaction, and they were almost three times more likely to report high levels of demoralization. A significantly larger number of wives of PTSD-veterans than other wives also reported ever having been on the verge of a nervous breakdown (55% versus 30%). No differences were found between the two groups on levels of alcohol or drug usage or extent of social isolation. Jordan et al. (1992) acknowledged that, despite a majority of wives of PTSD-veterans reporting high levels of demoralization, a majority also reported being at least somewhat happy and satisfied with their lives. Kulka et al. (1990) concluded that the majority of wives were coping adequately with their situation most of the time.

Beckham, Lytle & Feldman, 1996. Using a prospective design involving 58 treatment-seeking Vietnam war veterans, Beckham et al. investigated the relationship between the severity of veterans' PTSD symptoms and their wives' level of caregiver stress. The researchers examined what happened to wives' psychological health as the veterans' PTSD levels became more severe. Several measures were used to assess the severity of veterans' PTSD symptoms. Wives completed a postal questionnaire which assessed their mental health and the extent they experienced emotional stress due to their role as their husbands' caregivers. Veterans and wives completed their respective measures on two different occasions at eight month intervals. Beckham et al. found that severity of veterans' PTSD symptoms was significantly related to wives' stress and that PTSD-severity also accounted for a significant proportion of variance in measures of mental-health. The prospective design enabled a longitudinal examination of changes in both wives' stress and mental health at two time intervals. In the longitudinal analyses, increased caregiver stress and increased severity of PTSD symptoms were significant predictors of increased psychological distress in wives.

5.8 Summary of research on wives' of Vietnam war veterans

A number of caveats are given before the prior literature on wives is summarized. First, almost all published studies were conducted when either the veteran was receiving some form of psychotherapy or the couple's relationship had reached crisis point or both. Second, data on wives was often gathered when they were also receiving some form of psychotherapy. The treatment-receiving context of the research inevitably raises concern over the extent to which findings generalize to the non-treatment-seeking community population of wives of Vietnam war veterans. Third, design strategies of the earlier research (pre-1990) often differed markedly from study to study. Fourth, some of the studies lack descriptions of key methodological issues, including data-analysis procedures. The foregoing caveats render impossible anything other than making general comparisons across most of the prior research on the wives of Vietnam war veterans.

Research findings on wives of veterans suggests that their own mental-health is most at risk when their husbands have developed PTSD symptoms. Studies which have assessed wives' psychological-health have reported that wives themselves exhibit a range of behaviours that appear to characterize PTSD (Coughlan & Parker, 1987; Maloney, 1988; Verbosky & Ryan, 1988), although to date there appear to be no published accounts of clinical assessments of PTSD symptomatology in wives. Recent research on treatment-seeking veterans suggests that PTSD-symptom ***severity*** (rather than a cutoff-score based PTSD-classification) is also a useful variable for understanding the impact on wives of their husband's PTSD; that is, the more severe veterans' PTSD symptoms have been, the higher wives' caregiving stress has been (Beckham et al., 1996). However, to the extent that the prior research has studied couples in crisis rather than non-treatment-seeking couples, findings have uncertain generalizability to community populations of wives. One published study of a community-dwelling sample of

wives found that those whose husbands had PTSD had significantly poorer mental-health than wives whose husbands did not have PTSD (Kulka et al., 1990).

5.9 Chapter summary

The two research literatures reviewed in this chapter concerned war veterans' health and their wives' health. Within the larger domain of veterans' research, three areas were reviewed: New Zealand Vietnam war veterans' health and health-care, American war veterans' health and health-care, and the impact of PTSD on the association between combat stress and physical-health. New Zealand veterans with PTSD, in common with their American counterparts suffer from several health disadvantages relative to non-PTSD veterans and civilian peers. The health and health-care of Vietnam war veterans as a group, however, is broadly similar to that of their civilian peers. Recent research has explored relationships among combat-stress, PTSD and physical-health. Findings point to PTSD being a more salient predictor of physical-health than combat stress. In the literature on wives, the main predictor of their psychological-health has been their husbands' PTSD status.

Chapters 3, 4 and 5 have canvassed a wide range of studies that bear upon the present study investigating health and health-care among veterans and their wives. Chapter 3 reviewed the civilian health-care utilization research which looked at the contribution of predisposition, enablement and physical-need to health-care. Chapter 4 extended the focus to include the contribution of psychological-need. Lastly, Chapter 5 linked together several research strands within the domain of war veterans' research, including research on their wives. The following chapter brings together selected themes that have emerged in this and previous chapters, and links them to the objectives of the present research.

CHAPTER SIX

Research Objectives

6.1 Chapter overview

The main study is introduced in this chapter. Earlier chapters presented the civilian and war-veteran health-care-use literature: Chapter 1 established the research rationale; Chapter 2 discussed the conceptual framework applied in the present thesis, Andersen's (1968) health-care model; and Chapters 3 through 5, presented the empirical research evidence. This chapter, which bridges several separate areas of research, provides the justification for the objectives and hypotheses of the present study.

The present study has a twofold aim: To test and develop the capacity of Andersen's (1968) model as an explanatory framework of health services used by a sample of New Zealand Vietnam war veterans[1] and their wives. Beyond this central aim, research objectives encompass three sequential analytical stages. The first will investigate the contribution of the 'basic' components (i.e., predisposition, enablement and physical-need) of Andersen's model to explaining veterans' and wives' use of health-care. This first stage represents a conventional replication and extension of the prior health-care-use research. The second stage will investigate the contribution of psychological-need to health-care. The focus in the second stage will be on the relationship of specific dimensions of psychological health to the health-care variables. The third stage will explore the relationship of 'multiple'-need variables to health-care. In this third stage, the impact of psychological-need on relationships between physical-need and use of health-care will be examined. Stages two and three represent extensions to the prior research.

[1]To streamline phrasing, the present sample of New Zealand Vietnam War veterans will henceforth also be referred to simply as "veterans", and phrases such as "veterans and their wives" will often be shortened to "veterans and wives".

6.2 Veterans' and wives' health and health-care use

While there are numerous in-print accounts of Vietnam veterans' health and mental health, little is available on their wives' health status. In addition, not much is known about the range and volume of health-care services utilized by either veterans or wives. Further, there is a veritable absence of any comparative accounts of veterans' and wives' health and use of health-care. Therefore, the first research objective is to provide a comparative descriptive account of veterans' and their wives' health and use of health-care.

6.3 Stage one: Applying the Andersen (1968) model to veterans' and wives' health-care

6.3.1 Elective versus non-elective health-care

A large body of literature provides evidence for two of the three core propositions of the Andersen model; namely, that physical-need is the most important explanatory health-care component, and that each component contributes independently to the explanation of health-care utilization (e.g., Nelson, 1993; Stoller, 1982; Wolinsky, 1978; Wolinsky et al., 1985)[2]. There is comparatively less research on the third proposition that the explanatory contribution of the components would vary as a function of 'type' of health service. This proposition locates different types of health-care along a patient 'versus' medical-professional continuum that represents at one pole, elective health services and at the other, non-elective types. For some services, the patient has substantial choice in deciding whether to utilize treatment, while for other services, the patient has relatively little choice beyond consent. For less elective types of health services such as inpatient and outpatient hospital care, medical professionals control the admission decision. According to Andersen's (1968; 1995) framework, the less elective a service is, the more it should be explained by physical (i.e.,

[2]Chapter 3 reviews the health-care utilization literature.

medical) need rather than by patient characteristics and resources[3]. In contrast, the explanatory configuration of the three components is expected to be different for GP-care and to differ still further for more elective health services such as dental care (Andersen, 1968). For non-hospital health services, the patient is expected to have greater control over the decision to use the service, and non-need characteristics therefore are expected to exert greater influence over decisions to obtain treatment. In deciding whether to have dental-care, the patient's predisposing and enabling characteristics are expected to increase in explanatory importance relative to physical-need characteristics whose importance is reduced.

6.3.2 Contribution of the three components to health-care

The findings of the studies which have investigated the third proposition of the Andersen (1968) model (i.e., that the explanatory configuration of the components would depend on whether the service was elective or non-elective) are now presented.

Self-care. In one study, physical-need dominated the explained variance in the volume of bedrest and cutback days (Wolinsky et al., 1983). However, in a later study with a similarly composed elderly adult sample, need and predisposition contributed equally to the explained variance in these informal sources of care (Wolinsky & Johnson, 1991).

Dental-care. In two studies, the non-need components, and in particular, enablement, were much more important than need in jointly explaining the uptake of dental care by older adults (Wolinsky, 1978; Wolinsky et al., 1983).

[3] Andersen argued that, in societies claiming equitable distribution of health services, non-physical-need characteristics - and particularly enabling characteristics - should confer no utilization advantage on the use of non-elective health-care (Andersen, 1968; Andersen & Newman, 1973; Andersen et al., 1975). In other words, medical professionals' decision to hospitalize patients should be based primarily, if not entirely, on physical-need and not whether the patient has the means to pay for non-elective services.

GP- and hospital-care. Most inprint research on GP- and hospital-care has confirmed the proposition that physical-need has a relatively greater explanatory role for non-elective health-care. Relative to GP-care, physical-need has been more important than the non-need components in explaining hospital care in several studies (e.g., Strain, 1991; Wolinsky, 1978; Wolinsky & Coe, 1984; Wolinsky et al., 1983). Mixed results on the explanatory configuration for GP- and hospital-care have been reported in at least two studies. In Wolinsky et al. (1989), physical-need accounted for most of the explained variance in GP-care; however, there was a trend towards ***non***-need components accounting for as much of the explained variance in hospital-care as physical-need. Wolinsky and Johnson (1991) found that physical-need ***and*** predisposition contributed equally to GP-visits and that predisposition contributed slightly ***more*** than physical-need to hospital contact and volume.

Although few in number, and not fully consistent with Andersen's (1968) framework, previous studies provide some support for the proposition that the contribution of the three components varies according to the level of discretion patients have in using a health service.

6.3.3 Contribution of physical-need to GP-care

The use-of-health-care literature has long argued that the ***initial*** GP-contact in a sickness episode is more likely to be influenced by both need ***and*** non-need variables. Follow-up visits, however, are more likely to be influenced by the GP's assessment of and recommendations regarding physical-need. According to this argument, physical-need should play a greater role in GP-visit frequency than in GP-contact. In four studies which compared the contribution of physical-need to contact and frequency of contact with GPs, physical-need accounted for substantially more of the explained variance in frequency (Stoller, 1982; Wolinsky et al., 1983; Wolinsky et al., 1989; Wolinsky & Johnson, 1991).

6.3.4 Contribution of demographic variables to health-care[4]

Chapter 3 details the research evidence for the contribution of demographic variables to health-care. While findings across the abundant health-care literature are neither clearcut nor consistent, the main evidence is summarized below.

Sex. Studies have repeatedly shown that women are more likely than men to have contact with health services and are also more frequent consumers of those services (e.g., Bernard et al., 1993; Hershey et al., 1975; Kandrack et al., 1993; Kohn & White, 1976; Verbrugge, 1989).

Age. While the literature has consistently found age-effects in health-care, there are mixed indications regarding both the direction of the effects and the conditions under which specified effects will be found. Nevertheless, the broad trend is toward increasing age being associated with increasing use of medical services. The relationship, however, appears to be non-linear because health-care utilization is not necessarily highest in the oldest age groups (e.g., Wolinsky et al., 1989; Wolinsky & Johnson, 1992).

Education. Numerous studies have found a positive correlation between level of education and use of primary health services such as GP-care and dental services (e.g., Hershey et al., 1975; Kohn & White, 1976; Stoller, 1982; Wolinsky et al., 1985).

Ethnicity. Ethnicity has emerged as a significant health-care predictor in the research. However, findings are mixed on the direction of effects. In some studies, use of health-care

[4]In the Andersen (1968) framework, most of the demographic predictors identified in the research correspond with predisposing characteristics.

by White Americans has depended less on physical-need than it has for other ethnic groups (e.g., Wolinsky et al., 1989). In other studies, Black Americans were more frequent consumers of GP services (e.g., Nelson, 1993). Some research has found that ethnicity has an indirect impact on health-care through socioeconomic variables such as education and income (e.g., Mutchler & Burr, 1991); that is, after controlling for health status, the effect of socioeconomic status on health-care use was the same for Black and White adults.

6.3.5 'Formal' versus 'informal' health-care[5]

Wolinsky and Johnson (1991) have advanced two reasons for applying the Andersen (1968) model to 'informal' types of care (i.e., self-treatment). The first reason builds upon Mechanic's (1979) work which suggested that informal care represents the earliest stage in the use of health-care. The second reason is that informal care may not so much precede as serve as a substitute for 'formal' health-care; that is, seeking treatment from medical professionals (Wolinsky & Johnson, 1991). According to Wolinsky and Johnson, the formal-informal distinction provides salient information on the extent to which one type of health-care substitutes for another in specific population groups.

Notwithstanding both the theoretical and practical utility of the formal-informal distinction, the initial Andersen (1968) model and its later revisions (e.g., Andersen & Newman, 1973; Andersen et al., 1975) have had their main application on formal health services. Propositions derived from the model have therefore not stated what the expected contribution of each component would be in explaining different types of self-treatment such as 'bedrest'. A reasonable expectation is that people would have more discretion in treating themselves by

[5] 'Elective-non-elective' categories and 'formal-informal' categories are not synonymous terms, although, as explained in Chapter 2, Section 2.5.3.4.2, there is some overlap between them.

taking bedrest than by seeking medical services. As a result, non-need characteristics (e.g., health beliefs, social support, satisfaction with standard of living, etc.) would be of greater importance than they would be for formal health-care.

In the inprint literature, at least two studies have compared the contribution of the components across formal and informal health-care, both of which comprised representative samples of older Americans. In the first (Wolinsky et al., 1983), need accounted for most of the explained variance in bedrest, with negligible contribution from non-need components. In the second study (Wolinsky & Johnson, 1991), need accounted for over half, and predisposition for almost half of the explained variance in bedrest. Therefore, results are mixed regarding the explanatory configuration for informal care. These two studies also found that Andersen's (1968) model explained more of the total variance in informal than formal health-care.

In the present examination of formal and informal types of health-care, the explanatory capacity of non-need components ***between*** formal and informal types of health services will be compared in the first instance, and ***within*** those types in the second. The rationale for comparisons both between- and within-types of health-care is the view of the present thesis that elective versus non-elective care is better depicted as a continuum than a dichotomy, and that within the respective formal and informal subclusters of health-care, some services are more elective than others. For example, it seems highly likely that formal health-care is less elective than informal care. In turn, within the formal category, in-patient care may be less elective than outpatient-care, and these two hospital services, less elective than GP-care.

There are two research objectives in the first stage of inquiry. The first is to investigate the relationship of the predisposing, enabling and physical-need components to health-care used

by veterans and wives. The second objective is to compare the explanatory capacity of the three components of the Andersen (1968) model across formal and informal health-service variables. Research demonstrates that health and use of health-care differ according to several demographic variables; that is, the impact of physical-need on health-care depends on these non-need variables. Therefore, in the present multivariate analyses, predisposing and enabling variables will be viewed as having a relationship with phyiscal-need as well as health-care. Accordingly, non-need variables will be entered into the statistical equations before the physical-need variables[6].

Hypotheses in the first stage of inquiry are:

1. Each component of the Andersen model will contribute independently to the explanation of differences in veterans' and wives' use of health-care.
2. Each component of the Andersen model will vary in its explanatory capacity across different health services, with physical-need being the most important overall component of health-care.
3. The less elective that a health service is, the less non-need, and the more physical-need will explain its use.
4. The more elective a health service is, the more non-need and the less physical-need will explain its use.
5. Physical-need will be more important in explaining GP-visit frequency than in explaining GP-contact.

[6]This order of entry into multivariate analyses has been followed by most health-care utilization studies (e.g., Bazargan et al., 1998; Nelson, 1993; Wenzel et al., 1995; Wolinsky & Johnson, 1991).

6.4 Stage two: Contribution of psychological-need to health-care

In the present study, Andersen's (1968) model will be modified to include an additional component comprising psychological-need variables. Two lines of reasoning underlie this modification. The first concerns the 'silence' of the Andersen model on the contribution of psychological-need to health-care: Neither the original model nor its revisions has explicitly accomodated psychological functioning into the explanation of health-care. The non-accomodation of psychological-need possibly reflects the development of the model for research on ***medical*** care utilization in general population samples[7]. With the exception of a handful of studies on war veterans' health-care, there appear to be no published studies applying Andersen's (1968) model to populations such as crime victims and disaster evacuees - populations whose use of health-care could be prompted by psychological - as well as physical-need. Indeed, as outlined in Chapter 4, there exists a separate but large and growing body of research on the adverse physical-health impact and increased medical care associated with a range of traumatic stressors. This literature has also reported that, even in general populations, people may cope with their socio-emotional problems by increased use of ***medical*** services (Cheng, 1992; Van Hemert et al., 1993; Vàzquez-Barquero et al., 1992).

The empirical basis for adding psychological-need variables to analyses of the present sample is provided by the war-veterans' literature[8]. Tis literature documents the debilitating psychological health effects of war trauma and reports also that these effects extend to the veterans' marital and family relationships (Carroll et al., 1985; Jordan et al., 1992; Roberts et al., 1982). Specifically, veterans with PTSD have reported more problems than non-PTSD-veterans with self-disclosure, expressiveness to their wives, physical aggression and marital

[7]The focus on medical care may also explain Andersen-based researchers' reliance upon physical health-need variables to represent the need component.

[8]The literature on Vietnam war veterans is reviewed in Chapter 5.

adjustment (Carroll et al., 1985), more family violence (Jordan et al., 1992) and more difficulties with marital intimacy and sociability towards people in general (Roberts et al., 1982). Research on their wives confirms a positive correlation between the veterans' and their own health status (e.g., Kulka et al., 1990; Maloney, 1988; Verbosky & Ryan, 1988)[9]. In addition to poorer psychological health, the literature reports that PTSD-veterans have also been more likely than non-PTSD-veterans to have used medical services and to have been more frequent in their use of those services (Kulka et al., 1990; Vincent et al., 1991).

The second line of reasoning for modifying the Andersen (1968) model to include psychological-need variables stems from recent research which has included more comprehensive measures of the predisposing, enabling and ***physical***-need components. Despite the use of more comprehensive measures (which, as mentioned above have seldom included measures of psychological-need), there has been very little increase in the total amount of explained variance in health-care both in the overseas research (Nelson, 1993; Wolinsky & Johnson, 1991; Wolinsky & Johnson, 1992) and the local New Zealand research (Madison-Smith, 1998; Millar, 1996). Thus, in terms of improving the model's overall explanatory capacity, it remains an empirical question about whether and how much psychological-need will increase the explained variance in use of health-care by the present sample of war veterans and their wives.

There are two research objectives in the second stage. The first is to ascertain whether the inclusion of the psychological-need component will enhance the amount of explained variance in veterans' and wives' health-care use. The second objective is to investigate the relationship

[9]Chapter 5, Section 5.7.1, reviews the literature on wives.

of psychological-need to health-care use, and, in particular, whether psychological-need is associated with an increased likelihood and frequency of utilization.

The hypothesis in the second stage of inquiry is:

1. Psychological-need will contribute independently to the explanation of health-care use, and be positively associated with it.

6.5 Stage three: Contribution of multiple-need to health-care

The third stage of inquiry is an extension of the second stage, and includes both the physical-need and psychological-need components, which jointly serve as a 'multiple-need' component as explained below.

In recent years, ***relationships among predictors*** of health-care have received increasing attention in multivariate analyses. The predominant focus has been on determining whether the relationship of a specified predisposing variable to health-care has been influenced by other predisposing variables (e.g., Cafferata, 1987; Kandrack et al., 1991; Nelson, 1993; Wolinsky et al., 1989). In contrast to analyses identifying relationships among the predisposing variables, research has seldom examined the influence on health-care of ***multiple co-existing need*** involving physical- and psychological-need. The question of confounding need variables assumes considerable relevance in populations such as Vietnam War veterans whose health-care appears to be precipitated by multiple health-need (e.g., both physical- and psychological-need). Wenzel et al. (1995) suggested that "when [health] service use is the outcome of interest, multiple-need factors may be confounded" (p.1133); that is, the association between need variables and health-care may depend on other need variables. In

their study on homeless war veterans, Wenzel et al.[10] found evidence for the confounding effects of multiple-need. The association between veterans' chronic health problems and health-care, for example, was influenced by substance abuse: Veterans with no history of substance-abuse who had chronic illnesses were more likely to use outpatient medical care than veterans with a substance-abuse history who had chronic illnesses.

Based on the prior research, it is likely that multiple-health need not only exists among the present sample, but that relationships among need variables produce different effects on veterans' and their wives' health-care use. In other words, the relationship between physical-need and use of health-care may be different among veterans and wives who have greater psychological-need relative to other respondents. Once the direct effects of physical-need and psychological-need have been taken into account, interactions between the two components may further enhance the explanation of health-care use. In this regard, the literature suggests that the association between specified physical-need variables and health-care will vary with psychological-need variables. Following the strategy by Wenzel et al. (1995), multiple-need variables were created by forming interaction terms (i.e., cross products) between psychological-need and physical-need[11].

There are two research objectives in the third stage: The first objective is to ascertain whether multiple-need enhances the explained variance in veterans' and wives' use of health-care. The second objective is to ascertain whether psychological-need variables moderate the relationship between physical-need and veterans' and wives' health-care use.

[10]See Chapter 5, Section 5.4 for an overview of Wenzel et al.'s (1995) study.

[11]Details of these interaction terms are provided in Chapter 10, Section 10.4.

The hypothesis in the third stage is:

1. The multiple-need component will contribute independently to the explanation of health-care use, and psychological-need will strengthen the association between physical-need and health-care.

6.6 Summary of research objectives and hypotheses

Table 1 provides a summary of the objectives of the present study and, where applicable, their corresponding hypotheses.

6.7 Chapter summary

The present thesis, whose twofold aim is to test and develop the Andersen (1968) model, draws upon several research areas. These include the general (i.e., civilian) research on health-care utilization, life stressors, psychological distress, and the war veterans research, including that on wives of war veterans. The thesis examines the influence of predisposition, enablement and physical-need on the use of formal and informal health-care. It examines as well the influence on health-care of psychological-need, further examining whether and how health-care predictors vary between veterans and wives.

The present research extends previous research in several important ways. First, it provides a comparative descriptive account of veterans' and wives' health status and use of health-care. Second, earlier findings are replicated with a different sample (i.e., war veterans and their wives). Third, the role of psychological-need in health-care use is examined. Finally, the role of psychological-need in moderating the relationship between physical-need and health-care is examined. In the chapter that follows, the research design, respondents, measures and analytical procedures employed in the present investigation are described.

Table 1: Summary of research objectives and hypotheses in the present study of New Zealand Vietnam War veterans and their wives.

Objectives	Hypotheses
Preliminary	
1. To provide a comparative descriptive account of veterans' and their wives' health and health-care use.	
Stage One: Replication	
2. To investigate the relationship of the the three components (i.e., predisposition, enablement and physical-need) of the Andersen (1968) model to health-care.	1. Each component will contribute independently to the explanation of differences in veterans' and wives' health-care use. 2. Each component will vary in its explanatory capacity across different health services, with physical-need being the most important overall component of health care. 3. The less elective that a health service is, the less non-need, and the more physical-need will explain its use. 4. The more elective a health service is, the more non-need and the less physical-need will explain its use. 5. Physical-need will be more important in explaining GP-visit frequency than in explaining GP-contact.
3. To compare the explanatory capacity of the three components across formal and informal health-service variables.	
Stage Two: Extension	
4. To ascertain whether the psychological-need component will enhance the explained variance in health-care use. 5. To investigate the direction of the relationship of psychological-need to health-care use.	6. Psychological-need will contribute independently to the explanation of health-care use, and be positively associated with it.
Stage Three: Extension	
6. To ascertain whether multiple-need enhances the explained variance in health-care use. 7. To ascertain whether psychological-need variables moderate the relationship between physical-need and health-care use.	7. The multiple-need component will contribute independently to the explanation of health-care use, and psychological-need will strengthen the association between physical-need and health-care.

CHAPTER SEVEN

Method

7.1 Chapter overview

This chapter details the present sample selection procedure, research design, questionnaire development, statistical techniques and stages of analysis. The present data was collected by a cross-sectional survey which investigated the health and health-care utilization of Vietnam War veterans and their wives. The survey incorporated a single, self-report questionnaire mailed to a sample of New Zealand Vietnam War veterans.

7.2 Sample and procedure

The present veterans' sample was drawn from an already-existing list of New Zealand Vietnam War veterans.

Background of the veterans' address list. No national register exists of New Zealand military personnel who served in the Vietnam war. Neither is the number of New Zealanders who served in the war known, with published figures ranging from 2,500 to 3,500 (Long et al., 1992; Vincent et al., 1994). In 1991, the New Zealand Defence Department supplied researchers at Massey University with an address list of 2046 names of New Zealanders known to have served in Vietnam (Vincent et al., 1991). In that year, a systematic sampling method was used (i.e., every second name was selected) to select half the veterans for participation in a postal survey. Three years later, the remaining 1,000 names, and earlier respondents, were selected for a second survey (Vincent et al., 1994). Over the years, names have been deleted from the list for two main reasons:[1] Non-response to mailouts and current addresses not being known[2]. At the time of the present survey, the list comprised 728 names.

[1] See Vincent et al., (1991) and Vincent et al., (1994) for details of response rates and a breakdown of categories for non-participation.

[2] Through deletion of names from the address list, the possibility exists that the composition of the present sample of veterans differs from that of earlier samples'. A detailed series of comparisons of the three samples of veterans involving demographic and military variables are provided in Chapter 8.

The present study. Data collection occurred over a three-month period. The initial mailout comprised a cover letter, an information sheet, and two questionnaires which were identical in every respect except one was titled 'Veteran's Questionnaire' and the other 'Partner's Questionnaire'[3]. Two postage-paid envelopes were also included in the mailout. The cover letter invited veterans to participate in the research. As the current marital status of the veterans was unknown, each partner (that is, the spouse or woman with whom the veteran cohabited) was first contacted through the veterans. Veterans who were married or in de facto relationships were asked to share the cover letter and information sheet with their partners, and if their partners agreed to participate, to hand them the Partner's Questionnaire. Non-responding veterans were sent reminder letters six weeks after the mailout[4]. The survey conformed with the New Zealand Psychological Society's ethical guidelines.

For the present study, the 728 veterans who remained on the revised address list were sent the initial mailout. In total, 53 (7%) questionnaires were returned because the current addresses were unknown, 7 were returned because the veterans were deceased and 3 returned questionnaires were invalid. Of the remaining 665 questionnaires, 5 veterans declined to participate and 479 (72%) returned valid questionnaires. Three female veterans were excluded from the study because there were too few to provide reliable estimates. The response rate was noticeably higher than that reported for the two earlier surveys involving New Zealand Vietnam veterans (Vincent et al., 1991: 62%; Vincent et al, 1994: 55.4%). A higher response rate had been expected because the veterans had already shown a willingness to participate in at least one prior study, and 213 (44%) of them had also taken part in a second study. A

[3]The questionnaire was titled 'Partner's Questionnaire' because the marital status of the veterans was not known, and the aim was to invite all female partners tp participate in the research, married and de facto.

[4]Cover letter, information sheet and reminder letters are given in Appendix 1, and measures used in the questionnaire are described in Section 7.3.

total of 287 wives[5] returned valid questionnaires and 6 of these were from wives whose husbands (i.e., veterans) did not return questionnaires.

The present study reports data only for Vietnam veterans (N=281) ***and*** their wives (N= 281) who both returned valid questionnaires. Thus, total sample size was 562. No demographic and military-background differences were found between the 281 veterans whose wives returned questionnaires and the 195 veterans for whom no 'Partner's Questionnaires' were returned. A description of the present sample of veterans and wives is provided in Chapter 8.

7.3 Questionnaire

The questionnaire comprised measures of the predisposing, enabling and physical-need components of Andersen's (1968) model, as well as measures of psychological-need. Measures were sourced from several different research areas, including those pertaining to Vietnam War veterans, health-care utilization, and psychological distress and trauma.

7.3.1 Predisposing measures

There were ten measures of predisposing characteristics. Six tapped the predisposing **demographic** dimension. These sought standard 'personal' information about respondents, and included one item apiece on sex (male or female), age (years), education (highest educational qualifications) employment status and ethnicity. The employment-status variable was trichotomous, ascertaining whether the respondent was in full- or part-time employment or unemployed. For the multivariate analyses, this variable was made into two dummy variables. The first contrasted being unemployed with part- and full-time employment. This variable was

[5]As stated in Chapter 1, the label 'wives' encompasses both married and de facto partners.

labelled 'Unemployed'. The second contrasted full- with part-time employment and being unemployed, and was labelled 'Fulltime Work'. Responses to the ethnicity item were dichotomised into Maori (1) and Other (0). The latter category primarily comprised those who reported Pakeha or European ethnicity (97%).

The predisposing **social-structural** dimension was measured by Cohen and Syme's (1985) seven-item scale that tapped 'network' aspects of social contacts. This scale enumerated the range of respondents' actual and potential social contacts. Research has shown that the range of contacts available to people over any given time has an impact on the frequency of medical care visits (Nelson, 1993; Wolinsky & Johnson, 1991). Items tapping actual contacts concerned whether respondents had: talked on the phone to relatives or friends, got together with relatives or friends, attended a church service and attended a social event in the last two weeks. Items tapping potential contacts concerned whether respondents had living children and siblings. The seventh item asked whether respondents had volunteered for community work in the past year; however it was deleted from analyses because of the relatively high percentage of missing data (34%). Consequently, in all analyses the social contacts measure comprised six items and the computed score was the total number of these items endorsed by respondents. Analyses focussed on summed scores rather than responses to specific items. No Cronbach's alpha was provided for the social-contacts measure since the summed score can be legitimately derived from independent subsets of items (i.e., answering yes or no to any item does not constrain answers to the other contact items).

Predisposing **health beliefs** and attitudes were assessed by three measures. The first measure comprised two subscales from the Visit-Specific Satisfaction Questionnaire (VSQ; Ware & Snyder, 1975). The VSQ was initially developed to tap patients' current satisfaction with

specified dimensions of their GP's care. Respondents indicated their level of satisfaction on a five-point scale that ranged from 'Strongly Agree' to 'Strongly Disagree' and that also included reverse-scored items. A higher score on this measure reflects greater satisfaction with a GP's services. The VSQ subscales used in the present study were the four-item general satisfaction (with GP) subscale and the four-item GP-competence subscale. In prior research, these two subscales were the strongest predictors of utilization of general medical services, dental visits and annual medical checkups[6] (Ware & Snyder, 1975). In addition, Ware, Davies-Avery and Stewart (1978) cite several studies which have demonstrated acceptable levels of internal consistency and test-retest reliability of the VSQ subscales. In the present study, the standardised alphas were .94 for the general satisfaction subscale, .89 for the competence subscale and .93 for the combined subscales (N=562).

The second predisposing health-beliefs measure was an item on health worry. On a numerically-anchored Likert scale ranging from 'no worry at all' (1) to 'a great deal' (4), respondents indicated how much health worry they had experienced. The third measure, an item with a similar scale to the previous measure, assessed perceived health control. On a scale ranging from 'no control at all' (1) to 'a great deal' (4), respondents indicated how much control they had over their future health. In prior research, health worry and health control have been strong predictors of adults' health-care use (Newman, 1975; Rodkin, 1986).

7.3.2 Enabling measures

There were six measures of enabling resources. Enabling measures sought information on either household or medical resources. Two of the measures tapped into respondents'

[6] In addition to the two subscales employed in the present study, the VSQ comprises two further subscales; namely, access to care and GP humaneness.

perceptions of household financial resources. The first of these was an item on satisfaction with the standard of living and the second was an item on perceived adequacy of household income. Respondents indicated the level of satisfaction with their living standard on a scale that ranged from (1) 'Very dissatisfied' to 'Very satisfied' (4) and indicated the extent they were able to get by on their income on a scale that ranged from 'Can't make ends meet' (1) to 'Always have money left over' (4). These measures have been associated with health-care in the prior research (Eve, 1988; Stoller, 1982; Strain, 1991), and also served as proxies for household income which was deleted from multivariate analyses[7].

The other four enabling measures assessed respondents' medical resources. The first two of these were single items asking whether respondents had a 'Community Services Card' (CS Card) and a health insurance policy that refunds some or all of the money paid for health-care. The CS Card is issued to New Zealanders on low incomes[8] or who are receiving income support such as the Veteran's Pension or the Domestic Purposes Benefit. The card entitles the care-seeker to a subsidy for each GP visit. The third measure of medical resources was an item asking respondents whether the GP's fee had ever prevented them seeking GP-care when they needed it. The CS Card, health insurance and GP-fee measures are standard items used in the prior health-care research and which have been associated with the likelihood and frequency of health-care use (e.g., Bazargan et al., 1998; Gribben, 1992; Nelson, 1993; Wolinsky & Johnson, 1991).

The fourth measure of medical resources comprised a three-item scale ascertaining how many GP "accessibility" resources respondents possessed (i.e., resources conducive to GP visits).

[7]See Chapter 8, Section 8.2.2.

[8]Entitlement to the CS Card differs according to household composition and marital status. For example, a couple with no children whose before-tax income is at least $NZ27,000 are entitled to the card.

These items asked about: whether respondents had a "regular" GP (i.e., one they referred to as "their" doctor), the number of years they had visited the GP from whom they currently seek care, and the number of minutes they usually spent in the waiting room before seeing the doctor. The latter two items yielded continuous data that were subsequently dichotomized around the median value for the multivariate analyses (five or more years with the same GP=1; fifteen or fewer minutes waiting to see the GP=1)[9]. This enabled the scale to provide a summed 'GP-Resource' score, with a higher score indicating more resources conducive to GP-visits. The three items which comprise the present scale have been positively correlated with frequency of GP-contact in previous studies (Andersen & Newman, 1973; Andersen et al., 1975; Gribben, 1992; Penchansky & Thomas, 1981).

7.3.3 Physical-need measures

There were three measures of physical-need. The first was a 17-item checklist of common chronic health problems (i.e., physical illnesses that had persisted for at least three months). The measure was developed by amending an existing checklist of serious medical problems (Belloc, Breslow & Hochstim, 1971) to reflect problems which have frequently been reported by Vietnam war veterans (Centers for Disease Control, 1988; Eisen et al., 1991; Vincent et al., 1994). Respondents endorsed each of the health problems that they were currently experiencing and that had lasted three or more months. The endorsed items were summed to provide an index of the total number of different chronic illnesses.

The second measure was Wolinsky and Johnson's (1991) 21-item Activities of Daily Living scale (ADL). Wolinsky and Johnson (1991) sourced their items from two existing scales: Katz

[9]Assigning of algorithms for these two items was guided by prior research which has found positive correlations between number of years with the same GP and GP-visit frequency and negative correlations between waiting-room time and GP-visit frequency (i.e., longer waits, fewer visits. See Chapter 3, Section 3.4.2.1).

et al.'s (1963) scale and Nagi's (1976) disability scale. Katz et al.'s scale assesses the extent to which difficulty is experienced carrying out three different types of activities; namely, personal, household and advanced instrumental activities. Four items tap personal activities (e.g., getting out of bed), four tap household activities (e.g., meal preparation) and three tap advanced instrumental activities (e.g., managing money). The nine items from Nagi's (1976) disability scale comprise four items which tap lower body limitations (e.g., difficulty crouching or kneeling) and five which tap upper body limitations (e.g., reaching arm out as if to shake hands). These two scales comprised a numerically-anchored Likert scale which required respondents to indicate the extent to which they experienced each of the activity limitations. Findings suggest the Katz et al. (1963) scale and the Nagi (1976) scale enhance prediction of health-care seeking and health-related costs (Strain, 1991; Thomas & Lichtenstein, 1986; Wolinsky et al., 1989; Wolinsky & Johnson, 1991). For the present study, the Katz et al. and Nagi scales were combined and modified so that respondents simply indicated the absence or presence of any functional disabilities. The score computed was the total number of ADLs reported. In the present study, the Kuder Richardson reliability CKR-20 for the ADL was .84.

The third measure of physical-need was a single item indicator of overall health. Respondents graded their health on a four-point scale, which ranged from 'excellent' to 'poor'. Single item measures of perceived health have been used extensively in prior research, including prior surveys of New Zealand Vietnam veterans (Vincent et al., 1991; Vincent et al., 1994; Wolinsky & Johnson, 1991). Idler and Kasl (1991) cite five epidemiological studies that found self-reports of health to be predictive of health-care and mortality.

7.3.4 Psychological-need measures

There were five measures of psychological-need. The first two were the major subscales of the 38-item Mental Health Inventory (MHI; Veit & Ware, 1983). The MHI can be scored to provide five specific scores, scores on two subscales referred to as psychological wellbeing and psychological distress[10], or an overall mental-health score. Scores for wellbeing and distress were calculated for the present study. The wellbeing scale is keyed to positive affective states (i.e., feeling content, satisfied and happy), while the distress scale is keyed to negative affective states (i.e., feeling downhearted and tearful). Respondents indicated how frequently in the past month they had experienced specific emotional states and interpersonal events tapping either one or the other of the subscales. The MHI was developed for use with non-psychiatric populations, has been found to be a sensitive measure of the impact of stressful events and social support (Mannings & Wells, 1992) and has been used in previous New Zealand research on Vietnam War veterans (Long et al., 1992; Vincent et al., 1994). Veit and Ware (1983) report internal consistency measures of .92 for wellbeing and .94 for distress, with a one-year stability coefficient of .63 and .64, respectively for the two scales. In the present study, the standardised alphas were .93 for the wellbeing subscale, .95 for the distress subscale and .97 for the full scale (N=562).

The third measure of psychological need was the Wolfe et al. (1993) short-form of the 35-item Mississippi Scale. The Mississippi Scale is a measure of post-traumatic stress disorder initially developed for use with military and ex-military personnel exposed to war-zone stress (Keane et al., 1986). Evidence indicates that the Mississippi Scale is a reliable and valid instrument for the identification of PTSD symptoms in Vietnam combat veterans (Watson et

[10] In the chapters that follow, these subscales and the dimensions of psychological health they represent are often referred to simply as 'wellbeing' and 'distress'.

al., 1994). Internal consistency measures of .94 (Keane, Caddell & Taylor, 1988) and .96 (McFall, Smith, MacKay & Taylor, 1990) have been reported. Keane et al. (1988) also report a test-retest reliability of .97. Wolfe et al.'s (1993) short-form of the Mississippi Scale comprises eleven items selected through factor analytic procedures in which items with the highest factor loadings were retained. The wording in six of the eleven items referred specifically to being "in the military". The words "in the military" were replaced with the phrase "in my past" which rendered the items also applicable to wives. Respondents indicated the extent to which they had experienced specific thoughts, feelings and reactions that characterize PTSD (e.g., emotional numbness, and being easily startled). While the full 35-item scale provides both a continuous measure of PTSD symptomatology and a cut-off score to define PTSD as absent or present (Keane et al., 1986), the short-form provides only a continuous measure of PTSD symptomatology. In the present study, the standardised alpha for the short-form PTSD scale was .83.

The fourth measure of psychological-need was a 19-item[11] checklist of past-year 'life changes' adapted from existing measures (Rubio & Lubin, 1986; Williams, Ware & Donald, 1981). 'Life changes' are relatively common events that require some adjustment and, thus are likely to be stressful to the individual. Research suggests that an excess of changes within a given time period (e.g., one year) can increase susceptibility to stress-related illnesses and the need for health-care (Koss et al., 1990; Rubio & Lubin, 1986; Williams et al., 1981; Kimmerling & Calhoun, 1994). Items in the present checklist represented relatively common events that have the potential to increase susceptibility to daily stress. They included changes in personal relationships, employment, family composition, finances and family health

[11]For present multivariate analyses, the personal injury/illness item was excluded from the summed stress score because it would be directly linked to medical use and could also be confounded with measures of physical need.

problems. Respondents were asked whether they had experienced any of the life changes in the past year. The score was the number of changes.

The fifth measure of psychological-need was a thirteen-item checklist of event-defined traumatic experiences. Items represented extreme (i.e., violent and/or life-threatening) events and were adapted from the Traumatic Stress Schedule, a screening instrument for assessing traumatic stress in the general population (TSS; Norris, 1990). The TSS was specifically developed to ascertain the frequency, recency and intensity of traumatic experiences and contains thirteen items which meet DSM-III-R criteria for traumatic events (Norris, 1992; APA, 1987). Research suggests that the types of events in the TSS place victims at greater risk of developing PTSD symptoms and also of increasing their use of health-care (Kimmerling & Calhoun, 1994; Koss et al., 1990; Norris, 1992; Ullman & Siegel, 1996). Events involved firsthand experiences (e.g., physical assault, sexual abuse), and loved ones' experiences (e.g., sudden, violent death). For present analyses, the TSS checklist was included simply to ascertain the number of specific types of trauma respondents had experienced across the lifespan. Respondents indicated whether they had ever experienced any of the events, and the 'traumatic stress' score was the total number of different types of traumatic events ever experienced.

7.3.5 Health-care measures

Health-care use was measured by thirteen health-care variables. With two exceptions, the recall period for use of these services was one year, the standard time-frame in the utilization research (Wolinsky, 1990). The two time-frame exceptions involved contact with and frequency of 'cutback days'[12] whose recall period was ***three*** months. Service variables

[12]This measure had also been used in the two previous New Zealand surveys on Vietnam war veterans.

measured either contact or volume aspects of health-care. Contact measures were applied to the entire sample of veterans and wives, regardless of whether they utilized specified health-care, whereas volume measures, with one exception[13], were confined to veterans and wives who actually utilized specified services.

Contact measures. These comprised seven dichotomous measures ascertaining whether or not respondents had had contact with specified health services, and these were subdivided further into 'formal' and 'informal' care. Formal refers to professional health-care and especially to medical-based care, informal refers to self-treatment. There were four variables measuring formal health-care contacts; these were whether respondents had contact with: inpatient hospital services, outpatient hospital services, GP services and secondary services. Whereas the first three of these represent traditional measures of health-care, secondary services comprised a diverse range of specialized health services which included medical specialists, physiotherapists, consellors and naturopaths, among others[14]. There were three measures of informal health-care contact; these ascertained whether respondents had taken home-based bedrest due to poor health (Bedrest Contact), reduced their normal daily activites due to ill-health (Cutback Contact) or had obtained pharmaceutical prescription items. Whereas the first two measures of informal contact have often been investigated, prescription-use has been infrequently investigated in prior research (Wolinsky & Johnson, 1991).

Volume measures. These comprised six variables assessing the volume (i.e., amount) of health-care utilized by respondents. There were three measures of formal and three of

[13]Hospital Volume; see below for details.

[14]These services were collectively referred to as secondary services as a convenient shorthand to distinguish them from medical establishment 'primary' formal health-care such as GP- and hospital-care. Appendix 2 lists the secondary-care health services, while Chapter 8, Scction 8.2.4 lists the secondary-care services most commonly used by veterans and wives.

informal volume of health-care. The volume measures broadly parallel the contact measures, but were confined to respondents who used those services. Formal measures included the number of ***different*** hospital services utilized, the total number of GP visits and the number of ***different*** secondary services utilized. The Hospital-Volume item comprised three different categories of care, inpatient, outpatient, and Accident and Emergency (A & E). This item[15] was a summed score of the number of hospital services utilized by respondents and ranged from 0 to 3. Similary the Secondary Volume item comprised the total of different secondary services utilized and ranged from 1 to 12. Informal volume measures included the total number of: pharmaceutical prescription items, bedrest days and cutback days.

Summary of measures. The present multivariate analyses comprised twenty-four independent variables (IVs). Ten of these represented the predisposing component, six the enabling, three the physical-need component and five the psychological-need component. The physical-need and psychological-need IVs were combined in the third stage of analysis to form 'multiple-need' interaction terms (i.e., crossproducts of physical-need IVs and psychological-need IVs). There were thirteen service variables, categorized into contact and volume measures, and formal and informal types of health-care.

7.4 Data analyses

Unless otherwise stated, all statistical analyses were conducted by the Statistical Package for the Social Sciences (SPSS; Norusis, 1992a; Norusis, 1992b; Norusis, 1992c). The primary methods of data analysis were logistic multiple regression analysis (LMR) and ordinary least-squares multiple regression analysis (OLS).

[15]The decision to include all respondents in the Hospital Volume variable was based on the relatively low N for users of any hospital-based services. Chapter 8, Section 8.2.4 provides further information on the Hospital-Volume variable.

7.4.1 Logistic multiple regression

Seven dependent variables (DVs) in the present study are dichotomous. Logistic regression is the appropriate statistical method for analyzing the effects of independent variables (IVs) on a dichotomous (i.e., binary) DV. Logistic regression calculates a sample's probability of being in one of its two categories versus the other (Hosmer & Lemeshow, 1989). The linear model postulated by logistic regression analysis is similar to the one underlying standard multiple regression, except it is the log odds for one outcome versus the other that is assumed to vary linearly with a set of explanatory variables (i.e., IVs). Accordingly, the logistic regression model calculates the odds (i.e., likelihood) of a particular outcome occurring with the equation for the model written in terms of an outcome occurring (e.g., the likelihood of health-care contact), as shown below:

$$log\ [Prob(health\text{-}care\ contact)/Prob(no\ contact)] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_n X_n$$

where $log\ [Prob(health\text{-}care\ contact)/Prob(no\ contact)]$ is the log odds that health-care contact will occur and $X_1, X_2, ... X_n$ are the IVs). The coefficient β_0 is the intercept, which is the constant in the regression model. β_1, β_2 ... β_n are the regression coefficients which indicate the change in the log odds of contact, taking into account the IVs already entered into the model (Norusis, 1992b).

In LMR, 'likelihood' is the probability of the observed results (given the parameter estimates), expressing how well the model fits the data. A high likelihood indicates a good model and the significance of the observed likelihood can be calculated by comparing it with the chi-square distribution (Hosmer & Lemeshow, 1989). Since the likelihood value is less than 1.0, LMR procedures apply the value of minus 2 times the likelihood (-2LL) to produce a

workable value which serves as a measure of how well the estimated model fits the data. The change in -2LL also provides a measure of the importance of a block of variables as they are entered into the model. Three statistics derived from the -2LL formula are used in the present analyses. The first, the **model chi-square test**, is the difference between the model with only the constant or baseline variables and the log likelihood for the current block of IVs. It tests the null hypothesis that the coefficients for all terms in the current model, except the base model, are 0. This is comparable to the F test in standard multiple regression. The second statistic, the **chi-square improvement test,** is the log likelihood between successive steps of model building. It tests the null hypothesis that the coefficients for the IVs added at a current step are 0. This is comparable to the F-change test in multiple regression. The third statistic is a 'generalized' coefficient of determination (i.e., R^2) which represents the proportion of explained variance (Fleiss, Williams & Dubro, 1986)[16].

To provide a more accurate estimate of the amount of explained variance explained by a model, an **adjusted R^2** value can be calculated. The adjustment is based on the ratio of total degrees of freedom over the residual degrees of freedom, and as such it calculates an ***additional*** portion of explained variance which yields a larger value than that obtained with unadjusted R^2 (Magee, 1990; Nagelkerke, 1991)[17].

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[16]The standard definition of R^2 has been generalized to logistic regression models whose concept of residual variance cannot be easily defined and for which maximum likelihood is the criterion of fit. The following equation for a generalized R^2 was proposed by Magee (1990):

$$R^2\ 1 - exp\left[-^{2/n}\{l(\beta) - l(0)\}\right] = 1 - \{L(0)/L(\beta)\}^{2/n},$$

where $l(\beta)$ = log $L(\beta)$ and $l(0)$ = log $L(0)$ denote the log likelihoods of the fitted and 'null' model, respectively. This definition of R^2 is consistent with the standard definition applied to linear regression and with maximum likelihood as an estimation method (i.e., the maximum likelihood estimates of the model parameters maximize R^2). In addition, it has an interpretation as the proportion of explained variation (Nagelkerke, 1991), a feature critical to testing present hypotheses. **R^2 values were hand-calculated from the chi-square improvement test statistic using Magee's (1990) equation specified above, because SPSS/PC+ (Norusis, 1992b) does not calculate R^2 values for logistic regression.**

[17]This contrasts with its use in standard multiple regression procedures in which the adjusted R^2 is a 'downsizing' correction for inflated population estimates. This difference also explains in part why it is statistically inappropriate to compare R^2 values derived from LMR and OLS regression (Nagelkerke, 1991).

Among the statistics available to test parameter effects (i.e., coefficients) in LMR are the Wald statistic, the partial correlation and the odds ratio (Norusis, 1992b). The **Wald statistic** tests whether an IV's coefficent is significantly different from zero, calculating a *p*-value indicating whether the results could have been due to chance. The **partial correlation** (*pr*), when squared, represents the size of the correlation between the IV and the DV when the linear effects of the other IVs have been removed from both the IV and the DV. Positive values mean that as the IV increases in size, so does the likelihood of the event occurring, while negative values signify the unlikelihood of its occurrence[18].

The **odds ratio** is the ratio of the odds that health-care contact will have occurred to the odds that contact will not have occurred. In logistic regression, the concept of the ***log*** odds of contact occurring is not as readily interpreted as is the concept of the odds of contact occurring. Therefore, to facilitate interpretation, log odds are 're-formulated' as the odds of contact occurring which are referred to as odds ratios (ORs). ORs greater than 1 signify that the IV is more likely to be positively associated with contact and ORs less than 1 signify that the IV is more likely to be negatively associated with contact. In cases where the IV is significant and dichotomous, the OR is readily interpretable: it indicates the odds of having had health-care contact when the IV changes from 0 to 1, controlling for all other variables in the model. For example, if the OR for a dichotomous IV is 3.5, it indicates that the group coded 1 is 3.5 times more likely to have had contact than the Group coded 0[19]. ORs are provided in SPSS/PC+ as regression coefficients (β) (Norusis, 1992b).

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[18]SPSS logistic multiple regression calculates partial but not semi-partial correlations for IVs. Semi-partial correlations, when squared, provide the more easily interpreted values, representing the percentage of variance attributed to the corresponding IV (Tabachnick & Fidell, 1989).

[19]Conversely, an odds ratio less than 1 indicates that the group coded 0 was more likely than the group coded 1 to have experienced some outcome such as health-care contact. To calculate the number of times group 0 was more likely, the value of 1 is divided by the odds ratio. For example, an odds ratio of .288 indicates that group 0 were 3.5 times more likely to have had contact.

When an IV has more than two categories (for example, a continuous IV), the OR represents the change in the odds of having had health-care contact per unit change in the IV, and hence is not readily interpretable in terms of effect magnitude. Accordingly, in the present logistic analyses, when an IV has more than two categories, the partial correlation rather than the odds ratio is reported in the text.

7.4.2 Standard multiple regression

For the six continuous dependent variables in the present study, the appropriate procedure involved standard multiple regression, and specifically, Ordinary-Least-Squares (OLS) whose equation can be written as follows:

$$R^2 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + e^i$$

where R^2 is the outcome (e.g., the volume of services consumed) and $\beta_1 + \beta^2 + \ldots + \beta_n$ are the regression coefficients which indicate the change in volume of health-care services for each of the specified IVs ($X_1 + X_2 + \ldots + X_n$). β_0 is the intercept, the constant in the model. The term e^i is an error value representing the difference between the observed volume of health-care and the mean outcome calculated for a specified IV. Error values are assumed to be normally distributed with a constant variance and a mean of 0 (Norusis, 1992a). A limiting property of OLS-derived R^2 for a sample is its tendency to be an inflated estimate of the population value. Thus, an adjusted R^2 value is available which provides a more conservative estimate of the population value. However, unlike adjusted R^2 for LMR regression, adjusted R^2 for OLS regression is sensitive to the number of IVs in the model, performing optimally for models with few rather than many IVs. In the present analyses which tested whether a more elaborate set of IVs provided a better fit than a less comprehensive one, OLS adjusted

R^2 values provided unduly harsh adjustments for the inflated R^2 values[20]. For this reason, ***unadjusted*** R^2 values for OLS regressions were used because they are more appropriate for testing elaborate models (D.I. Hedderley, personal communication, February 22, 1999)[21].

To summarize the respective uses of R^2 and adjusted R^2 in the present study: When logistic regression procedures are used, adjusted R^2 will be reported because it provides a larger value that is useful for model-testing. On the other hand, when OLS regression procedures are used, ***un***adjusted R^2 will be used because it provides a less restrictive value for model-testing. Thus, the emphasis will be on maximising each procedure's usefulness for model testing, a practice that is consistent with the in-print utilization literature (Nelson, 1993; Wenzel et al., 1995; Wolinsky et al., 1985; Wolinsky et al., 1989)[22].

OLS regression coefficients (β) provide direct information about their impact on the DV. Another useful measure of the importance of an IV is the semipartial correlation coefficient (*sr*) which is the correlation between the IV and the DV once the linear effects of other IVs have been subtracted from the DV (Tabachnick & Fidell, 1989). When squared, semipartial correlations indicate how much R^2 increases when the IV is added to the equation. They represent the amount of variance (expressed as a percentage) uniquely associated with the IV.

7.5 Overview of analyses

Results from the present study are reported in the next three chapters. Chapter 8 provides a

[20]OLS-derived adjusted R^2 values were sometimes decreased in size as successive blocks of variables were added to the model, an indication of their inappropriateness for testing more elaborate multivariate models.

[21]Prior health-care utilization research also reports *un*adjusted OLS R^2 values (e.g., Nelson, 1993; Wolinsky et al., 1985; Wolinsky et al., 1989; Wolinsky & Johnson, 1991).

[22]The significance or otherwise of the contribution of blocks of variables in a model is not related to the use of either unadusted or adjusted R^2.

descriptive account of the present sample of veterans and wives[23]. Chapter 9 reports results from stage one, while Chapter 10 reports results from stages two and three of the multivariate analyses. An overview of these analyses is presented in Table 2. Analyses proceed sequentially in three discrete stages. Each stage, in turn, comprises 'steps' in which specified components (i.e., blocks of variables) are introduced into the analyses. 'Steps' refer to the entry-order of components into the hierarchical multiple regression models[24].

Table 2: Overview of the three stages of analysis and the corresponding entry-steps of the five components into the hierarchical multiple regression models

Stage	Description	Step	Component
One:Replication	Health-care impact of the three components	1.	Predisposition
		2.	Enablement
		3.	Physical-need
Two: Extension	Health-care impact of the psychological-need component	4.	Psychological-need
Three: Extension:	Health-care impact of the multiple-need component	5.	Multiple-need

7.6 Chapter summary

Respondents, research design, measures and statistical procedures employed in the presented study were described in this chapter. Respondents were Vietnam war veterans and their wives who each completed a single postal questionnaire. Measures were selected on the basis of their use in prior research. Data derived from the questionnaires provided the basis for a statistical description of the respondents and multivariate statistical analyses. Finally, an overview of the present sequence of analyses was provided. The chapter that follows is the first of three that describes the findings obtained in the present study on health-care utilization by Vietnam veterans and their wives.

[23]Chapter 6 provides details of the present research objectives.

[24]Rationale for use of hierarchical regression models is provided in Chapter 9, Section 9.2.

CHAPTER EIGHT

Results: Sample Description

8.1 Chapter overview

This chapter comprises three main sections: The first statistically describes and compares the present sample of veterans and wives. Andersen's (1968; 1995) model of health-care provides the main framework for comparisons. The statistical description of respondents has been expanded to accomodate the first objective of the present study which is to provide a comparative account of the sample of veterans' and wives' health and health care. The sample size was 562. The second section of the chapter provides summary information on the veterans' military background. The third section reviews intercorrelations between independent and dependent variables.

8.2 Independent and dependent variables

The first major objective of the present thesis was to describe veterans' and their wives' health status and health-care use. Coding algorithms, and means and standard deviations (SDs) for all variables used in present analyses are detailed in this section. Means and standard deviations have been calculated separately for veterans and wives. In accord with the methodology followed in Wolinsky et al. (1985), differences between veterans and wives were analyzed by one-way analysis of variance (ANOVA). Transformation of variables for ANOVA was undertaken where necessary, but untransformed values have been reported to maintain clarity and aid interpretability. Where possible, comparisons have also been made between the present and prior samples of New Zealand (NZ) Vietnam War veterans. The between-veteran-samples comparisons are relevant to concerns about the potentially biasing effects of self-selection and attrition when repeated samples of veterans have been taken from the same population[1].

[1]There have been two previous national surveys of New Zealand Vietnam War veterans (Vincent et al., 1991; Vincent et al., 1994). Details of these surveys are provided in Chapter 5. Data used to assess the comparability of the veteran-based samples primarily consists of sociodemographic information, and thus it falls within the predisposing and, to a lesser extent,

8.2.1 Predisposing variables

The ten predisposing variables included in the present anaylses are shown in Table 3. There were significant sex differences for seven of these variables. Veterans and wives differed in age, number of social contacts, rate of unemployment and fulltime employment, health worry, perceived health control and satisfaction with GP-care. Specifically, veterans were, on average, three years older than their wives and a larger proportion of veterans than wives was employed fulltime, and, conversely, a larger proportion of wives than veterans was not in paid employment. Compared with wives, veterans reported fewer social contacts (4.42 versus 4.74), lower levels of GP-satisfaction (28.38 versus 30.52), more health worry (2.46 versus 2.19) and a lower level of perceived health control (3.13 versus 3.38). With the exception of the two employment variables, the magnitude of the differences was small.

Table 4 displays the age distributions of wives, present veterans and prior samples of veterans. Significant age differences between veterans and their wives were found, χ^2 (6) = 64.11, p<.001. Over two-thirds (67%) of veterans were currently aged between 45 and 54 years, compared with just over half (51%) the wives. In addition, a somewhat larger proportion of veterans (17%) than wives (11%) were aged 60 and over. Conversely, whereas almost one-quarter of wives were less than 45 years old, very few veterans (2%) were. The present veterans were also older, on average, than veterans in the prior surveys, a finding which reflects the time between surveys.

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also the enabling components of the Andersen (1968) model. Consequently, these comparisons have been included in the respective sections of the current chapter. Some physical-health status and health-care comparisons have also been made between the respective veteran samples; however, these latter comparisons are limited since few health and health-care measures have been common across the three national surveys of New Zealand Vietnam War veterans.

Table 3: Coding algorithms and means (and SDs) of predisposing variables for NZ Vietnam War veterans and their wives (with one-way analysis of variance significance-of-difference results) (N=562).

Variables		Wives	Veterans	p
Demographic				
Sex	1=male;0=female	0.50	0.50	
Age	# years	49.61	52.42	.000
		(7.44)	(6.12)	
Ethnicity	Maori:	0.15	0.15	.971
	1=yes;0=no	(0.36)	(0.36)	
Educational **Qualifications**[1]	1=yes;0=no	0.56	0.59	.366
		(0.49)	(0.49)	
Unemployed	1=yes;0=no	0.30	0.21	.050
		(0.46)	(0.41)	
Fulltime Work	1=yes;0=no	0.41	0.67	.000
		(0.49)	(0.46)	
Social Structural				
Social Contacts	6-item scale;1=contact;0=no	4.74	4.42	.001
		(0.93)	(1.09)	
Health Beliefs				
GP-satisfaction	8-item scale	30.52	28.38	.001
		(7.10)	(7.31)	
Health Worry	1=no worry;2=hardly any;	2.19	2.46	.001
	3=some;4=great deal	(0.89)	(0.84)	
Health Control	1=no control;2=hardly any;	3.38	3.13	.000
	3=some;4=great deal	(0.65)	(0.74)	

[1] Boldened variable labels are the shorthand labels used in subsequent tables.

Table 4: Age distributions: Comparative percentages for present sample of wives and NZ Vietnam War veterans and prior samples of NZ Vietnam war veterans.

	Present sample		Prior samples	
Age (years)	Wives	Veterans	1993[1]	1991
39 and under	5	0	0	0
40-44	19	2	12	32
45-49	33	41	41	33
50-54	18	26	22	17
55-59	14	14	12	9
60-64	8	12	13	9
65 and over	3	5	[2]	

[1] Year in which the prior survey was conducted.
[2] Highest age group in the 1991 and 1993 surveys was "60+".

Distributions for ethnic identification are shown in Table 5. Most veterans and wives identified themselves as "Pakeha/European". The same proportion (15%) of veterans and wives identified themselves as Maori. This represents a slightly higher proportion of Maori men and women over the age 39 than that found in the general population (New Zealand

Department of Statistics, 1996). While the military services do not record the ethnic membership of personnel, anecdotal accounts suggest Maori veterans may be under-represented in the present sample whose proportion is also smaller than that reported in prior New Zealand samples. In the 1991 survey, 18% of veterans identified themselves as Maori and this increased to 25% in the 1993 survey.

Table 5: Ethnicity: Comparative percentages for present sample of wives and NZ Vietnam War veterans and prior samples of NZ Vietnam War veterans.

	Present sample		Prior samples	
Ethnicity	Wives	Veterans	1993[1]	1991
Maori	15	15	25	18
Pakeha	79	83	71	78
Other	6	2	4	4

[1] Year in which the prior survey was conducted.

Table 6 presents data on marital status. Since the sample was selected on a "couples" basis (i.e., the veteran and his wife both participated), the comparative marital status of veterans and wives was unavoidably constrained. The majority of respondents reported being married and only rarely was a status chosen which implied respondents continued to define their presumed current status in terms of a former relationship (e.g., divorced)[2].

Household composition (i.e., persons living in the same house) reported by respondents are shown in Table 7. The most common living arrangements were two-person households (i.e., the couple living alone) (51%), and living with wife and children (45%). In comparison with the 1993 survey of veterans, however, there were substantially fewer respondents who lived

[2] A very small number of veterans appeared to be separated from their wives at the time of the study but they invited their wives to participate in the study. Four wives volunteered the information that they were recently separated from the veterans. These cases were treated as cohabiting couples, because of the recency of separation, and indeterminancy regarding its permanence. On another matter involving relationship status, it is not clear from a self-selected status such as 'divorced' whether the veteran was currently living in a subsequent de facto relationship, but continued to identify himself as divorced. In the few cases such as these, if the veteran and his wife both returned their respective questionnaires, they were treated as a couple and were included in the study.

alone or in 'non-nuclear' families. Again, the difference reflects the criterion for inclusion in the present study (i.e., confined to cohabiting couples).

Table 6: Marital-status: Comparative percentages for present sample of wives and NZ Vietnam War veterans and prior samples of NZ Vietnam war veterans.

	Present sample		Prior samples	
Marital status	Wives	Veterans	1993[1]	1991
Married	92	91	83[2]	78
De facto	6	6		
Divorced,separated,widowed	2	3	12	17
Other (e.g., never married)	0	0	5	5

[1] Year in which the prior survey was conducted.
[2] 1991 and 1993 surveys subsumed de facto relationships under "married" category.

Table 7: Household-composition: Comparative percentages for present sample of wives and NZ Vietnam War veterans and a prior sample of NZ Vietnam War veterans.

	Present sample		Prior sample[1]
Household	Wives	Veterans	1993[2]
With wife	50	51	28
With wife & children	46	45	48
Other (e.g.,extended family, alone)	4	4	24

[1] 1991 study did not include household composition data.
[2] Year in which the prior survey was conducted.

Table 8 displays respondents' employment-status information. Significant status differences were found between veterans and wives, χ^2 (2) = 43.39, $p < .001$. Over two-thirds (67%) of veterans were in fulltime employment, compared with less than half (42%) of wives. A much smaller proportion of veterans (11%) than wives (28%) was in part-time employment and a somewhat smaller proportion of veterans (22%) than wives (30%) were not in paid employment. Two in three veterans and one in three wives who were unemployed had either reached or were close to retirement age. Table 8 also shows that, across the three surveys there has been a steadily decreasing proportion of veterans in full-time employment (1991: 75%; present: 67%), although the proportion currently not in paid employment has remained unchanged (22%) since the 1993 survey.

Table 8: Employment status: Comparative percentages for present sample of wives and NZ Vietnam War veterans and prior samples of NZ Vietnam War veterans.

	Present sample		Prior samples	
Employment status	Wives	Veterans	1993[1]	1991
Employed full-time	42	67	70	75
Employed part-time	28	11	8	17
Not in paid employment	30	22	22	8

[1] Year in which the prior survey was conducted.

The New Zealand Standard Classification of Occupations (1992) was used to classify respondents' occupations which are shown in Table 9. The most commonly held occupations among veterans involved managerial/administrative positions (29%). Other commonly held positions were labouring and elementary service work (29%).

Table 9: Occupational classifications: Comparative percentages for present sample of wives and NZ Vietnam War veterans and prior samples of NZ Vietnam War veterans.

	Present sample		Prior samples	
Occupation	Wives	Veterans	1993[1]	1991
Legislators,Administrators & Managers	15	29	22	14
Professionals, Technical	25	16	17	8
Clerks	25	4	8	11
Service & sales workers	9	16	11	25
Agricultural & fishery workers	6	6	9	8
Production, labourers	20	29	33	34

[1] Year in which the prior survey was conducted.

Among wives, the most commonly held occupational positions were professional/technical (e.g., teaching, nursing) (25%), clerical/secretarial (25%), and labour and elementary service work (20%). While twice the proportion of veterans than wives were in managerial/administrative positions, a larger proportion of wives (25%) than veterans (16%) occupied professional and technical positions. The profile of different occupations among present veterans matched that of the 1993 sample, although a somewhat larger proportion of present (45%) than earlier veterans (39%) held administrative/managerial or professional positions.

Table 10 shows the different levels of educational attainment in the present sample. No significant differences were found in the proportions of veterans and wives reporting their highest level of educational attainment, χ^2 (4) = 3.13, p.<.536. About one-fifth of veterans (21%) and wives (19%) had professional or trade qualification. One-quarter of both groups had at most secondary school qualifications, and an even larger proportion of both veterans (40%) and wives (44%) had no formal (i.e., educational or tertiary) qualifications. The distribution of levels of educational qualifications has changed somewhat across the three samples of veterans. A reduced proportion of present veterans reported either having no school qualifications or having trade and professional qualifications, and twice the proportion of them as in the 1991 sample reported having university qualifications compared with the 1991 sample.

Table 10: Educational qualifications: Comparative percentages for present sample of wives and NZ Vietnam War veterans and prior samples of NZ Vietnam War veterans.

	Present sample		Prior samples	
Qualifications	Wives	Veterans	1993[1]	1991
No school qualification	44	40	44	46
Secondary school	25	25	22	25
Trade or professional	19	21	25	24
University	11	10	[2]	5
Other qualification	1	4		[3]

[1] Year in which the prior survey was conducted.
[2] No "University" or "Other qualificaton" categories in 1993 survey.
[3] No "Other qualification" category in 1991 survey.

Main differences to emerge from comparisons between veterans and wives and also between present and prior samples of veterans will now be summarised. Veterans differed from wives in age, employment and occupational status. Comparisons between samples of veterans showed the following: a larger proportion of present than prior veterans was in administrative and managerial positions, with a slightly reduced proportion in production or labouring positions; a reduced proportion of present veterans reported no qualifications and a somewhat larger proportion university qualifications; a smaller proportion of present than prior veterans

reported incomes below $40,000 and an increased proportion reported $50,000 or higher; a reduced proportion of present- than prior veterans were in full-time work, although no change was found in the proportion who were not in paid employment.

8.2.2 Enabling variables

Algorithms, mean values and SDs for the six enabling variables are shown in Table 11. A significant difference between veterans and wives was found on only one variable: veterans reported more dissatisfaction with their standard of living (3.00 versus 3.11), although, the difference was very small. Both groups reported similar levels of perceived ability to get by on household income, and the mean values on all medical-related variables were highly similar. Over two-thirds of respondents had health insurance and over one-fifth the Community Services Card, almost two-thirds reported that the GP fee had never prevented use of that service and they had, on average, nearly two of three GP-access resources.

Table 11: Coding algorithms and means (and SDs) of enabling variables for NZ Vietnam War veterans and their wives (with one-way analysis of variance significance-of-difference results) (N=562).

Variables		Wives	Veterans	*p*
Household Resources				
Living Standard	1=very dissatisfied;2=dissatisfied 3=satisfied;4=very satisfied	3.11 (0.64)	3.00 (0.64)	.030
Income Adequacy	1=can't make ends meet;2=just enough; 3=little $ left over;4=always $ left over	2.63 (0.79)	2.71 (0.80)	.267
Medical Resources				
Health Insurance	1=yes;0=no	0.65 (0.47)	0.65 (0.47)	.886
Community Services Card **(CS Card[1])**	1=yes;0=no	0.22 (0.42)	0.21 (0.40)	.594
GP-fee Barrier	1=yes;0=no	0.31 (0.46)	0.32 (0.46)	.950
GP-resources	3-item scale:Years with same GP;sameday appointment;time in waiting room	1.86 (0.94)	1.86 (0.86)	.985

[1] = Boldened variable labels are the shorthand labels used in subsequent tables.

Regarding household incomes, several of the wives appeared to provide details, not of household income as requested, but of ***personal*** income, with at least seven of them indicating

that the annual income details pertained only to their own earnings. Consequently, it is not possible to ascertain whether differences between a veteran's and his wife's reported income involves their reporting different types of income (e.g., household versus personal) or incorrect reporting. For this reason, and also because of extreme non-normality of distribution, the household income variable was deleted from all multivariate analyses[3].

Table 12 shows the percentages of respondents who possessed three medical-access resources. Almost two-thirds of wives and veterans had health insurance, less than one-quarter had the Community Services Card, and a much smaller proportion of both groups (5%) had the Chronic Illness Card. The latter dichotomous variable was excluded from regression analyses because it fell outside the .10 and .90 range necessary for inclusion in multivariate analyses (Norusis, 1992c). Proportions of three other medical variables which comprised the summed "GP-resources" item were as follows: About two-thirds of respondents had the same doctor for five or more years (wives: 65%; veterans: 68%); two-thirds of wives (67%) and a slightly lower proportion of veterans (62%) could obtain same-day GP-appointments; and wives waited 19 minutes on average to see the GP while veterans waited 17 minutes.

Table 12: Selected medical-access variables: Comparative percentages for wives and NZ Vietnam War veterans.

Variable	Wives	Veterans
Health Insurance	66	65
CS Card	23	21
Chronic Illness Card	5	5

Two patterns emerged from comparisons involving enabling variables: First, veterans and wives were highly similar in terms of specified household and medical-resource variables, a finding that reflects the couples' sharing those resources; second, the sole significant

[3] Appendix 3 provides comparative percentages of annual incomes for wives and present and prior samples of NZ veterans.

difference found between the couples (i.e., veterans were more dissatisfied than wives with the household living standard) was very small.

8.2.3 Physical- and psychological-need variables

Coding algorithms, mean values and SDs for physical- and psychological-need variables are presented in Table 13. Significant differences were found between veterans and wives on two of the three physical-need characteristics. Veterans reported, on average, one chronic illness more than wives (2.58 versus 1.41) and they also reported a lower level of perceived health (2.94 versus 3.17). The perceived-health difference was small; in fact, a majority of both veterans and wives reported their overall health to be either "good" or "excellent". Significant psychological-health differences were also found on four of the five psychological variables. Compared with wives, veterans reported lower wellbeing (69.58 versus 72.27), higher distress (61.22 versus 56.79), higher levels of PTSD symptomatology (26.21 versus 22.44) and more lifetime traumatic experiences (2.33 versus 1.45).

Table 13: Coding algorithms and means (and SDs) of physical- and psychological-need variables for NZ Vietnam War veterans and their wives (with one-way analysis of variance significance-of-difference results) (N=562).

Variables		Wives	Veterans	*p*
Physical-need				
Impaired ADLs[1]	21-item scale;# impairments	2.17 (3.30)	1.87 (2.47	.215
Chronic Illnesses[2]	17-item scale;# chronic illnesses	1.41 (1.52)	2.58 (1.84)	.000
Perceived Health	1=poor;2=not so good; 3=good;4=excellent	3.17 (0.63)	2.94 (0.69)	.000
Psychological-need				
Psychological **Wellbeing**	14-item scale	72.27 (15.05)	69.58 (15.64)	.040
Psychological **Distress**	24-item scale	56.79 (25.18)	61.22 (27.26)	.047
PTSD Symptomatology	11-item scale	22.44 (5.43)	26.21 (7.32)	.000
Traumatic Events	13-item summed scale;event occurred:1 =yes; 0=no	1.45 (1.76)	2.33 (1.82)	.000
Life Changes Events	19-item summed scale;event occurred:1 =yes; 0=no	1.73 (0.53)	1.87 (1.62)	.160

[1] ADLs = Activities of daily living.
[2] Boldened variable labels are the shorthand labels used in subsequent tables.

Percentages reporting different numbers of chronic health problems are shown in Table 14. One third of wives reported no chronic illnesses, while less than half that proportion (13%) of veterans reported no such illnesses. Most veterans (87%), therefore, reported at least one chronic health problem. Three or more health problems were reported by almost half the veterans (46%) compared with about one-fifth (19%) of wives.

The number of chronic illnesses reported by the present veteran-sample is similar to the number reported by the 1993 sample, as also seen in Table 14[4]. However, a slightly higher proportion of the present than the 1993 sample reported no chronic illnesses, and a slightly lower proportion of the present than the 1993 sample reported five or more of these illnesses.

Table 14: Number of chronic illnesses: Comparative percentages for present sample of wives and NZ Vietnam War veterans and prior samples of NZ Vietnam War veterans.

	Present sample		Prior samples	
Number	Wives	Veterans	1993[1]	1991[2]
None	33	13	11	27
1	30	17	17	27
2	18	24	21	20
3	8	18	20	13
4	6	13	13	7
5	3	8	9	6
6 and more	2	7	9	[3]

[1] Year in which the prior survey was conducted.
[2] Inventory of chronic illnesses in 1991 survey differs slightly from later surveys.
[3] Highest Chronic Illnesses category: "5+".

Table 15 shows that the distribution and profile of chronic illnesses was broadly the same for wives and veterans. However, there were three instances of marked differences, with differences indicating substantially higher rates of specific illnesses among the veterans. Almost two-thirds of veterans (63%) reported chronic hearing impairments, with their

[4] Proportions reporting one or more chronic illnesses in the 1993 sample were noticeably larger than in the 1991 sample. In addition to possible indications of health decline, differences could also be due to a somewhat different list of chronic illnesses (see Vincent et al., 1991 and Vincent et al., 1994). The list of chronic illnesses in the 1993 sample is the same as the one used in the present study.

incidence 7 times higher among veterans than among wives (9%). More than half of the veterans (55%) also reported chronic sight impairments; they were over one-and-a-half times more likely than were wives to have sight impairments (35%). Veterans were also more than 2 times as likely as wives to have chronic skin problems (21% versus 10%). In both groups, about one-quarter reported arthritis/rheumatoid illnesses, about one-fifth, high blood pressure and just under one-fifth, respiratory health problems. Similar proportions of veterans (31%) and wives (28%) reported a diverse range of 'other' chronic illnesses. Table 15 also shows that a slightly higher proportion of the present veterans sample compared with the 1993 sample had hearing and sight impairments, almost twice the proportion of them also had 'other' chronic illnesses (31% versus 16%) and a ***lower*** proportion reported skin problems (21% versus 30%).

Table 15: Types of chronic illnesses: Comparative percentages for present sample of wives and NZ Vietnam war veterans and a prior sample of NZ Vietnam war veterans.

	Present sample		Prior sample[1]
Types	Wives	Veterans	1993[2]
Hearing impairment	9	63	59
Sight impairment	35	55	48
Arthritis/rheumatism	25	27	29
High blood pressure	18	22	22
Skin conditions	10	21	30
Respiratory conditions	18	16	16
Heart trouble	5	12	11
Bowel disorders	6	11	[3]
Hernia	2	8	10
Stomach ulcer	3	6	8
Diabetes	4	6	4
Kidney/urinary	2	5	5
Hepatitis	1	4	5
Cancer	4	3	4
Liver	1	2	[2]
Epilepsy	>1	1	1
Other (e.g.,gout,back ailment)	28	31	16

[1] Year in which the prior survey was conducted.
[2] In the 1991 survey, some chronic illnesses were subsumed under collective classifications (e.g., "nervous and sense systems"), rendering those illnesses nonequivalent with the ones used in the 1993 and the present study.
[3] No separate listing for this chronic illness in 1993 survey.

Almost half of the wives (46%) and a slightly smaller proportion of veterans (41%) reported no Activities of Daily Living impairments. Almost one-fifth of respondents reported at least one impairment (wives: 17%; veterans: 18%) and over one-quarter (28%) reported three or more ADL impairments. Table 16 displays the percentages of respondents reporting each activity impairment. For both groups, the most frequently reported impairments involved lower body functions; these were, stooping or crouching (wives: 35%; veterans: 37%), standing for two hours (24%) and sitting for two hours (wives: 16%; veterans: 22%). Large differences were found, however, in the percentages of veterans and wives having difficulties with two activities: About one-quarter of wives (24%), but a much lower proportion of veterans (9%) had difficulty doing heavy housework, and while over one-third of wives (35%) had difficulty lifting or carrying ten kilos, a much lower proportion of veterans (14%) reported such difficulties.

Table 16: Types of impaired ADLs: Comparative percentages for wives and NZ Vietnam war veterans.

Types	Wives	Veterans
Bathing	4	4
Dressing	6	6
Getting out of bed	6	8
Walking	15	13
Toileting	3	7
Meal preparation	2	>1
Shopping	5	3
Light housework	5	1
Heavy housework	24	9
Managing money	2	4
Using the phone	0	5
Eating	4	5
Walking half a kilometre	10	5
Walking up ten steps	5	3
Standing for two hours	24	24
Stooping or crouching	35	37
Lifting ten kilograms	35	14
Sitting for two hours	16	22
Reaching up overhead	13	9
Reaching hand out	1	2
Using fingers to grasp	8	9

Regarding the number of past-year life-change events, one-fifth of veterans (20%) and a slightly smaller proportion of wives (17%) reported no life-changes. Over half the veterans (60%) and an even larger proportion of wives (69%) experienced one to three changes and few veterans (10%) and wives (7%) reported five or more changes. The profile of past-year life-changes shown in Table 17 was broadly similar for veterans and wives, a finding that reflects their dwelling within the family and/or household. The most frequently reported changes were operations, illnesses or injuries experienced either by family members' (wives: 32%; veterans:38%) or personally experienced (wives: 22%; veterans: 28%). Other changes reported by substantial numbers of respondents were changing or starting a new job (wives: 20%; veterans: 19%), children leaving home (wives: 22%; veterans: 20%) and death of a family member (wives: 24%; veterans: 20%). Some past-year changes indicated differences in life experiences between veterans and wives, particularly in paid work and life-cycle stages. More veterans (8%) than wives (4%) lost their jobs, were unemployed for at least one month (12% versus 5%) and retired (7% versus 4%).

Table 17: Past-year life-changes: Comparative percentages for wives and NZ Vietnam war veterans.

Life changes	Wives	Veterans
Personal operation,illness or injury	22	28
Family member's operation, illness or injury	32	38
Marriage	6	9
Separation/Divorce	3	2
Relationship reconciliation	1	1
Pregnancy (of wife)	>1	>1
Birth/Adoption	>1	0
Arrival of new person in household	9	10
Child(ren) left home	22	20
Retirement	4	7
New/changed job	20	19
Loss of job	4	8
Unemployed for one month or more	5	12
Moved house	10	8
Major financial problems	13	15
Finances improved considerably	15	15
Personal serious legal problems	2	2
Family member's serious legal problems	5	5
Death of family member(s)	24	20
Death of partner	0	0

Regarding the number of traumatic events ever experienced, almost four times as many wives (40%) as veterans (11%) reported no lifetime traumatic events. Two-thirds of veterans (66%) and almost half the wives (47%) reported one to three traumatic events. Over one-fifth of veterans (23%) reported four or more traumatic experiences, compared with a much smaller proportion of wives (13%). Percentages of respondents reporting each traumatic event are presented in Table 18. The profile of event-defined traumas differed markedly across the two groups. Some events were reported by more veterans than wives, while other events were reported by more wives than veterans. For veterans, the most frequently reported event was combat (79%). Veterans were also more likely than wives to have been: seriously beaten by a non-family member (17% versus 4%), robbed (15% versus 9%) and in a motor vehicle accident (12% versus 9%). On the other hand, wives were more likely than veterans to have been: seriously beaten by family members (14% versus 6%) and sexually abused as children (11% versus 2%) and adults (12% versus > 1%). Almost one-quarter of wives and veterans (23%) had experienced the violent or unexpected death, and almost one-quarter of veterans (23%), but a larger proportion of wives (29%) had a family member who had been violently assaulted or injured.

Table 18: Lifetime traumatic events experienced: Comparative percentages for wives and NZ Vietnam war veterans.

Traumatic events	Wives	Veterans
Robbed and/or mugged	9	15
Motor vehicle accident	9	12
Non-vehicle accident (eg, work)	4	18
Military combat	0	79
Disaster injury (eg, fire, flood)	8	9
Disaster evacuation	5	7
Violent/unexpected death of loved one (by accident, homicide or suicide)	23	23
Violent assault/injury of loved one	30	23
Sexually abused as child	11	2
Sexually abused as adult	12	>1
Seriously beaten by family member	14	6
Seriously beaten by non-family member	4	17
Other trauma	22	26

The main pattern to arise from need comparisons involved significantly more physical- and psychological health-need among veterans than wives. Veterans had more chronic illnesses and traumatic events, lower levels of perceived health and wellbeing, higher levels of distress and PTSD symptoms. Compared to the 1993 veteran sample, slightly more of the present veterans reported impairments of sight and hearing, twice the proportion reported a range of other chronic illnesses, but a lower proportion reported skin ailments.

8.2.4 Health-care use variables

Table 19 displays coding algorithms and mean values (and SDs) for the health-care variables for veterans and wives. Across the formal contact measures, one significant difference was found; namely, veterans were less likely than wives to have contacted a GP in the past year (0.82 versus 0.91). Across the informal contact variables, one significant difference was found: Veterans were less likely than wives to have obtained GP-prescribed items in the past year (0.77 versus 0.84). Across the formal and informal volume measures, no significant differences were found, although the hospital-care variable was of borderline significance.

Hospital-care. The Hospital-Volume variable, listed in Table 19, comprised a summed measure of three different services; namely, inpatient-care, outpatient-care and Accident and Emergency-care (A & E)[5]. In the past year, one-fifth of wives (19%) and veterans (20%) received outpatient care. Overall, however, hospital services were not used often.

GP-care. Table 20 shows that most respondents visited the GP at least once, although more wives (90%) than veterans (82%) had done so. Almost one-fifth of veterans (18%) and a

[5]See Chapter 7, Section 7.3.5 for a more complete description of the Hospital-Volume variable.

slightly lower proportion of wives (15%) visited the GP once. Over half of veterans (53%) and almost three-quarters of wives (72%) visited the GP from two to six times. Similar proportions of wives (13%) and veterans (11%) made seven or more visits.

Table 19: Coding algorithms and means (and SDs) of health-care variables for NZ Vietnam war veterans and their wives (with one-way analysis of variance significance-of-difference results) (N=562).

Variables		Wives	Veterans	*p*
Formal Contact				
Inpatient-contact[a]	1=yes;0=no	0.08	0.11	.207
		(0.27)	(0.31)	
Outpatient-contact	1=yes;0=no	0.18	0.20	.537
		(0.39)	(0.40)	
GP-contact	1=yes;0=no	0.91	0.82	.001
		(0.28)	(0.38)	
Secondary-care-contact	1=yes;0=no	0.88	0.87	.567
		(0.31)	(0.33)	
Informal Contact				
Prescription-contact	1=yes;0=no	0.84	0.77	.047
		(0.36)	(0.41)	
Bedrest-contact	1=yes;0=no	0.51	0.52	.736
		(0.50)	(0.50)	
Cutback-contact	1=yes;0=no	0.39	0.40	.931
		(0.49)	(0.49)	
Formal Volume				
Hospital-volume	3-services:inpatient, outpatient, A&E	0.32	0.44	.061
		(0.58)	(0.81)	
GP-volume	Number of past-year visits	4.11	4.26	.503
	among those who had contact	(4.48)	(4.77)	
Secondary-care-volume	Number of past-year different secondary	2.15	2.44	.615
	services among those who had contact	(1.43)	(1.46)	
Informal Volume				
Prescription-volume	Number of past-year prescription items	1.70	1.71	.951
	among those who had contact	(0.99)	(1.06)	
Bedrest-volume	Number of past-year bedrest days	5.82	6.17	.400
	among those who had contact	(14.50)	(9.36)	
Cutback-volume	Number of past-three-months cutback days	16.32	15.88	.734
	among those who had contact	(14.89)	(25.81)	

[a] = For unambiguous differentiation of the two different aspects of health care, services are labeled as either **contact** or **volume**.

Table 20: Number of GP visits: Comparative percentages for wives and NZ Vietnam war veterans.

GP visits	Wives	Veterans
None	10	18
1	15	18
2	19	14
3	20	9
4	14	19
5	7	4
6	12	7
7 or more	13	11

Secondary-care. Most respondents (86%) contacted at least one secondary service, while similar proportions of wives (38%) and veterans (37%) had contacted three or more. Table 21 presents the secondary-care services most frequently utilised by veterans and wives. Overall, the profile of contacts was similar for both veterans and wives. About half of all respondents utilized chemist services, and almost half the wives (48%) and a slightly lower proportion of veterans (45%) received dental care. Services with whom respondents also had contact were medical specialists (wives: 39%; veterans: 43%) and opticians (wives: 34%; veterans: 31%). One-fifth of wives and a slightly smaller proportion of veterans (15%) received physiotherapy. Few respondents had contact with mental-health services.

Table 21: Secondary services most frequently used: Comparative percentages for wives and NZ Vietnam War veterans.

Secondary service	Wives	Veterans
Medical specialist	39	43
Chemist	53	48
Dentist	41	45
Optician	34	31
Physiotherapist	20	15

Prescription-items. Nearly one quarter of veterans (22%) and a smaller proportion of wives (17%) did not obtain any such items. Almost half of the respondents obtained one to four prescription items (wives: 48%; veterans: 47%). Few respondents obtained ten or more prescription items.

Cutback-days and bedrest-days. The number of cutback days taken by respondents in the past three months is given in Table 22. Over half the wives (60%) and veterans (59%) reported taking no cutback days. Over one quarter of wives (26%) and veterans (27%) reported one to seven cutback days, and substantially fewer (8%) reported eight to thirty cutback days, and fewer still (6%) thirty-one or more such days. Table 22 also shows that, across the three

surveys, the percentage of veterans who reported no cutback days decreased then increased. A larger percentage of present veterans than those in the *1993* sample reported no cutback days. On the other hand, proportions of veterans having eight or more cutback days has remained steady across the surveys. Table 22 also displays the distribution of bedrest days taken by respondents in the past year. Almost half of the wives (49%) and veterans (47%) reported no bedrest days. A somewhat smaller proportion of respondents reported one to seven bed days (wives:40%; veterans: 44%). A small proportion of wives (11%) and veterans (9%) had eight and more days of bedrest.

Table 22: Number of cutback days in the past three months and number of bedrest days in the past year: Comparative percentages for wives and NZ Vietnam war veterans and prior samples of NZ Vietnam war veterans.

	Present sample		Prior samples	
Days	Wives	Veterans	1993[1]	1991
Cutback days in past 3 months				
None	60	59	51	69
1 - 7	26	27	32	18
8 - 30	8	8	12	8
31 or more	6	6	5	5
Bedrest days in past year[2]				
None	49	47		
1 - 7	40	44		
8 - 30	11	9		

[1] Year in which the prior survey was conducted.
[2] No data on bedrest in prior surveys.

Across the health-service comparisons, only one significant difference was found: Veterans were less likely than wives to have had past-year GP contact. No significant differences were found in veterans' and wives' ***frequency*** of use of health-care.

8.3 Military background information

Details of veterans' military characteristics are provided in Appendix 3. The average length of military service for the present sample of veterans was 15 years, and ranged from 2 to 37 years[6]. Nearly one third (32%) served 5 years or less, with almost half of the veterans (48%) serving in the military more than 15 years. The majority (90%) completed one tour of duty in Vietnam whose duration was less than twelve months. Half (51%) held ranks below that of corporal, and 14% were officers. Nearly two-thirds (62%) were engaged in war zone combat duties, serving mainly in either the infantry (48%) or the artillery (32%). The present sample of veterans was highly comparable with the two earlier samples in terms of number of years in the military, number of tours of duty, highest rank in Vietnam, role in Vietnam and specialization in Vietnam.

8.4 Intercorrelations among variables

Intercorrelations among independent variables. Intercorrelations were computed for all measures of predisposing, enabling and need-for-care characteristics and the resulting product-moment correlation coefficients are displayed in Appendix 4. Overall, almost half of the correlations were significant. An inspection of variables *within* each component (i.e., predisposition) showed the following: One-quarter of predisposing variables were significantly correlated with each other, with all except one (Unemployed and Fulltime Work: r = .65) having a magnitude of less than .25. Of the 15 enabling intercorrelations, 9 were significant, with 2 exceeding .50 (Living Standard and Income Adequacy: r = .57; and Income Adequacy and Health Insurance: r = .53) and 5 exceeding .25 in magnitude.

[6]All military-background data on the present sample of veterans was obtained when they participated in prior surveys (Vincent et al., 1991; Vincent et al., 1994).

Most need variables were significantly correlated with each other, with two-thirds having a magnitude of less than .25. Three measures of psychological health exceeded .50 (PTSD and Wellbeing: r = -.60; PTSD and Distress: r = .68; Wellbeing and Distress: r = -.80). These strong correlations among the measures of psychological-need may reflect some overlap in their respective dimensions.

Intercorrelations among the three components. Less than half the correlations *among* the three components were significant. Of these, few exceeded .25 and none were strong. This supports the present claim that variables measuring each component were tapping into relatively independent characteristics.

Intercorrelations between independent and dependent variables. Intercorrelations between the 13 DVs and the 24 IVs are also presented in Appendix 4. Numerous significant bivariate correlations were found. The largest proportion of significant correlations involved the need variables and the DVs, with two-thirds registering a significant impact, but with only one exceeding a magnitude of .25 (Cutback Volume and Impaired ADLs = .30). One-quarter of the correlations between the IVs and enabling DVs were significant, with 11 larger than .25 and one-quarter of those between the DVs and prediposing IVs were significant, with 9 larger than .25. None of the correlations between the DVs and the IVs exceeded .50.

8.5 Chapter summary

This chapter described and compared the present sample of veterans and wives. The description focused on predisposing, enabling and health-need characteristics and also included their patterns of health-care use. The characteristics represent the three components of Andersen's (1968) model and served as the IVs in the present multivariate analyses; the

specified health services served as the DVs. To address concerns about the potential biasing effects of self-selection and attrition, the present sample of veterans was further compared with prior veteran samples, with comparisons also including military-background variables. Lastly, intercorrelations among the IVs and DVs were presented. In Chapter 9, results from the first stage of the analyses are reported.

CHAPTER NINE

Results: Stage One

9.1 Chapter overview

This chapter, the first of two which examine the impact of conceptually-linked variables on health-care used by New Zealand Vietnam War veterans and their wives, reports the results from stage one of the present multivariate analyses. In total, present analyses involved three discrete stages. Results of stages two and three are reported in Chapter 10. Each stage is further divided into two parts; the first contains analyses which involved all respondents whether or not they had contact with specified health services, while the second part contains analyses which were confined to those respondents who actually utilized specified services.

The three stages of analysis forming the core of the present thesis parallel successive 'steps' of analysis designed to test different hypotheses about the contribution of theoretically-relevant components (either singly or in combination) to the explanation of health-care. Since stage one looked at the basic Andersen (1968) model, 3 steps were involved, each corresponding to one of the components of the model (i.e., predisposition, enablement or physical-need). In stage two, analyses tested the health-care impact of a fourth component, psychological-need, which accordingly comprised step 4. In stage three, the impact of a fifth component, multiple-need, on health care utilization was examined, which paralleled step 5.

9.2 Hypotheses 1 to 5: Health-care impact of the three components

The second objective of this thesis was to investigate the relationship of predisposition, enablement and physical-need to health-care use by a sample of NZ Vietnam veterans and their wives. A further aim was to compare the explanatory capacity of the 'Andersen' components across both formal and informal service variables. This section presents the results of several hierarchical multiple regressions which tested hypotheses 1 to 5[1].

[1]Hypotheses 1 to 5 are listed in Chapter 6, Section 6.3.

Regressions comprised seven logistic multiple regressions (LMR) and six ordinary-least-squares linear multiple regressions (OLS).

In all multivariate analyses, the entry order of components followed the order used in several recent studies (e.g., Bazargan et al., 1998; Nelson, 1993; Wenzel et al., 1995). Components were entered into analyses in the following sequence: Predisposition first, enablement second and physical-need third. Predisposition and enablement were treated as being related to physical-need, and therefore their health-care impact was taken into account before the health-care impact of physical-need[2]. The generic procedure employed to sequentially enter blocks of variables into the model was 'hierarchical' multiple regression. This procedure allows blocks of variables to be entered into analyses in controlled (i.e., predetermined) steps, with their impact assessed at each step. Importantly for the present emphasis on model-testing, hierarchical entry enabled the proportion of variance obtained at each step to be calculated once the proportion of variance attributed to earlier-entered blocks had already been calculated (Tabachnick & Fidell, 1989).

Prior to analyses, data was screened for data-entry accuracy, missing values and fit between variable distributions and assumptions of multivariate analysis for LMR regression and OLS regression, respectively. Two variables, Household Income and Chronic Illnesses Card, were deleted from all analyses, as noted in Chapter 8, Section 8.2.2. All other variables were retained as none exceeded 5% missing cases. As LMR and OLS regressions have different assumptions about the distribution of values for variables, these were checked separately for each and are reported below for LMR regressions and in Section 9.2.2 for OLS regressions.

[2] A more complete rationale for entry-order of the components into the model is provided in Chapter 2, Section 2.5.3 and Chapter 6, Section 6.3.4.

Pre-screening for logistic regressions. Logistic regression does not require strict assumptions about multivariate normality. The procedure was developed to analyze the probability of relatively rare binomial-distributed events (Hosmer & Lemeshow, 1989). As a result, this method involves fewer assumptions than OLS regression, is statistically more robust than other procedures such as standard multiple regression (e.g., OLS) and is suitable for analyzing relatively low outcomes such as in-patient hospital admission (Tabachnick & Fidell, 1989). One assumption that should be checked is the absence of 'cases' (i.e., respondents) whose multivariate scores fall more than three standard deviations from the group mean (D.I.Hedderley, personal communication, 22 February, 1999). These cases may exert unduly high influence on the regression result. The statistic used to check excessive influence is Cook's Distance, which measures the change in regression coefficients obtained by leaving out an outlying case (Tabachnick & Fidell, 1989; Norusis, 1992a). Cases with Cook's Distance scores exceeding 1.00 are possible outliers whose influence should be checked. Checking involves comparing results with and then without the identified cases to see if there is a significant difference in the results. If results are significantly different, the outlying cases are deleted. Using Cook's Distance, a few cases suspected of large influence were identified in four of the present service-contact variables: Inpatient-, GP-, Secondary- and Prescription-Contact. Since subsequent comparisons failed to yield significantly different results in any of these variables, ***no*** cases were deleted.

9.2.1 Health-care contact

Results of the logistic regression analyses explaining veterans' and their wives' contact with four formal service variables are shown in Tables 23 to 26. Measures of these categories were whether or not respondents had past-year contact with any of the following services: Inpatient-, Outpatient-, GP- and Secondary-care.

9.2.1.1 Formal health-care contact

The results of the logistic regression analyses explaining the likelihood of respondents' contact with each of four formal health services are shown in Tables 30 to 33. The measures of these services were contact with inpatient-, outpatient-, GP- and secondary-care.

Inpatient-contact. Table 23 shows that on step 1, predisposing variables explained 15.4% of the variance in respondents' past-year Inpatient-contact (adjusted R^2), χ^2 (10) = 42.36, p<.0001. After step 2, with the addition of enabling variables, total explained variance was 17.5% (adjusted R^2), χ^2 (6) = 6.09, p<.41, a non-significant increment. After step 3, with physical-need variables entered, total explained variance increased to 18.9% (adjusted R^2), also a non-significant increment, χ^2 (3) = 4.33, p<.22. The measures of enablement and physical-need appeared to have no relationship with the likelihood of inpatient care.

On step 3 of the regression of variables on Inpatient-contact, two predisposing variables emerged as significant. Past-year hospital inpatient contact was more likely among those who reported higher GP-satisfaction (pr = .089)[3], and more health worry (pr = .143).

[3]In the present logistic regression tables, the partial correlation (pr) is provided for continuous IVs, and the odds ratio (OR) for dichotomous IVs.

Table 23: Logistic hierarchical multiple regression of predisposition, enablement and physical-need on past-year hospital in-patient contact versus no contact, showing odds ratios (OR), partial correlations (*pr*), generalized R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives (N = 561).

	Steps					
	1		2		3	
Variables	OR	*pr*	OR	*pr*	OR	*pr*
Predisposition						
Sex	1.418		1.319		1.179	
Age		.070		.065		.000
Ethnicity	0.590		0.585		0.558	
Qualifications	0.851		0.857		0.814	
Unemployed	0.584		0.486		0.459	
Fulltime Work	0.567		0.653		0.627	
Social Contacts		.000		.000		.000
GP-satisfaction		.118**		.091*		.089*
Health Worry		.212****		.197***		.143**
Health Control		.000		.000		.000
Enablement						
Living Standard				.000		.000
Income Adequacy				.000		.000
Health Insurance			0.766		0.687	
CS Card			1.518		1.285	
GP-resources				.000		.000
GP-fee			0.572		0.535	
Physical-need						
Impaired ADLs						.000
Chronic Illnesses						.050
Perceived Health						.000
R^2	.073****		.083****		.090****	
Adjusted R^2	.154		.175		.189	
R^2 change	.073****		.010		.007	

* p < .05, ** p < .01, *** p < .001, **** p < .0001

Outpatient-contact. Logistic regression results for Outpatient-contact are summarized in Table 24. On step 1, predisposing variables accounted for 12% of the variance (adjusted R^2), χ^2 (10) = 43.88, p <.0001, a significant increment. With the enabling variables added on step 2, explained variance was 14.1% (adjusted R^2), χ^2 (6) = 8.14, p<.22, a non-significant increment. With physical-need variables entered on step 3, total explained variance increased to 20.3% (adjusted R^2), χ^2 (3) = 24.39, p.<.0001, a significant increment. The likelihood of outpatient contact appeared to be unrelated to enabling characteristics.

Table 24 also illustrates that with predisposing, enabling and physical-need variables in the model, three variables registered significant impact on the likelihood of Outpatient-contact. Past-year outpatient contact was more likely among those who reported more (a) social contacts (*pr* = .098) (b) health worry (*pr* = .059), and (c) chronic illnesses (*pr* = .125).

Table 24: Logistic hierarchical multiple regression of predisposition, enablement and physical-need on past-year hospital out-patient contact versus no contact, showing odds ratios (OR), partial correlations (*pr*), generalized R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives (N = 561).

	Steps					
	1		2		3	
Variables	OR	*pr*	OR	*pr*	OR	*pr*
Predisposition						
Sex	1.119		1.061		0.926	
Age		.000		.034		.000
Ethnicity	0.787		0.730		0.701	
Qualifications	1.165		1.215		1.203	
Unemployed	1.109		1.018		0.828	
Fulltime Work	0.612		0.710		0.634	
Social Contacts		.072*		.089*		.098**
GP-satisfaction		.000		.000		.000
Health Worry		.183***		.175***		.059*
Health Control		.000		.000		.000
Enablement						
Living Standard				-.017		.000
Income Adequacy				.000		.000
Health Insurance			0.829		0.669	
CS Card			1.326		0.983	
GP-resources				.000		.000
GP-fee			1.409		1.288	
Physical-need						
Impaired ADLs						.034
Chronic Illnesses						.125**
Perceived Health						.000
R^2	.076***		.089***		.128***	
Adjusted R^2	.120		.141		.203	
R^2 change	.076***		.013		.039***	

* p < .05, ** p < .01, *** p < .0001

GP-contact. Table 25 shows the regression results for past-year GP-contact. Predisposing variables accounted for 18.7% of the variance (adjusted R^2), χ^2 (10) = 52.22, p<.0001, a significant increment. With the entry of enabling variables on step 2, total explained variance was 21.3% (adjusted R^2), χ^2 (6) = 8.72, p<.18, a non-significant increment. The addition of

need variables on step 3 increased total explained variance to 22.6% (adjusted R^2), χ^2 (3) = 5.80, p<.12, a non-significant increment. Predisposition alone was important in explaining the likelihood of GP-contact.

Table 25: Logistic hierarchical multiple regression of predisposition, enablement and physical-need on past-year GP-contact versus no contact, showing odds ratios (OR), partial correlations (*pr*), generalized R^2, adjusted R^2, and R^2 change NZ Vietnam War veterans and their wives (N = 556).

	Steps					
	1		2		3	
Variables	OR	*pr*	OR	*pr*	OR	*pr*
Predisposition						
Sex	0.278**		0.292**		0.281*	
Age		.000		.000		.000
Ethnicity	0.631		0.682		0.687	
Qualifications	1.143		1.109		1.113	
Unemployed	0.567		0.602		0.522	
Fulltime Work	0.955		0.800		0.757	
Social Contacts		.000		.000		.000
GP-satisfaction		.000		.000		.000
Health Worry		.286**		.306**		.220**
Health Control		.000		.000		.000
Enablement						
Living Standard				.000		.000
Income Adequacy				.000		.000
Health Insurance			1.575		1.436	
CS Card			0.656		0.542	
GP-resources				.000		.000
GP-fee			0.772		0.728	
Physical-need						
Impaired ADLs						.040
Chronic Illnesses						.000
Perceived Health						.000
R^2	.102**		.116**		.123**	
Adjusted R^2	.187		.213		.226	
R^2 change	.102**		.014		.007	

* p < .001, ** p < .0001

Two predisposing variables were significant after the three blocks of variables had been entered into the model. Those who worried more about their health were more likely to have had GP-contact (*pr* = .220), while contact was less likely among veterans[4]; that is, veterans were over 3.5 times less likely (OR = .281) than wives to have had GP-contact.

[4]The Sex variable had two levels which consisted of veteran and wife.

Secondary-care-contact. Table 26 contains the hierarchical multiple logistic regression results on the likelihood of past-year contact with secondary services. On step 1, predisposing variables accounted for 18.1% of the explained variance (adjusted R^2), χ^2 (10) = 54.32, p<.0001, a significant increment. On step 2, with the addition of enabling variables, total explained variance was 20.6% (adjusted R^2), χ^2 (6) = 8.29, p<.21, a non-significant increment. Need variables, entered on step 3, increased the explained variance to 22.9%, (adjusted R^2), χ^2 (3) = 7.62, p<.04, a significant increment. Enablement appeared to have no influence on the likelihood of secondary-care-contact.

Five variables were significant after the three blocks of variables had been entered into the model. Those who had (a) more health worry (*pr* = .212), (b) more perceived control over their health (*pr* = .137), (c) educational qualifications (OR = 1.8), and (d) a higher number of impaired ADLs (*pr* = .070) were more likely to contact secondary health-care services in the past year. The fifth variable, Sex, indicated that veterans were less likely to have had secondary health-care contact; they were almost 2 times less likely (OR = .519) than wives to have had such contact.

Table 26: Logistic hierarchical multiple regression of predisposition, enablement and physical-need on past-year secondary-care-contact versus no contact, showing odds ratios (OR), partial correlations (*pr*), generalized R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives (N = 549).

	Steps					
	1		2		3	
Variables	OR	*pr*	OR	*pr*	OR	*pr*
Predisposition						
Sex	0.522*		0.531*		0.519*	
Age		.000		.000		.000
Ethnicity	0.597		0.614		0.609	
Qualifications	1.864*		1.799*		1.853*	
Unemployed	0.931		0.848		0.709	
Fulltime Work	1.910		1.650		1.525	
Social Contacts		.000		.000		.000
GP-satisfaction		.000		.000		.000
Health Worry		.284***		.307***		.212***
Health Control		.109**		.122**		.137**
Enablement						
Living Standard				.000		.000
Income Adequacy				.000		.000
Health Insurance			1.454		1.325	
CS Card			1.261		1.022	
GP-resources				.000		.000
GP-fee			2.148*		2.104*	
Physical-need						
Impaired ADLs						.070*
Chronic Illnesses						.000
Perceived Health						.000
R^2	.095***		.108***		.120***	
Adjusted R^2	.181		.206		.229	
R^2 change	.095***		.013		.012*	

* p < .05, ** p < .01, *** p < .0001

9.2.1.2 Informal health-care contact

Tables 27 to 29 display the results of the logistic regression analyses explaining veterans and their wives' contact with three informal service variables. Measures of these categories were whether or not respondents had: obtained prescriptions for their own use; taken bedrest due to poor health and cutback usual activites due to poor health.

Prescription-contact. The regression results explaining the likelihood of prescription use are shown in Table 27. On step 1, predisposing variables accounted for 22% of the explained variance (adjusted R^2), χ^2 (10) = 85.06, p<.0001. On step 2, with the addition of enabling

variables, total explained variance was 28% (adjusted R^2), χ^2 (6) = 21.81, p<.001. Physical-need variables, entered on step 3, increased the amount of explained variance to 32.8% (adjusted R^2), χ^2 (3) = 21.04, p<.0001. Each of the three components was important in explaining of the likelihood of prescription use by veterans and wives.

With the three components entered into the model, nine variables emerged as significantly associated with the likelihood of obtaining prescriptions. Of these, five were predisposing and two each were enabling and physical-need variables. Groups more likely to have obtained prescriptions were those who were (a) older (*pr* = .087), and who had more (b) GP-satisfaction (*pr* = .059) (c) health worry (*pr* = .229), (d) health control (*pr* = .109), (e) GP-resources (*pr* = .119) (f) ADL impairments (*pr* = .075) and (g) had health insurance (OR = 2.1). On the other hand, two groups were less likely to obtain prescriptions: those with positive perceived health (*pr* = -.070) and veterans (OR = .302). Veterans were more than 3 times less likely than wives to have obtained prescriptions.

As shown in Table 27, Health Control, which had been entered on step 1, did not reach significance until step 2. The 'delay' in attaining significance suggests that enabling variables had a suppression effect on irrelevant variance belonging to Health Control. This effect involves later-entered IVs (i.e., enabling variables) accounting for variance which belongs to an earlier-entered variable (i.e., Health Control) (Tabachnick & Fidell, 1989). As a result of suppressing this variance, the earlier-entered variable now becomes significant. However, since its significance depends on the other IVs, clearcut conclusions cannot be drawn regarding the independence of its impact on the DV. Similarly, another variable entered on step 1, GP-satisfaction, attained significance only on step 3, suggesting that physical-need variables suppressed irrelevant variance. A 'reverse' pattern was found with GP-fee, an

enabling variable that was significant only up until step 3. This occurrence suggested that the impact of GP-fee may have been partly mediated through physical-need. Thus, in addition to its direct association with an increased likelihood of prescription use, GP-fee also contributed to an increased likelihood through its association with need.

Table 27: Logistic hierarchical multiple regression of predisposition, enablement and physical-need on past-year prescription-item-contact versus no contact, showing odds ratios, partial correlations (*pr*), generalized R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives (N = 559).

	Steps					
	1		2		3	
Variables	OR	*pr*	OR	*pr*	OR	*pr*
Predisposition						
Sex	0.366***		0.349***		0.302****	
Age		.095**		.124**		.087*
Ethnicity	0.991		1.010		1.012	
Qualifications	1.355		1.284		1.354	
Unemployed	0.859		0.882		0.635	
Fulltime Work	1.045		0.802		0.705	
Social Contacts		.000		.000		.000
GP-satisfaction		.055		.052		.059*
Health Worry		.318****		.344****		.229****
Health Control		.051		.076*		.109**
Enablement						
Living Standard				.000		.000
Income Adequacy				.000		.000
Health Insurance			2.449**		2.135**	
CS Card			0.723		0.586	
GP-resources				.116**		.119**
GP-fee			1.788*		1.690	
Physical-need						
Impaired ADLs						.075*
Chronic Illnesses						.040
Perceived Health						-.070*
R^2	.142****		.175****		.205****	
Adjusted R^2	.227		.280		.328	
R^2 change	.142****		.033**		.030****	

* p < .05, ** p < .01, *** p < .001, **** p < .0001

Bedrest-contact. Table 28 shows the results of the logistic regression analysis on the likelihood of bedrest. On step 1, predisposing variables accounted for 10.9% of the explained variance (adjusted R^2), χ^2 (10) = 47.96, p<.0001. With the addition of enabling variables on step 2, total explained variance was 14.1% (adjusted R^2), χ^2 (6) = 13.15, p<.04. On step 3 with the addition of the physical-need variables, total explained variance was 18.4% (adjusted

R^2), χ^2 (3) = 22.15, p<.0001. Each component contributed a significant increment to the model and consequently, was relevant to the explanation of the likelihood of past-year bedrest.

Seven variables registered significant independent impact on the likelihood of bedrest: Those who worried more about their health (*pr* = .075), were satisfied with their living standard (*pr* = .099) and had more ADL impairments (*pr* = .062) were more likely to have had bedrest. On the other hand, respondents who were (a) older (*pr* = -.079), (b) unemployed (OR = .646), (c) positive about their perceived health (*pr* = -.100) and (d) reported adequate incomes (*pr* = -.052) were less likely to have had bedrest. Although Unemployed did not have a significant impact on step 1, it registered a significant impact on step 3, indicating that the physical-need block of variables suppressed irrelevant variance between the Unemployed status and Bedrest-contact.

Table 28: Logistic hierarchical multiple regression of predisposition, enablement and physical-need on past-year bedrest-contact versus no bedrest contact, showing odds ratios (OR), partial correlations (*pr*), generalized R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives (N = 562).

	Steps					
	1		2		3	
Variables	OR	*pr*	OR	*pr*	OR	*pr*
Predisposition						
Sex	0.954		1.015		1.058	
Age		-.068*		-.054*		-.079**
Ethnicity	1.054		1.056		1.014	
Qualifications	0.942		0.981		0.966	
Unemployed	0.746		0.677		0.646*	
Fulltime Work	0.964		0.999		0.939	
Social Contacts		.000		.000		.000
GP-satisfaction		.000		.000		.000
Health Worry		.188***		.180***		.075*
Health Control		.000		.000		.000
Enablement						
Living Standard				.071*		.099**
Income Adequacy				-058*		-.052*
Health Insurance			1.348		1.218	
CS Card			1.372		1.097	
GP-resources				.000		.000
GP-fee			1.391		1.358	
Physical-need						
Impaired ADLs						.062*
Chronic Illnesses						.000
Perceived Health						-.100*
R^2	.082***		.106***		.138***	
Adjusted R^2	.109		.141		.184	
R^2 change	.082***		.024*		.032***	

* p < .05, ** p < .01, *** p < .0001

Cutback-contact. Table 29 shows that predisposing variables accounted for 14.7% of the explained variance in Cutback-contact (adjusted R^2), χ^2 (10) = 64.61, p<.0001. With the entry of enabling variables on step 2, total explained variance in Cutback-contact was 17.5% (adjusted R^2), χ^2 (6) = 13.22, p<.03, a significant increment. The entry of physical-need variables on step 3 increased total explained variance in Cutback-contact to 22.9% (adjusted R^2), χ^2 (3) = 24.40, p<.0001. Each component contributed a significant increment to the model and thus was important in the explanation of whether or not respondents had cutback days.

With three components entered, seven variables had a significant impact on Cutback-contact in the past three months. Of these, three were predisposing, one each enabling and physical-need. There was an increased likelihood of cutback among those who had more (a) health worry (*pr* = .082), (b) GP-resources (*pr* = .088), (c) ADL impairments (*pr* = .048) and (d) chronic illnesses (*pr* = .051). There was a decreased likelihood of cutback among veterans (OR = .645), Maori (OR = .574) and those with positive perceived health (*pr* = -.085). Two predisposing variables, sex and ethnicity, attained significance only after the entry of physical-need.

Summary of health-care contact. Main findings to have emerged from the first 3 steps of logistic analyses of the contact service variables were as follows: The predisposing component accounted for most of the explained variance, with physical-need accounting for comparatively less. However, the enabling component registered the least impact, failing also to add anything significant to formal contact service variables.

Table 29: Logistic hierarchical multiple regression of predisposition, enablement and physical-need on past-three-months cutback-contact versus no contact, showing odds ratios (OR), partial correlations (*pr*), generalized R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives (N = 562).

	Steps					
	1		2		3	
Variables	OR	*pr*	OR	*pr*	OR	*pr*
Predisposition						
Sex	0.729		0.701		0.645*	
Age		.000		.000		.000
Ethnicity	0.654		0.612		0.574*	
Qualifications	1.122		1.193		1.175	
Unemployment	0.862		0.780		0.637	
Fulltime Work	1.058		1.169		1.099	
Social Contacts		.000		.000		.000
GP-satisfaction		.000		.000		.000
Health Worry		.212***		.199***		.082**
Health Control		-.044		-018		.000
Enablement						
Living Standard				.018		.000
Income Adequacy				.000		.000
Health Insurance			1.102		0.952	
CS Card			1.366		1.052	
GP-resources				.086**		.088**
GP-fee			1.129		1.060	
Physical-need						
Impaired ADLs						.048*
Chronic Illnesses						.051*
Perceived Health						-.085**
R^2	.109***		.130***		.170***	
Adjusted R^2	.147		.175		.229	
R^2 change	.109***		.021*		.040***	

* p < .05, ** p < .01, *** p < .0001

9.2.2 Health-care volume

Assumption checking for OLS analyses. Assumptions regarding the normality of variable distributions are stricter for OLS regressions than for LMR regressions because the latter were designed to investigate the probability of rare dichotomous-distributed outcomes. Thus, while OLS regressions are compromised by non-normality of variable distribution, LMR regressions are not (Nagelkerke, 1991). In addition, OLS analyses involved samples of varying sizes (e.g., consumers of GP-care), so data screening for normality of distribution was addressed anew for each volume-service variable. The main assumption that was checked for OLS regressions was that independent and dependent variables were normally distributed.

Assumption checking for OLS analyses: Dependent variables. All volume measure, except Hospital-volume, were severely positively skewed and logarithmic transformation substantially reduced skewness. Consequently, the log transformations of the five volume measures were included in all multivariate analyses involving volume of health care[5].

Assumption checking for OLS analyses: Independent variables. Preliminary analyses for each of the volume service variables was made to determine that the assumptions of OLS regression had not been violated. This included examining univariate, bivariate and multivariate relationships for distribution normality, additivity, linearity and multicollinearity. Standard assumption checking procedures revealed several significant violations of OLS assumptions (Tabachnick & Fidell, 1989). In addition, the number of multivariate outliers, identified by the criterion of $p<.001$ (χ^2 (19) = 43.82) for Mahalanobis Distance[6], varied across the volume service categories. Since the OLS multiple regression analyses were confined to those who actually consumed specified types of health-care, both the sample sizes and their composition varied across the volume service variables[7]. This necessitated checking anew assumptions about variable distributions and multivariate outliers for ***each*** of the service variables. Details of data screening for each volume service-variable are presented prior to reporting OLS regression results for that variable.

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[5]In the utilization literature, severe skewness has usually been corrected through truncating the offending DV (e.g., Wolinsky & Coe, 1983; Wolinsky et al., 1989; Wolinsky & Johnson, 1991). Typically, truncations are applied at the points in the distributions where the tail has become noticeably flat. In the present preliminary analyses, however, truncations had a disappointingly weak corrective effect on skewness, and hence were abandoned in favour of logarithmic transformations.

[6]Mahalonobis Distance is the appropriate statistical procedure in standard regression procedures for checking the presence of multivariate outliers which "are cases that have an unusual pattern of scores" (Tabachnick & Fidell, 1989, p. 68). If a case exceeds a Mahalonobis Distance (which, by convention, is set at $p < .001$), it has too much influence in the analysis and is a potential candidate for deletion from analysis.

[7]Initially, all analyses involving the service-volume measures were to have been confined to consumers of the services, with non-consumers excluded. However, since relatively few respondents had used hospital services in the past year, the ratio of the number of users to independent variables failed to meet the OLS multiple regression criterion of *at least* five cases for each independent variable (Tabachnick & Fidell, 1989). Thus, in order to avoid removing this dependent measure from the analyses, it was 'opened up' to include all respondents, consumers and non-consumers alike.

9.2.2.1 Formal health-care volume

Results of the OLS multiple regression analyses on volume of formal health services utilization are displayed in Tables 30 to 32. Service variables examined included the volume of: different hospital-based services, GP visits and different secondary services.

Hospital-volume. The Hospital-volume measure was a summed index of the number of different hospital services had been utilized in the past year, and ranged from none to three. Hospital services included Inpatient-, Outpatient- and A&E-care. Four IVs were highly positively skewed: Impaired ADLs, Chronic Illnessess, Trauma and Life Changes[8]. Logarithmic transformation of Impaired ADLs and square root transformation of the other three variables markedly reduced skewness. GP-satisfaction was moderately negatively skewed, but it was left untransformed because transformation did not alter results. Six cases, identified as multivariate outliers, were deleted.

The results for the number of different hospital services utilized in the past year are shown in Table 30. Predisposing variables, entered on the first step, accounted for 10.4% of the explained variance (R^2), F (10,545) = 6.39, p<.0001. With enabling variables entered on the second step, total explained variance was 11.9%, F (16,539) = 4.563, p<.0001. The R^2 change when the enabling variables were introduced was not significant, F (16,539) = 4.600, p. < .18. The entry of physical-need variables on the third step increased total explained variance to 15%, F (19,536) = 4.995, p<.0001. The R^2 change on step 3 was also significant, F (19,536) = 6.54, p<.0001. Thus, while predisposition and physical-need were important in the explanation of volume of hospital services utilized, enablement was not.

[8]Psychological-need variables were introduced into analyses on step 4 and, therefore, first appear in the regressions in Chapter 10.

On step 3, three predisposing and one physical-need variable registered independent impact on the number of hospital services used. More (a) Social Contacts (β = .094), (b) GP-satisfaction (β = .096), (c) Health Worry (β = .158) and more chronic illnesses (β = .160) were significantly associated with use of more hospital-based care. Social Contacts, entered on step 1, attained significance only on step 2. By itself, Social Contacts was a weak predictor of Hospital-volume. This suggested that the impact of Social Contacts may have been partly mediated through enabling variables.

Table 30: OLS hierarchical multiple regression of predisposition, enablement and physical-need on past-year volume of hospital services utilized, showing standardized regression coefficients, R, R^2 adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives (N = 556).

	Steps		
Variables	1	2	3
Predisposition			
Sex	.032	.021	-.011
Age	.078	.084	.037
Ethnicity	-.029	-.033	-.024
Qualifications	.012	.022	.024
Unemployed	-.029	-.055	-.071
Fulltime Work	-.088	-.053	-.066
Social Contacts	.077	.084*	.094*
GP-satisfaction	.087*	.098*	.096*
Health Worry	.274****	.256****	.158**
Health Control	-.052	-.038	-.020
Enablement			
Living Standard		-.068	-.053
Income Adequacy		.015	-.021
Health Insurance		-.025	-.052
CS Card		.092	.052
GP-resources		.032	.030
GP-fee		.012	-.003
Physical-need			
Impaired ADLs			.081
Chronic Illnesses			.160**
Perceived Health			-.045
R	.324	.345	.387
R^2	.104****	.119****	.150****
Adjusted R^2	.088	.093	.120
R^2 change	.104****	.015	.031***

* p < .05, ** p < .01, *** p < .001, **** p < .0001

GP-volume. Six variables showed marked positive skewness, five of which were improved by square root transformation; these were Chronic Illnesses, Trauma, Life Changes and GP-resources. The sixth variable, Impaired ADLs, was improved by logarithmic transformation. Three cases qualified as multivariate outliers and were deleted from GP-volume analyses.

Table 31 displays the regression results for the number of past-year GP visits. Entered on step 1, predisposing variables accounted for 21.5% of the explained variance (R^2), F (10,468) = 12.83, p<.0001. With the enabling variables entered on step 2, total explained variance was 24.4%, F (16,462) = 9.35 p<.01. The R^2 change was significant, F (16,462) = 3.00, p<.006. On step 3 with physical-need variables entered, total explained variance 30.6%, F (19,459) = 10.683, p.<.0001. The R^2 change was significant, F (19,459) = 13.650, p<.0001.

On step 3, seven variables were significant; these were two predisposing, two enabling and the three physical-need variables. Those who were more frequent in their use of GP-services had (a) health insurance (β = .099), and more (b) health worry (β = .267) (c) GP- resources (β = .103), (d) ADL impairments (β = .123), and (e) chronic illnesses (β = .162). Those who were less frequent in their GP-visits were veterans (β = -.161) and those with positive health perceptions (β = -.152). Table 31 also shows that being unemployed was significantly associated with frequency of GP-care, but only up to the entry of physical-need, indicating that its impact may have been mediated in part through its relationship with physical-need.

Table 31: OLS hierarchical multiple regression of predisposition, enablement and physical-need on past-year volume of GP-services utilized, showing standardized regression coefficients, R, R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives (N = 479).

	Steps		
Variables	1	2	3
Predisposition			
Sex	-.140**	-.138**	-.161***
Age	.056	.048	-.013
Ethnicity	.004	.005	.001
Qualifications	-.006	-.018	-.027
Unemployed	.142*	.123*	.084
Fulltime Work	-.033	-.001	-.019
Social Contacts	.048	.030	.047
GP-satisfaction	.032	.020	.023
Health Worry	.412****	.411****	.267****
Health Control	-.044	-.047	.004
Enablement			
Living Standard		-.054	-.018
Income Adequacy		.062	.072
Health Insurance		.130**	.099*
CS Card		.064	.000
GP-resources		.109**	.103**
GP-fee		-.011	-.032
Physical-need			
Impaired ADLs			.123*
Chronic Illnesses			.162**
Perceived Health			-.152**
R	.463	.494	.553
R^2	.215****	.244****	.306****
Adjusted *R2*	.198	.218	.277
R^2 change	.215****	.030**	.062****

* p < .05, ** p < .01, *** p < .001, **** p < .0001

Secondary-care-volume. Marked positive skewness was evident in six variables: Chronic Illnesses, Trauma, Life Changes, Impaired ADLs, Living Standard and GP-resources. Marked negative skewness was evident in GP-satisfaction. The first three variables were improved following square root transformations and Impaired ADLs was improved following logarithmic transformation. Transformation improved neither Living Standard nor GP-resources, hence they remained untransformed. GP-satisfaction was noticeably improved through square-root transformation. Five cases were deleted, having been identified as multivariate outliers.

Table 32: OLS hierarchical multiple regression of predisposition, enablement and physical-need on volume of secondary health services utilization, showing standardized regression coefficients, R, R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives (N = 478).

	Steps		
Variables	1	2	3
Predisposition			
Sex	-.075	-.064	-.050
Age	-.033	-.036	-.054
Ethnicity	-.012	-.006	.000
Qualifications	.148***	.123**	.120**
Unemployed	-.076	-.080	-.086
Fulltime Work	-.004	-.056	-.068
Social Contacts	.053	.037	.045
GP-satisfaction	.056	.056	.051
Health Worry	.338****	.352****	.316****
Health Control	-.044	-.047	-.053
Enablement			
Living Standard		.003	.004
Income Adequacy		.053	.056
Health Insurance		.174***	.163***
CS Card		-.017	-.009
GP-resources		.000	.000
GP-fee		.043	.020
Physical-need			
Impaired ADLs			.158**
Chronic Illnesses			.036
Perceived Health			.080
R	.372	.408	.428
R^2	.139***	.166***	.183***
Adjusted R^2	.120	.137	.149
R^2 change	.139***	.027*	.017*

* p < .05, ** p < .01, *** p < .0001

Table 32 shows that, with respect to the use of secondary care, predisposition explained 13.9% of the variance (R^2), F (10,467) = 7.54, p<.0001. Enablement, entered on step two, increased explained variance to 16.6%, F (16,461) = 5.76, p<.0001. The R^2 change following entry of the enabling block was significant, F (16,461) = 2.54, p<.05. Physical-need, entered on step 3, increased explained variance to 18.3%, F (19,458) = 5.42, p<.0001. The R^2 change following entry of physical-need was significant, F (19,458) = 3.20, p<.05.

Table 32 further shows that with the three components entered, four variables had an independent impact on the number of secondary services utilized. More secondary services

were used by those who had (a) educational qualifications (β = .120), (b) more health worry (β = .316), (c) health insurance (β = .163), and (d) more ADL impairments (β = .158).

9.2.2.2 Informal health-care volume

Tables 33 to 35 detail the results of the OLS multivariate regressions on the volume of use of three informal services; namely, the number of: past-year prescription items, bedrest days and past-three-months cutback days.

Prescription-volume. Four variables were highly positively skewed (Chronic Illnesses, Impaired ADLs, Trauma and Life Changes)[9]. One variable (GP-satisfaction) was highly negatively skewed. Square-root transformation greatly improved them all. Multivariate outliers totalled three and these were deleted from the prescription-volume analysis.

Regarding the number of prescription items obtained by respondents, Table 33 shows that predisposing variables accounted for 20.1% of the variance (R^2), F (10,438) = 11.03, p<.0001. On step 2, with the addition of enabling variables, total explained variance was 21.6%, F (16,432) = 7.46, p<.0001. The R^2 change resulting from the enabling block was not significant, F (16,432) = 1.40, p<.21. With entry of physical-need variables on step 3, total explained variance was 28.6%, F (19,429) = 9.04, p<.0001. The R^2 change on this step was significant (adjusted R^2), F (19,429) = 13.91, p<.0001.

On step 3, five variables contributed significantly to explaining the number of past-year prescriptions. More prescriptions were utilized by those who were unemployed (β = .153), had

[9]Psychological-need variables were entered into analyses on step 4. Results for step 4 are described in Chapter 10.

more health worry (β = .112) and more chronic illnesses (β = .209). Fewer prescriptions were utilized by veterans (β = -.153) and those with positive health perceptions (β = -.177).

Of the six significant predisposing variables in step 1, three (Age, Qualifications and Health Control) were significant only up to the entry of physical-need variables on step 3. This suggests that those three variables may have been mediated in part through the physical-need variables. Thus, being older, having educational qualifications and more health worry may have contributed to increased prescription use through their associationwith physical-need.

Table 33: OLS hierarchical multiple regression of predisposition, enablement and physical-need on volume of past-year prescription-item utilization, showing standardized regression coefficients, R, R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives (N = 449).

	Steps		
Variables	1	2	3
Predisposition			
Sex	-.109*	-.108*	-.153**
Age	.094*	.094*	.035
Ethnicity	-.022	-.013	-.015
Qualifications	.097*	.096*	.080
Unemployed	.222***	.186**	.153*
Fulltime Work	.040	.057	.041
Social Contacts	-.043	-.033	-.025
GP-satisfaction	.044	.041	.047
Health Worry	.273****	.241****	.112*
Health Control	-.125*	-.119*	-.052
Enablement			
Living Standard		-.069	-.027
Income Adequacy		-.038	-.030
Health Insurance		.038	.005
CS Card		.096	.032
GP-resources		.004	-.006
GP-fee		-.061	-.072
Physical-need			
Impaired ADLs			.051
Chronic Illnesses			.209****
Perceived Health			-.177**
R	.448	.465	.534
R^2	.201****	.216****	.286****
Adjusted R^2	.183	.187	.254
R^2 change	.201****	.015	.070****

* p < .05, ** p < .01, *** p < .001, **** p < .0001

Bedrest-volume. Distributions for variables showed that four were highly positively skewed (Impaired ADLs, PTSD, Trauma and Life Changes) and one was highly negatively skewed (Wellbeing). All five were improved with square-root transformations. One multivariate outlier was identified and deleted from the volume-of-bedrest regression.

The results of the regression analysis for volume of bedrest days are shown in Table 34. Predisposing variables accounted for 25.9% of the variance (R^2), F (10,279) = 9.76, p<.0001. With the entry of enabling variables on step 2, total explained variance was 27.6%, F (16,273) = 6.50, p<.0001. The R^2 change after entry of the enabling variables was not significant, F (16,273) = 1.05, p<.38. On step 3, physical-need variables increased total explained variance to 31.3%, F (19,270) = 6.49, p<.0001. The R^2 change following the entry of the physical-need variables was significant, F (19,270) = 4.94, p<.01.

With the three components entered, three variables registered significant independent impact on the number of bedrest days. More bedrest days were taken by those who were employed (β = .147) and reported more ADL impairments (β = .173) and fewer were taken by those who reported having less control over their health (β = -.113). Health worry was significant up until the entry of physical-need variables, indicating that its influence on frequency of bedrest was mediated partially through its relationship with physical-need.

Table 34: OLS hierarchical multiple regression of predisposition, enablement and physical-need on volume of past-year bedrest days, showing standardized regression coefficients, R, R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives (N = 290).

	Steps		
	1	2	3
Predisposition			
Sex	-.079	-.071	-.062
Age	-.018	-.004	-.047
Ethnicity	.090	.085	.097
Qualifications	-.009	-.006	-.004
Unemployed	.184**	.191**	.147*
Fulltime Work	-.089	.089	-.097
Social Contacts	-.030	-.023	-.008
GP-satisfaction	-.001	.001	.007
Health Worry	.249****	.229***	.113
Health Control	-.184**	-.173**	-.131*
Enablement			
Living Standard		-.077	-.055
Income Adequacy		-.052	-.052
Health Insurance		.026	-.002
CS Card		-.030	-.081
GP-resources		.098	.097
GP-fee		-.004	-.015
Physical-need			
Impaired ADLs			.173**
Chronic Illnesses			.077
Perceived Health			-.089
R	.509	.525	.560
R^2	.259****	.276****	.313****
Adjusted R^2	.232	.233	.265
R^2 change	.259****	.017	.037**

* p < .05, ** p < .01, *** p < .001, **** p < .0001

Cutback-volume. Distributions for Impaired ADLs, PTSD, Trauma and Life Changes were highly skewed. Square-root transformations improved all of them except Life Changes which was improved by logarithmic transformation. There were no multivariate outliers.

Results for the regression analysis of cutback days are displayed in Table 35. Predisposing variables accounted for 32.4% of the variance (R^2), F (10,214) = 10.29, p<.0001. Entry of enabling variables in step 2 increased explained variance to 34.3%, F (16,208) = 6.80, p<.0001, and the R^2 change was not significant, F (16,208) = 0.98, p<.43. On step 3, physical-

need variables increased explained variance to 42.6%, F (19,205) = 8.027, p<.0001. The R^2 change with the entry of physical-need was significant, F (19,205) = 9.90, p<.0001.

On step 3, five variables were significant. More cutback days were taken by those who (a) identified themselves as Maori (β = .171), (b) were unemployed (β = .199), (c) worried more about their health (β = .226) and (d) reported more ADL impairments (β = .225). Fewer cutback days were taken by those with positive health perceptions (β = -.272).

Table 35: OLS hierarchical multiple regression of predisposition, enablement and physical-need on volume of past-three-months cutback days, showing standardized regression coefficients, R, R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives (N = 225).

	Steps		
Variables	1	2	3
Predisposition			
Sex	-.096	-.101	-.073
Age	.060	.060	.030
Ethnicity	.159**	.169**	.171**
Qualifications	-.009	-.014	-.049
Unemployed	.201*	.228**	.199*
Fulltime Work	-.109	-.126	-.102
Social Contacts	-.048	-.047	-.027
GP-satisfaction	.002	-.018	-.008
Health Worry	.385****	.376****	.226***
Health Control	.016	.010	.079
Enablement			
Living Standard		-.129	-.095
Income Adequacy		.047	.068
Health Insurance		.003	-.109
CS Card		-.073	-.150*
GP-resources		.050	.065
GP-fee		-.080	-.091
Physical-need			
Impaired ADLs			.225**
Chronic Illnesses			-.082
Perceived Health			-.272*
R	.570	.586	.653
R^2	.324****	.343****	.426****
Adjusted R^2	.293	.292	.373
R^2 change	.324****	.019	.083****

* p < .05, ** p < .01, *** p< .001, **** p < .0001

9.3 Stage one summary: Explanatory capacity of the three-component model

Cumulative R^2 on steps 1 to 3 of the analyses and the respective contribution of each component to the explained variance are summarized in Table 36 for contact-service measures and in Table 37 for volume-service measures. Emphasis in this summary is on comparisons within the contact-service variables and volume-service variables, respectively[10].

9.3.1 Overall patterns

Several patterns emerged from stage one analyses. First, predisposition dominated the explanation of health care use. Predisposing characteristics were more important than enabling and physical-need characteristics in explaining veterans' and wives' use of health-care.

Second, physical-need consistently emerged as the second most important explanatory component in veterans' and wives' health-care utilization. In five service variables, physical-need accounted for almost one-quarter of the variance or exceeded that amount. However, in two formal contact services (Inpatient- and GP-care) the contribution of physical-need was non-significant; a result suggesting that it was relatively less important in explaining the likelihood of contact with formal services than it was in explaining the frequency of formal health-care use. In addition, physical-need appears to have been more important in explaining ***informal*** than formal contact. Therefore, physical-need was a salient component in explaining firstly, the ***volume*** of health-care use by veterans and wives and secondly, the likelihood of their utilizing informal care.

[10]Comparisons of total explained variance *between* contact services and volume services have not been undertaken because their R^2s were derived through logistic and standard multiple regression procedures, respectively. These two procedures employ non-equivalent equations to calculate explained variance (D.I. Hedderley, personal communication, January 18, 1999). An elaboration on the equations used in these multiple regressions is provided in Chapter 7, Section 7.4.

Third, enablement was a relatively unimportant explanatory component, as evidenced by its small magnitude and the absence of significant impact across several measures of health-care contact and volume. It accounted for very little of the explained variance in almost all service variables, contributing non-significant increments to each formal-contact service variable and each informal-volume service variable. Although weak, enablement contributed to the three informal contact variables and (with one exception) to formal volume.

Fourth, the three-step model provided the best fit for informal contact measures; that is, each component made a significant contribution to these services. It also provided a good fit in explaining use of two volume services (GP- and secondary-care). A more detailed review of the explanatory configuration of the components to contact and volume services as well as to formal and informal types of care is now provided.

9.3.2 Specific explanatory configurations

Formal and informal health-care contact. Table 36 shows that the model explained a similar level of variance in all formal-contact service variables, ranging from 18.9% to 22.9%. Predisposition contributed significantly to each formal contact-service, physical-need to two, and enablement to no contact-service variable. Thus, in no formal contact category did the basic three components each add significant increments to the same service. The model explained a noticeably larger amount of variance in Prescription-contact (32.8%) than in either Bedrest-contact (18.4%) and Cutback-contact (22.9%). Each component contributed significantly to each informal contact service.

Formal and informal health-care volume. The effects of the basic components on formal-volume variables are summarised in Table 37. Total variation explained by the model differed

across the volume variables. The basic model explained about twice the proportion of variance in volume of GP visits (30.6%) than in volume of hospital (15%) and secondary services (18.3%). Predisposition and physical-need contributed to each formal-volume service and enablement to two of three services. Total variance explained by the model varied somewhat across the informal-volume variables, with the largest amount explained for number of cutback days (42.6%) and the least for number of prescriptions (28.6%). Predisposition and physical-need contributed significantly to each informal volume category, whereas enablement contributed to none.

Table 36: Summary of contact-service logistic regressions, showing *cumulative* adjusted R^2, significance of the model at steps 1 to 3, and (percent) contribution of *each* component to the total explained variance.

	Steps[a]		
Health Care	1	2	3
Formal Contact			
Inpatient	.154*	*.175*[b]	*.189**
	(81%)	(11%)	(08%)
Outpatient	.120*	*.141**	.203*
	(59%)	(10%)	(31%)
GP	.187*	*.213**	*.226**
	(83%)	(11%)	(06%)
Secondary	.181*	*.206**	.229*
	(79%)	(11%)	(10%)
Informal contact			
Prescription items	.227*	.280*	.328*
	(69%)	(16%)	(15%)
Bedrest	.109*	.141*	.184*
	(59%)	(17%)	(24%)
Cutback	.147*	.175*	.229*
	(64%)	(12%)	(24%)

a = step 1 = predisposition; step 2 = predisposition + enablement; step 3 = predisposition + enablement + physical-need.
b = Italicised entries denote a non-significant increment on the corresponding step.
* $p < .0001$

Table 37: Summary of volume-service OLS regressions, showing *cumulative* adjusted R^2, significance of the model at steps 1 to 3, and (percent) contribution of *each* component to the total explained variance.

	Steps[a]		
Health Care	1	2	3
Formal volume			
Hospital	.104*	*.119**[b]	.150*
	(69.3%)	(10%)	(20.7%)
GP	.215*	.244*	.306*
	(70.3%)	(9.5%)	(20.2%)
Secondary	.139*	.166*	.183*
	(76%)	(15%)	(9.3%)
Informal volume			
Prescription	.201*	*.216**	.286*
	(70.3%)	(5.2%)	(24.5%)
Bedrest	.259*	*.276**	.313*
	(82.8%)	(5.4%)	(11.8%)
Cutback	.324*	*.343**	.426*
	(76%)	(4.5%)	(19.5%)

a = step 1 = predisposition; step 2 = predisposition + enablement; step 3 = predisposition + enablement + physical-need.
b = Italicised entries denote a non-significant increment on the corresponding step.
* $p < .0001$

9.3.3 Significant predictors of health-care measures

This section reviews the predictors that registered a unique, independent impact on health care on step 3 of the regression analyses. Significant predictors of contact-services are reviewed first, followed by significant predictors of volume-services. For all service variables, the introduction of the physical-need component on step 3 resulted in modest changes to the strength of the significant variables already in the model.

9.3.3.1 Predictors of contact measures

Variables that had a significant impact on health-care contact after the step-3 entry of the physical-need block of variables for stage one are summarized in Table 38[11].

[11] In this section, emphasis in tables summarizing significant predictors is on effect size. To facilitate comparisons of effect sizes, statistics are used that provide more readily interpretable information on the strength of correlations between predictor variables and health-care variables. Specifically, in the *contact*-services comparisons, partial correlations (*prs*) have been displayed for all significant predictors. This is a departure from the use of Odds Ratios (ORs) for all dichotomous IVs in Section 9.2.1, but it makes possible comparisons of effect sizes between dichotomous and continuous IVs. In the *volume*-services comparisons, semipartial correlations (*srs*) have been substituted for betas (β) because *srs* provide more immediately

Predisposing variables. Nine of ten predisposing variables had an impact on at least one health-service variable. **Fulltime Work** was the sole predisposing variable that failed to register an impact on any of the seven contact-service variables. **Health Worry** was the most important predisposing variable in terms of both its 'pervasive' significance across the contact-service variables and the magnitude of its impact on each contact-service variable. **Sex (i.e., being a veteran)**, the second most important predisposing variable, registered an impact on two formal and two informal contact variables. Compared with wives, veterans were 3.5 times less likely to have had GP contact, almost 2 times less likely to have had secondary-services contact, over 3 times less likely to have had prescriptions and 1.5 times less likely to have had cutback days.

Predictors whose impact was confined to relatively few contact-service variables are now reviewed. **Age** impacted on two informal contact variables, but did not have an impact on formal contact variables, with the direction of the impact different for each service. Compared to younger respondents, older ones were more likely to have obtained prescription items, but were less likely to have had bedrest. **Health Control** had an impact on one formal and one informal contact service; those who reported having more control over their health were more likely than others to have used secondary services and prescription items. **GP-satisfaction** emerged as a significant predictor of one formal and one informal contact measures; that is, higher levels of GP-satisfaction were associated with an increased likelihood of contact with inpatient- and prescription-care.

Four predisposing variables had an impact on one contact measure each. These variables were Ethnicity, Qualifications, Unemployed and Social Contacts. While **Ethnicity** did not have an

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interpretable information of effect sizes (i.e., sr^2s represent the percent explained variance uniquely attributable to the IV).

impact on formal contact measure, it had an impact on one informal measure; namely, Maori respondents were 1.5 times *less* likely than non-Maori to have taken cutback days. Those who had educational **Qualifications** were almost two times more likely to have used secondary-care services. **Unemployed** respondents were 1.5 times less likely to have used secondary-care, and those who had more **Social Contacts** were more likely to have had outpatient care.

Enabling variables. No enabling variable exerted an impact on any formal contact variable. Several enabling variables, however, exerted an impact on informal contact variables. Those with more **GP-resources** than others were more likely to have made use of two informal sources of care: Prescription- and Cutback-Contact. Those who possessed **Health Insurance** were more than two times as likely as non-insured respondents to have obtained prescriptions. Respondents who were satisfied with their standard of living and also those who reported *lower* perceived ability to get by on their income compared with others, were more likely to have taken past-year bedrest. C.S. Card and GP-fee failed to have a unique impact on any contact-service variable.

Physical-need variables. Physical-need variables were more frequently significant predictors of informal than formal health-care contact. Across the four formal contact measures, there were just two instances of physical-need variables having significant health-care impact; these variables were **Chronic Illnesses** and **ADL Impairments**. Respondents with more chronic illnesses were more likely to have used outpatient services, and respondents with ADL impairments were more likely to have used secondary-care services. ADL Impairments and **Perceived Health** had an effect on each informal contact measure, while Chronic Illnesses had an impact on one; that is, having more difficulties with everyday activities and poorer perceived health were associated with an increased likelihood of Prescription, Bedrest and

Cutback-Contacts, and a higher number of chronic illnesses was associated with an increased likelihood of Cutback Contact.

Table 38: Summary of *significant* partial correlations and adjusted R^2 values obtained on step 3 of the hierarchical logistic model of predisposition, enablement and physical-need on health-care contact by NZ Vietnam War veterans and their wives.

	Formal Health Care				*Informal Health Care*		
Variables	Inpatient	Outpatient	GP	Secondary	Chemist	Bedrest	Cutback
Predisposition							
Sex			-0.181	-0.068	-0.171		-0.050
Age					0.087	-0.079	
Ethnicity							-0.053
Qualifications				0.080			
Unemployed						-0.049	
Fulltime Work							
Social Contacts		0.098					
GP-satisfaction	0.089				0.059		
Health Worry	0.143	0.059	0.220	0.212	0.229	0.075	0.082
Health Control				0.137	0.109		
Enablement							
Living Standard						0.099	
Income Adequacy						-0.052	
Health Insurance					0.101		
CS Card							
GP-resources					0.119		0.088
GP-fee							
Physical-need							
Impaired ADLs				0.070	0.075	0.062	0.048
Chronic Illnesses		0.125					0.051
Perceived Health					-0.070	-0.100	-0.085
Adjusted R^2	.189	.203	.226	.229	.328	.184	.229
N	561	561	556	549	559	562	562

9.3.3.2 Predictors of volume measures

Table 39 displays variables that had a significant impact on health-care volume after entry into the model of the predisposing, enabling and physical-need variables for stage one.

Predisposing variables. All predisposing variables, except Fulltime Work and Age, had a significant impact on at least one service variable. As with contact-service variables, **Health Worry** was the most important variable regarding both its significant impact on all but one volume variable and the size of its impact which was strongest for GP- and secondary-

services. The second most frequently significant variable was **Unemployed** whose impact was confined to informal care. Unemployed respondents had more prescriptions, bedrest and cutback days than employed respondents. **Being a veteran** (the Sex variable) had an impact on one formal and one informal service; that is, veterans were less frequent consumers of GP- and prescription-care than were wives.

Predisposing variables that had an impact on only one volume variable were Ethnicity, Qualifications, Social Contacts, GP-satisfaction and Health Control. Respondents of Maori ethnicity had more cutback days than non-Maori (**Ethnicity**), those who had educational **Qualifications** used more secondary-care services; those who had more **Social Contacts** and higher levels of **GP-satisfaction** utilized more hospital-based services, and those with more perceived **Health Control** had less bedrest than others.

Enabling variables. Individual enabling variables failed to impact on informal volume service-variables although they had a significant impact on two formal services; that is, respondents who had **Health Insurance** were more frequent in their use of GP- and Secondary Services, and those with more **GP-resources** were also more frequent in their use of GP services. Four of the seven enabling variables failed to exert a significant effect on any volume service variables; namely, Living Standard, Income Adequacy, C.S. Card and GP-fee.

Physical-need variables. Each physical-need variable had a unique impact on at least three volume variables, registering that impact across both formal and informal services. Respondents who had more **Chronic Illnesses** than others were more frequent in their use of all formal services and prescriptions. **ADL Impairments** had an impact on one formal and two informal categories: Those with more impairments were more frequent consumers of GP-

care, bedrest and cutback days. Those with positive health perceptions were less frequent in their use of GP-care, prescriptions and cutback days. Each physical-need variable had its strongest impact on informal health-care.

Table 39: Summary of *significant* semipartial correlations and R^2 values obtained on step 3 of the OLS hierarchical model of predisposition, enablement and physical-need on health-care volume by NZ Vietnam War veterans and their wives.

	Formal Health Care			*Informal Health Care*		
Variables	Hospital	GP	Secondary	Chemist	Bedrest	Cutback
Predisposition						
Sex		-.134		-.127		
Age						
Ethnicity						.162
Qualifications			.113			
Unemployment				.103	.101	.130
Fulltime Work						
Social Contacts	.087					
GP-satisfaction	.090					
Health Worry	.119	.203	.237	.086		.171
Health Control					-.105	
Enablement						
Living Standard						
Income Adequacy						
Health Insurance		.086	.140			
CS Card						
GP-resources		.101				
GP-fee						
Physical-need						
Impaired ADLs		.097			.131	.171
Chronic Illnesses	.122	.126	.122	.165		
Perceived Health		-.101		-.118		-.166
R^2	.150	.306	.183	.286	.313	.426
N	556	479	478	449	290	225

This chapter has reported results for stage-one analyses. The following chapter reports results for stage-two and stage-three analyses. In these analyses, psychological-need and multiple-need components, respectively, were introduced into the health-care model.

CHAPTER TEN

Results: Stages Two and Three

10.1 Chapter overview

The previous chapter reported the results for stage one of the present analyses. Those analyses examined the contribution of predisposition, enablement and physical-need to veterans' and wives' use of health-care. The present chapter reports the results for the second and third stages of analyses. Stage two addressed objectives concerning the contribution of psychological-need to respondents' use of health care. Stage three addressed objectives concerning the contribution of multiple-need to respondents' use of health-care.

10.2 Stage two: Hypothesis 6: Health-care impact of psychological-need

This section describes results from stage two of the present analyses; that is, it describes the impact of the psychological-need block of variables on thirteen service variables. The impact of psychological-need was investigated after taking into account the impact of predisposition, enablement and physical-need . Thus, the model encompassed the same series of hierarchical multiple regression procedures as stage one. In this section, the description resumes with the introduction of the psychological-need block of variables into the model on step 4.

Objectives of stage two were to investigate whether psychological-need enhanced the explained variance in health-care use and to examine the direction of its relationship to health-care. Specifically, analyses tested whether psychological-need made an independent contribution to the explanation of differences in health-care use and whether it was positively related to the likelihood and frequency of health-care use.

10.2.1 Health-care contact

10.2.1.1 Formal health-care contact

Table 40 displays the results on step 4 of the logistic regressions of variables on each of the four formal-contact services.

Table 40: Step 4 of the logistic hierarchical regressions of predisposition, enablement, physical-need and psychological-need on formal health-care contact, showing odds ratios (OR), partial correlations (*pr*), generalized R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives.

	Inpatient		Outpatient		GP		Secondary	
Variables	OR	*pr*	OR	*pr*	OR	*pr*	OR	*pr*
Predisposition								
Sex	0.860		0.720		0.294***		0.444*	
Age		.057		.000		.000		.000
Ethnicity	0.470		0.552		0.772		0.554	
Qualifications	0.760		1.107		1.062		1.941*	
Unemployed	0.366*		0.838		0.575		1.690	
Fulltime Work	0.634		0.671		0.820		1.578	
Social Contacts		.000		.092*		.015		.000
GP-satisfaction		.104*		.000		.000		.000
Health Worry		.158***		.000		.202****		.192****
Health Control		.000		.000		.007		.144**
Enablement								
Living Standard		.000		.000		.000		.009
Income Adequacy		.000		.000		.000		.000
Health Insurance	0.825		0.729		1.582		1.375	
CS Card	1.379		0.982		0.535		1.065	
GP-resources		.000		.000		.000		.000
GP-fee	0.470		1.115		0.672		2.024	
Physical-need								
Impaired ADLs		.000		.000		.033		.052
Chronic Illnesses		.057		.105**		.000		.000
Perceived Health		.000		-.028		.000		.000
Psychological-need								
Wellbeing		.000		.000		.000		.000
Distress		-.113*		.000		.000		.000
PTSD		.000		.000		.000		.000
Trauma		.000		.079*		-.032		.000
Life Changes		.180***		.054		.027		.000
R^2	.118****		.147****		.137****		.124****	
Adjusted R^2	.248		.233		.251		.234	
R^2 change	.028**		.019*		.014		.004	
N	561		561		556		549	

* p < .05, ** p < .01, *** p < .001, **** p < .0001

Inpatient-contact. With the entry of the psychological-need component on step 4, the explained variance in Inpatient-contact increased from 18.9% to 24.8% (adjusted R^2) χ^2 (5) = 17.344, p<.01. Psychological-need was important in explaining the likelihood of inpatient

contact. Five variables registered a significant impact on inpatient care, two of which were psychological-need variables. There was an increased likelihood of being hospitalized among those who reported more (a) GP-satisfaction (*pr* = .104), (b) Health Worry (*pr* = .158), and (c) Life Changes (*pr* = .180). Two groups were less likely to have been hospitalised: Those who reported more distress (*pr* = -.113) and unemployed respondents (OR = .366) who were more than 2.5 times less likely to have been hospitalized. Entered on step 1, Unemployed did not register a significant impact until step 4. This indicated that psychological-need suppressed irrelevant variance between unemployed and inpatient contact. The two other predisposing variables (GP-satisfaction and Health Worry) retained significance from earlier steps, with their effect sizes marginally increased.

Outpatient-contact. On step 4, with psychological-need variables entered, explained variance in contact with outpatient services increased from 20.3% to 23.3% (adjusted R^2), χ^2 (5) = 12 .51, p<.05. Psychological-need was important in explaining Outpatient-contact. With the psychological-need component entered, three variables had a significant impact. Those who had more (a) Social-contacts (*pr* = .092), (b) Chronic Illnesses (*pr* = .105) and (c) Trauma (*pr* = .079) were more likely to have contacted outpatient services. On step 4, the magnitude of the significant predisposing and physical-need variables reduced marginally.

GP-contact. Explained variance in GP-contact increased from 22.6% to 25.1% (adjusted R^2) on step 4, a non-significant increment, χ^2 (5) = 7.75, p<.17. Psychological-need was not an important component in explaining the probability of GP-contact.

Secondary-care-contact. After entry of the psychological-need component on step 4, explained variance increased marginally from 22.9% to 23.4% (adjusted R^2), a non-significant

increment, χ^2 (5) = 2.165, p<.54. Psychological-need was unimportant in explaining the likelihood of secondary-care-contact. Chronic Illnesses, entered on the previous step, lost significance on step 4. However, since the null hypothesis that $R^2 = 0$ was supported on step 4, interpretation of the loss of significance by Chronic Illnesses is not justified (Hosmer & Lemeshow, 1989).

10.2.1.2 Informal health-care contact

Table 41 presents the results from step 4 of the logistic regressions on informal services. Service measures included whether or not prescriptions and bedrest had been used in the past year, and cutback days taken in the past three months.

Prescription-contact. On step 4, explained variance increased from 32.8% to 34.7% (adjusted R^2), a non-significant increment, χ^2 (5) = 8.54, p<.12). Psychological-need was irrelevant to explaining the likelihood of prescription-use. Significant variables remained unchanged from step 3, with slightly reduced effect sizes, but one variable, Perceived Health, lost significance.

Bedrest-contact. On step 4, explained variance in bedrest-contact increased from 18.4% to 19% (adjusted R^2), a non-significant increment, χ^2 (5) = 2.92, p<.71. Seven variables were significant, all of them having been significant on step 3, but the size of their independent impact now slightly reduced. The psychological-need component was unimportant in the explanation of the likelihood of respondents having had bedrest.

Cutback-contact. On step 4, explained variance in cutback-contact increased from 22.9% to 24.1% (adjusted R^2), χ^2 (5) = 6.34, p<.27, a non-significant increment. As with the other informal contact variables, Bedrest-contact did not appear to have an underlying

psychological-need component. The effect sizes of the five variables that had been significant on step three remained the same following the entry of psychological-need on step 4.

Table 41: Step 4 of the logistic hierarchical regressions of predisposition, enablement, physical-need and psychological-need on informal health-care contact, showing odds ratios (OR), partial correlations (*pr*), generalized R^2, adjusted R^2 and R^2 change for NZ Vietnam War veterans and their wives.

	Prescriptions		Bedrest		Cutback	
Variables	OR	*pr*	OR	*pr*	OR	*pr*
Predisposition						
Sex	0.342***		0.974		0.544*	
Age		.098*		-.067*		.000
Ethnicity	1.162		0.959		0.526*	
Qualifications	1.193		0.949		1.184	
Unemployed	0.727		0.545*		0.607	
Fulltime Work	0.718		0.971		1.148	
Social Contacts		.000		.000		.000
GP-satisfaction		.081*		.000		.000
Health Worry		.219****		.063*		.081*
Health Control		.114**		.000		.000
Enablement						
Living Standard		.000		.101**		.000
Income Adequacy		.000		-.047*		.000
Health Insurance	2.271**		1.283		0.989	
CS Card	0.530		1.106		1.122	
GP-resources		.132**		.000		.090**
GP-fee	1.656		1.315		1.017	
Physical-need						
Impaired ADLs		.083*		.051*		.020
Chronic Illnesses		.055		.000		.045
Perceived Health		-.042		-.108**		-.102**
Psychological-need						
Wellbeing		-.031		.000		.000
Distress		.000		.000		-.048
PTSD		.000		.000		.000
Trauma		.000		.000		.000
Life Changes		.000		.004		.000
R^2	.217****		.143****		.179****	
Adjusted R^2	.347		.190		.241	
R^2 change	.012		.005		.009	
N	559		562		562	

* p < .05. ** p < .01, *** p < .001, **** p < .0001

10.2.2 Health-care volume

10.2.2.1 Formal health-care volume

Table 42 presents results on step 4 of the OLS multiple regression analyses on volume of formal health-service use. Measures of services were past-year frequencies of respondents' use of different hospital and secondary services as well as their number of visits to the GP.

Hospital-volume. Explained variance increased from 15% to 18.1% (R^2), F (24,531) = 4.90, p<.0001, with the entry of psychological-need on step 4. The R^2 change was significant, F (24,531) = 4.01, p<.001. Six variables emerged as significant predictors of the number of different hospital services, of which two were psychological-need variables. Those who had more (a) Social Contacts, (β = .094), (b) GP-satisfaction (β = .085), (c) Health Worry (β = .132). (d) Chronic Illnesses (β = .141), (e) Trauma (β = .115) and (f) Life Changes (β = .109) utilized more hospital services. The four non-psychological-need variables had also been significant on step 3, each now having a slightly reduced effect size.

GP-volume. With the entry of the psychological-need variables, the explained variance in frequency of GP-service use increased marginally from 30.6% to 31% (R^2), F (24,454) = 8.50, p<.0001. The R^2 change on step 4 was not significant, F (24,454) = .476, p<.79. The seven variables that registered a significant impact on step 4 remained unchanged from step 3, with negligible change in the magnitude of their impact on GP-care.

Secondary-care-volume. Total explained variance in the number of different secondary services utilized increased from 18.3 to 20.6% (R^2) when the psychological-need variables were entered into the equation, F (24,453) = 4.92, p<.0001. The R^2 change on step 4 was significant, F (24,453) = 2.63, p<.05. Six variables emerged as significant, of which two were

psychological-need variables. More secondary services were used by those with (a) Qualifications (β = .122), (b) Health Insurance (β = .171), and more (c) Health Worry (β = .270), (d) ADL impairments (β = .130), (e) Wellbeing (β = .146) and (f) Distress (β = .171). The four non-psychological variables maintained significance from earlier steps, with marginal increase of effect size in some and decrease in others. Effects of the two psychological-need variables were in the same direction; that is, higher wellbeing levels and higher distress levels were associated with the use of more secondary-care services.

Table 42: Step 4 of the OLS hierarchical regressions of predisposition, enablement, physical-need and psychological-need on formal health-care volume by NZ Vietnam War veterans and their wives, showing standardized regression coefficients, R^2, adjusted R^2 and R^2 change values.

Variables	Hospital	GP	Secondary
Predisposition			
Sex	-.072	-.144**	-.079
Age	.066	-.019	-.026
Ethnicity	-.052	.005	-.020
Qualifications	.015	-.029	.122**
Unemployed	-.071	.093	-.092
Fulltime Work	-.047	-.022	-.069
Social Contacts	.094*	.048	.048
GP-satisfaction	.085*	.028	.049
Health Worry	.132*	.274****	.270****
Health Control	-.014	-.000	-.045
Enablement			
Living Standard	-.038	-.013	-.004
Income Adequacy	.023	.077	.066
Health Insurance	-.034	.094*	.171***
CS Card	.059	-.001	-.003
GP-resources	.034	.103**	.000
GP-fee	-.024	-.024	.000
Physical-need			
Impaired ADLs	.044	.129*	.130*
Chronic Illnesses	.141**	.168**	.006
Perceived Health	-.078	-.139*	.081
Psychological-need			
Wellbeing	-.039	-.061	.146*
Distress	-.146	.016	.171*
PTSD	.104	-.079	.092
Trauma	.115*	.012	.069
Life Changes	.109*	-.022	-.022
R	.425	.557	.454
R^2	.181****	.310****	.206****
Adjusted R^2	.144	.273	.164
R^2 change	.031***	.004	.023*
N	556	480	478

* p < .05, ** p < .01, *** p < .001. **** p < .0001

10.2.2.2 Informal health-care volume

Table 43 presents the OLS regression results for step-4 analyses of the model involving informal volume services. Measures of services were number of prescriptions and bedrest days in the past year and number of cutback days in the past three months.

Table 43: Step 4 of the OLS hierarchical regressions of predisposition, enablement, physical-need and psychological-need on informal health-care volume by NZ Vietnam War veterans and their wives, showing standardized regression coefficients, R^2, adjusted R^2 and R^2 values.

Variables	Prescription	Bedrest	Cutback
Predisposition			
Sex	-.143**	-.109	-.102
Age	.024	-.035	.027
Ethnicity	-.005	.085	.158**
Qualifications	.081	-.026	-.058
Unemployed	.157*	.141*	.203*
Fulltime Work	.041	-.109	-.096
Social Contacts	-.022	.016	-.006
GP-satisfaction	.048	-.002	-.010
Health Worry	.129*	.064	.213**
Health Control	-.052	-.104	.094
Enablement			
Living Standard	-.022	-.040	-.098
Income Adequacy	-.035	-.050	.046
Health Insurance	.005	.011	-.007
CS Card	.036	-.063	-.143*
GP-resources	-.005	.079	.058
GP-fee	-.064	-.047	-.107
Physical-need			
Impaired ADLs	.062	.124	.205**
Chronic Illnesses	.219***	.051	-.091
Perceived Health	-.175**	-.119	-.283**
Psychological-need			
Wellbeing	-.059	-.093	-.041
Distress	-.073	-.088	-.107
PTSD	-.013	.091	.096
Trauma	-.036	.176**	.074
Life Changes	.003	-.040	-.062
R	.537	.586	.660
R^2	.289****	.343****	.435****
Adjusted R^2	.249	.284	.368
R^2 change	.003	.030*	.009
N	449	290	225

* p < .05, ** p < .01, *** p < .0001

Prescription-volume. On step 4, total explained variance increased from 28.6% to 28.9% (R^2), F (24,424) = 7.19, p<.0001. The R^2 change was not significant, F (24,424) = .399, p<.84. The profile of significant variables from earlier steps now had slightly stronger effect sizes.

Bedrest-volume. On step 4, explained varianced increased from 31.3% to 34.3% (R^2), F (24,265) = 5.78, p<.0001. The R^2 change was significant, F (24,265) = 2.42, p<.03. Two variables registered a significant effect on bedrest days. Unemployed respondents (β = .141) and those who reported more lifetime trauma (β = .176) had more days of bedrest. Health control and ADL impairments, two ***physical***-need variables, lost significance on step 4. This indicates that their impact may have been partially mediated through association with psychological-need.

Cutback-volume. On step 4, total explained variance in number of cutback days increased slightly from 42.6% to 43.5% (adjusted R^2), F (24,200) = 6.43, p<.0001. The R^2 change was not significant, F (24,200) = .648, p<.66. Variables that had been significant in prior steps, retained significance on step 4 with marginal alterations in effect sizes.

10.3 Stage two summary: Explanatory capacity of the four-component model

Tables 44 and 45 summarize the cumulative R^2 at each of the 4 steps and each components' contribution to the explained variance in respondents' use of health care. While the addition of the psychological-need variables did not alter the explanatory dominance of predisposition, in two instances it altered the rank-order of the enabling and physical-need components; that is, its net contribution to inpatient contact exceeded the combined contribution of the other two components, and it contributed more than enablement to outpatient contact.

Psychological-need was an important component in the explanation of four formal services: Inpatient- and Outpatient-contact, and Hospital- and Secondary-care-volume. Noteworthy was its contribution to hospital-based services which Andersen viewed as being non-elective sources of health-care (1968; 1995).

Table 44: Summary of contact-service logistic regressions, showing *cumulative* adjusted R^2, significance of the model at steps 1 to 4, and (percent) contribution of *each* component to the total explained variance.

	Steps[a]			
Health Care	1	2	3	4
Formal Contact				
Inpatient	.154*	*.175*[b]	*.189**	.248*
	(62%)	(08%)	(06%)	(24%)
Outpatient	.120*	*.141**	.203*	.233*
	(52%)	(09%)	(26%)	(13%)
GP	.187*	*.213**	*.226**	*.251**
	(75%)	(10%)	(05%)	(10%)
Secondary	.181*	*.206**	.229*	*.234**
	(77%)	(11%)	(10%)	(02%)
Informal contact				
Prescription items	.227*	.280*	.328*	*.347**
	(66%)	(15%)	(14%)	(05%)
Bedrest	.109*	.141*	.184*	*.190**
	(57%)	(17%)	(23%)	(03%)
Cutback	.147*	.175*	.229*	*.241**
	(61%)	(12%)	(22%)	(05%)

a = step 1 = predisposition; step 2 = predisposition + enablement; step 3 = predisposition + enablement + physical-need; step 4 = predisposition + enablement + physical-need + psychological-need.
b = Italicised entries denote a non-significant increment on the corresponding step.
* $p < .0001$

Table 45: Summary of volume-service OLS regressions, showing *cumulative* adjusted R^2, significance of the model at steps 1 to 4, and (percent) contribution of *each* component to the total explained variance.

	Steps[a]			
Health Care	1	2	3	4
Formal volume				
Hospital	.104*	*.119*[b]	.150*	.181*
	(57%)	(09%)	(17%)	(17%)
GP	.215*	.244*	.306*	*.310**
	(69%)	(10%)	(20%)	(01%)
Secondary	.139*	.166*	.183*	.206*
	(68%)	(13%)	(08%)	(11%)
Informal volume				
Prescription	.201*	*.216**	.286*	*.289**
	(70%)	(05%)	(24%)	(01%)
Bedrest days	.259*	*.276**	.313*	.343*
	(76%)	(05%)	(11%)	(08%)
Cutback days	.324*	*.343**	.426*	*.435**
	(75%)	(04%)	(19%)	(02%)

a = step 1 = predisposition; step 2 = predisposition + enablement; step 3 = predisposition + enablement + physical-need; step 4 = predisposition + enablement + physical-need + psychological-need.
b = Italicised entries denote a non-significant increment on the corresponding step.
* $p < .05$, ** $p < .01$, *** $p < .001$, **** $p < .0001$

Compared with the contribution of predisposition and physical-need across the health-care variables, that of psychological-need on step 4 was small, as shown in Tables 44 and 45. Its effect sizes were small both in absolute terms and relative to the other components. Thus, after adjustments were made for the three components of Andersen's (1968) model, psychological-need added very little to the explanation of respondents' use of health-care.

10.4 Stage three: Hypothesis 7: Health-care impact of multiple-need

The sixth objective of the present study was to determine whether multiple-need variables contributed independently to the explanation of veterans' and wives' use of health-care. A further objective was to determine whether psychological-need variables moderated the relationship between physical-need and use of health-care (i.e., to determine whether the effects of physical-health on health-care use differed at different levels of psychological-health). This stage, the final one of three, involved introducing 'multiple-need' (cross-products of physical-need and psychological-need) into the model. It was introduced after controlling for four components (predisposition, enablement, physical-need and psychological-need) sequentially entered in prior steps.

Analyses tested hypothesis 7 that multiple-need would contribute independently to the explanation of veterans' and wives' health care, and that psychological-need would strengthen the association between physical-need and health-care. The hypothesis stated that interactions would exist between physical-need variables and psychological-need variables on veterans' and their wives' use of health services. Hence, vectors were formed by calculating the cross-product terms of physical- and psychological-need variables, which were added to the model

on step 5[1]. Consequently, variance attributable to multiple-need was assessed after controlling for the main effects of the four components previously entered into the model.

10.4.1 Health-care contact

10.4.1.1 Formal health-care contact

The entry of the multiple-need component on step 5 failed to add a significant increment to any of the contact service variables and for the main part, had only a marginal impact on the strength of the variables that had been significant in earlier stages. Appendix 5 provides the regression results for each of these services.

Inpatient-contact. On step 5, with the entry of the multiple-need component, explained variance increased from 24.8% to 29.3% (adjusted R^2) χ^2 (15) = 13.64, p<.55, a non-significant increment. With the exception of two interaction effects[2] (i.e., multiple-need variables), significant variables on step 5 had also been significant at earlier steps. On step 4, distress had been significant, but in the full model no longer had a main effect.

Outpatient-contact. On step 5, multiple-need variables accounted for 3.8% of the total explained variance, an increase from 23.3% to 27.1% (adjusted R^2), χ^2 (15) = 16.10, p.<.37, a non-significant increment. The two variables that registered a unique independent impact, had also been significant following earlier steps.

GP-contact. On step 5, explained variance in GP-contact increased from 25.1% to 28.3%

[1]There were three physical-need variables (ADL Impairments, Chronic Illnesses and Perceived Health) and five psychological-need variables (Wellbeing, Distress, PTSD, Trauma and Life Changes) and a total of fifteen interaction terms.

[2]The multiple-need component failed to contribute a significant increment to the model. Thus, the null hypothesis that the change in R^2 = 0 was supported. Consequently, interpreting individual interaction terms is not justified (Hosmer & Lemeshow, 1989).

(adjusted R^2) χ^2 (15) = 11.26, p<.73, a non-significant increment. In the full model, two predisposing variables continued to exert a significant impact on GP-contact.

Secondary-care-contact. After entry of the multiple-need component on step 5, explained variance increased from 23.4% to 27.8% (adjusted R^2) χ^2 (15) = 13.71, p<.54, a non-significant increment. In the full model, four predisposing variables retained their significance.

10.4.1.2 Informal health-care contact

Prescription-contact. Following the entry of the multiple-need component, explained variance increased from 34.7% to 38.9% (adjusted R^2) χ^2 (15) = 18.75, p<.22, a non-significant addition. In the full model, nine prior-entered variables had a unique impact. One of these variables, Chronic Illnesses, did not register a significant impact until step 5.

Bedrest-contact. On step 5, explained variance increased from 19% to 22.2% (adjusted R^2) χ^2 = (15) 15.89, p<.38, a non-significant increment. In the full model, five previously entered variables had a unique, independent impact. There was also one significant interaction effect. Two hitherto significant variables, Living Standard and Impaired ADLs, now lost significance.

Cutback-contact. There was an increase of explained variance from 24.1% to 28.1% (adjusted R^2) on step 5 χ^2 = (15) 20.40, p<.15, a non-significant increment. In the full model, six variables retained significance from earlier steps and one significant interaction emerged. One variable entered on step 3, Chronic Illnesses, only attained significance on step 5.

10.4.2 Health-care volume

The entry of the multiple-need component on step 5 added a significant increment to one formal and one informal service. Overall, the addition of the fifth block of variables resulted in extremely small changes in effect sizes of variables that were entered into the model in earlier stages. In addition, a few variables that had been significant in earlier stages now lost significance. Table 46 displays step 5 results for the two services for whom the fifth step added a significant increment. Appendix 5 displays the results for the volume services upon which multiple-need failed to have a significant impact.

10.4.2.1 Formal health-care volume

Results of step 5 OLS regressions are described in this section. Table 46 provides the results for formal volume services in which the entry of multiple-need contributed a significant increment.

Hospital-volume. On step 5, explained variance increased from 18.1% to 19.9% (R^2), F (39,516) = 3.29, p<.0001. The R^2 change was non-significant, F (39,516) = .77, p<.70. In the full model, seven variables entered on prior steps, and one interaction effect, had a significant impact on Hospital-volume.

GP-volume. On step 5, explained variance increased from 31% to 32.7% (R^2), F (39,439) = 5.48, p<.0001. The R^2 change was non-significant, F (39,439) = p<.74. In the full model, seven variables registered a unique, independent impact on GP-volume.

Table 46: Step 5 of the OLS hierarchical regressions of predisposition, enablement, physical-need, psychological-need and multiple-need on past-year frequency of use of secondary-care and bedrest by NZ Vietnam War veterans and their wives, showing standardized regression coefficients, R^2, adjusted R^2 and R^2 change values.

Variables	Secondary	Bedrest
Predisposition		
Sex	-.082	-.144*
Age	-.003	-.018
Ethnicity	-.011	.054
Qualifications	.121**	-.047
Unemployed	-.106	.164*
Fulltime Work	-.072	-.052
Social Contacts	.040	.040
GP-satisfaction	.045	.025
Health Worry	.292****	.120
Health Control	-.019	-.116
Enablement		
Living Standard	-.008	-.042
Income Adequacy	.075	-.042
Health Insurance	.180***	.001
CS Card	-.015	-.067
GP-resources	.007	.058
GP-fee	.013	-.023
Physical-need		
Impaired ADLs	.082	.134*
Chronic Illnesses	.012	.071
Perceived Health	.055	-.045
Psychological-need		
Wellbeing	.138	-.234*
Distress	.154	-.280*
PTSD	.115	.058
Trauma	.035	.092
Life Changes	-.026	.007
Multiple-need[a]		
ADL*Wellbeing	.054	-.164
ADL*Distress	.037	-.193
ADL*PTSD	-.068	.050
ADL*Trauma	.168*	.014
ADL*Changes	.053	-.095
Ills*Wellbeing	.096	.175
Ills*Distress	-.087	.189
Ills*PTSD	.104	.017
Ills*Trauma	-.020	-.230***
Ills*Changes	.108*	.091
Health*Wellbeing	.178	.000
Health*Distress	.205	-.003
Health*PTSD	-.116	-.105
Health*Trauma	.024	-.302***
Health*Changes	.053	.035
R	.501	.653
R^2	.251****	.427****
Adjusted R^2	.184	.338
R^2 change	.044*	.083**
N	478	290

* p < .05, ** p < .01, *** p < .001, **** p < .0001
[a] ADL=Impaired ADLs; Ills=Chronic Illnesses; Health=Perceived Health; Changes=Life Changes.

Secondary-care-volume. As shown in Table 46, explained variance increased from 20.6% to 25.1% (R^2) when the multiple-need variables were entered into the equation on step 5, F (39,438) = 3.76, p<.0001. The R^2 change was significant, F (39,438) = 1.73, p<.04. In the full model, five variables, two of which were interaction terms, exerted an independent impact on secondary care. Respondents with Qualifications (β = .121), Health Insurance (β = .180) and more Health Worry (β = .292) consumed a wider range of different secondary services. The effect sizes of the three previously-entered variables were marginally affected by the introduction of the multiple-need variables, with two of them smaller and one bigger. As well, three variables (ADL impairments, Wellbeing and Distress) that had been significant on step 4, no longer exerted an independent health-care impact on step 5. This suggested that the association of these three variables to secondary-care utilization may also have been mediated in part by multiple-need.

As can be seen from Table 46, the two significant interactions suggested that the association between physical-health and Secondary-care-volume depended on the level of psychological-need. Schematic representations of the interactions are displayed in Figures 3 and 4. The data in these figures were derived by conducting median splits of the measures of ADL Impairments, Chronic Illnesses, Trauma and Life Changes. This classification was performed only for purposes of illustration and the variables were treated as continuous in all statistical analyses.

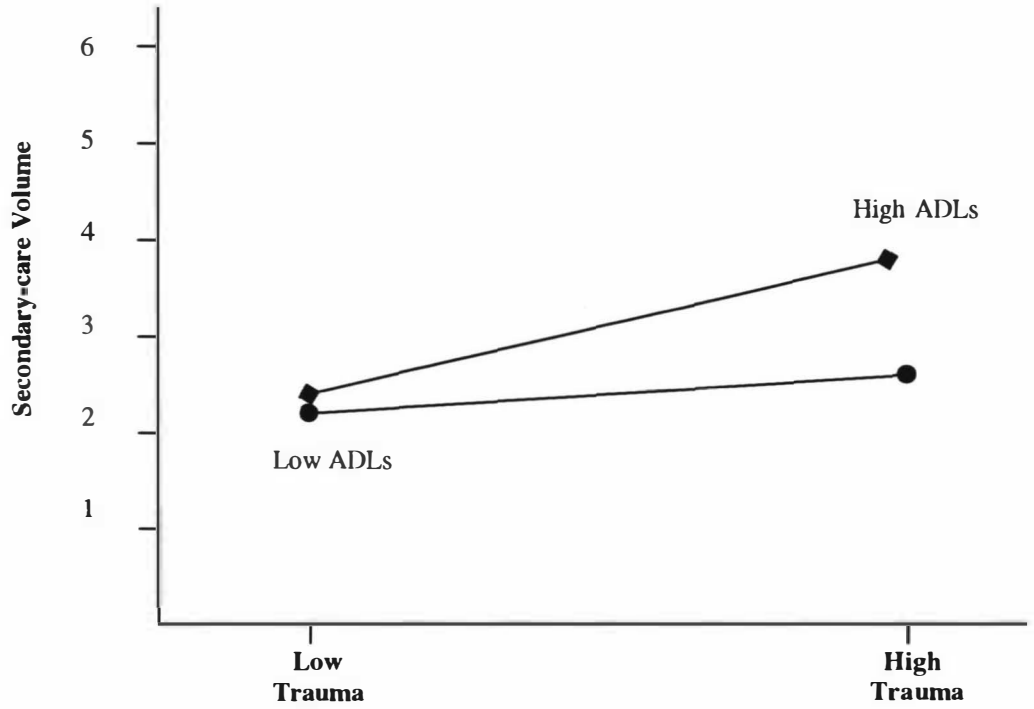

Figure 3. Schematic representation of the Trauma and ADL Impairment interaction in the prediction of past-year secondary-care utilization

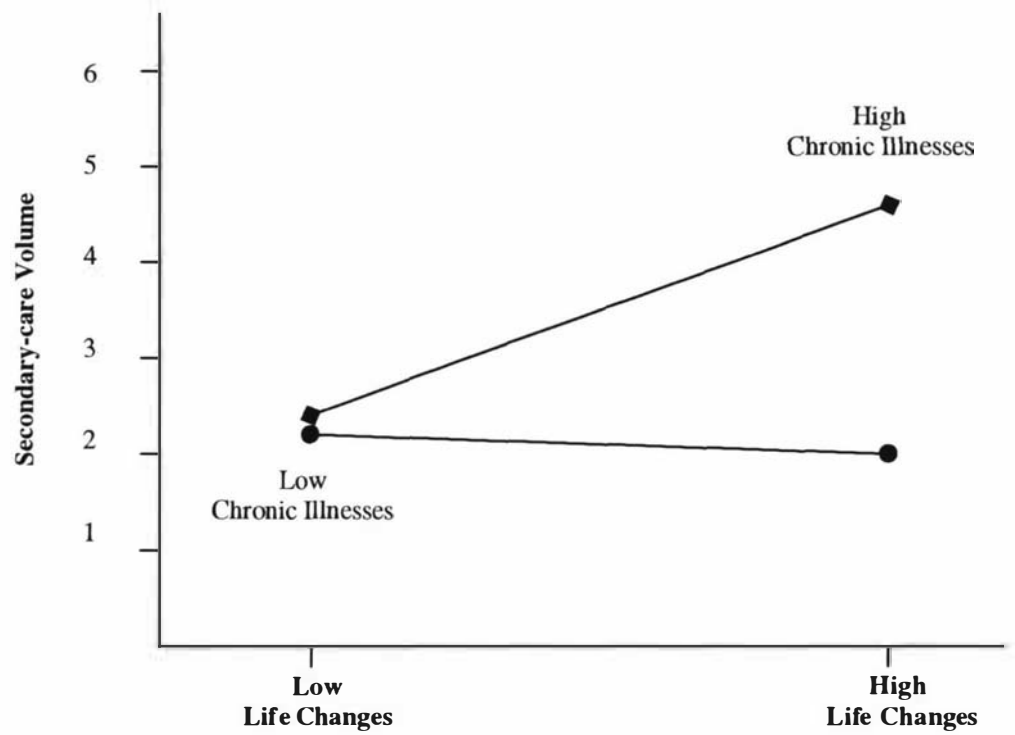

Figure 4. Schematic representation of the Life Changes and Chronic Illnesses interaction in the prediction of past-year secondary-care utilization.

Figure 3 illustrates that Trauma moderated the effects of ADL Impairments on the number of secondary-care services utilized by veterans and wives. Under low trauma conditions, veterans and wives with a high number of ADL impairments utilized a similar number of different secondary-care services as those with a low number of ADL Impairments, χ^2 = (1) .167, p<.68. However, under high trauma conditions, respondents with a high number of ADL Impairments utilized a significantly higher number of different secondary-care services than those with a low number of ADL Impairments, χ^2 = (1) 6.82, p<.01.

Figure 4 illustrates that Life Changes moderated the effects of Chronic Illnesses on the number of different secondary-care services utilized by respondents. Under conditions of a low number of life changes, those with a low number of chronic illnesses utilized a similar number of chronic illnesses as those with a high number of chronic illnesses, χ^2 = (1) .630, p<.42. By contrast, under conditions of a high number of life changes, those with a high number of chronic illnesses utilized significantly more secondary-care services than those with a low number of chronic illnesses, χ^2 = (1) 4.72, p<.05.

10.4.2.2 Informal health-care volume

Prescription-volume. With the introduction of the multiple-need component, explained variance in the likelihood of prescription contact increased 1% from 28.9% to 29.9% (R^2), F (39,409) = 4.47, p<.0001. The R^2 change was non-significant, F (39,409) = 0.38, p<.98. Six previously-entered variables continued to register a unique, independent impact on Secondary-contact. On step 5, Qualifications re-emerged as a significant variable, after losing its unique impact on step 4.

Bedrest-volume. As shown in Table 46, entry of multiple-need variables on step 5 increased

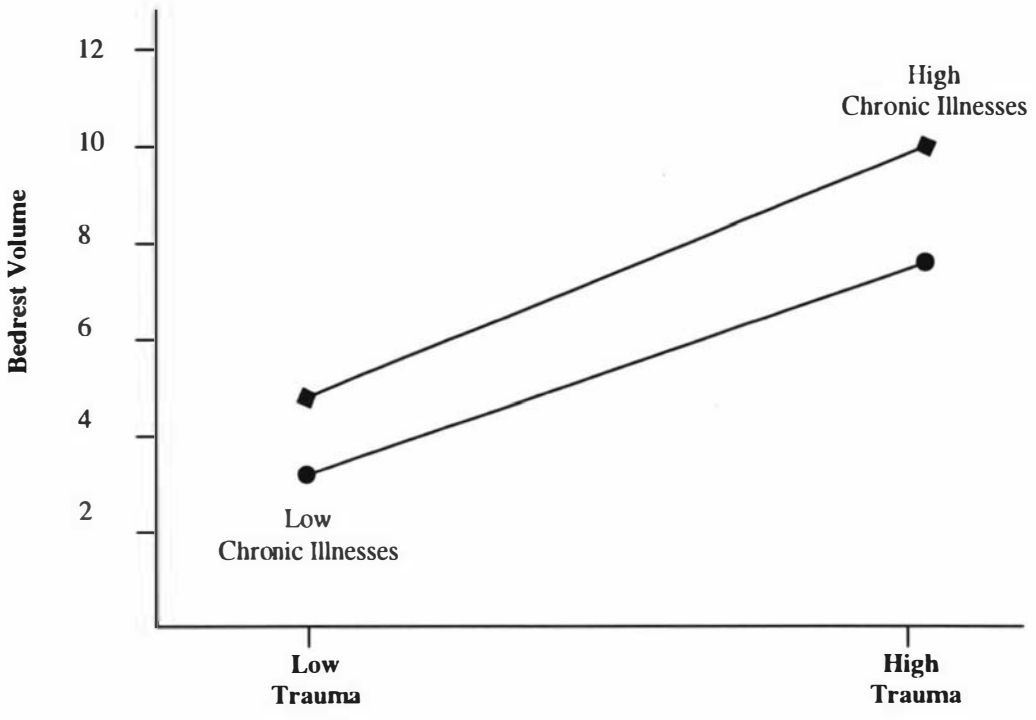

Figure 5. Schematic representation of the Trauma and Chronic Illnesses interaction in the prediction of past-year bedrest days.

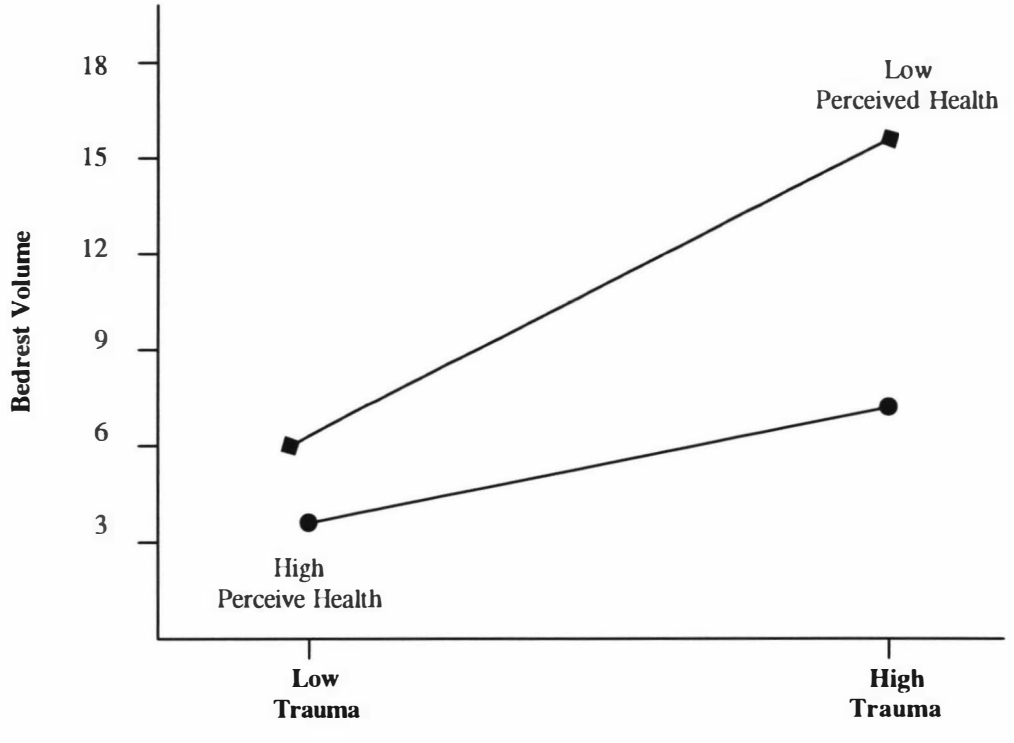

Figure 6. Schematic representation of the Trauma and Perceived Health interaction in the prediction of past-year bedrest days.

explained variance in bedrest from 34.3% to 42.7% (R^2), F (39,250) = 4.79, p<.0001. The R^2 change was significant, F (39,250) = 2.44, p<.004. Seven variables, including two interaction effects, registered a significant impact on the number of bedrest days. Respondents who were Unemployed (β = .164) and who had more ADL Impairments (β = .134) had more bedrest days. Three groups had less bedrest: (a) Veterans (the Sex variable) (β = -.144) and those who reported higher levels of (b) Wellbeing (β = - .234) and (b) Distress (β = -.280). As Table 46 shows, the two significant interactions suggested that the association between physical-need and Bedtrest-volume depended on the level of psychological-need. Schematic representations of the interactions are displayed in Figures 5 and 6. The data in these figures were derived by conducting median splits of the measures of Chronic Illnesses, Perceived Health and Trauma.

Figure 5 illustrates that Trauma moderated the effects of Chronic Illnesses on the use of bedrest days by veterans and wives. Under both high and low conditions of trauma, those who reported a high number of chronic illnesses had more bedrest than those who reported a low number of chronic illnesses, χ^2 = (1) 4.22, p<.05. However, the interaction indicated that the health-care effect was stronger under conditions of high than low trauma, χ^2 = (1) 6.80, p<.01.

Figure 6 illustrates that Trauma moderated the effects of Perceived health on the use of bedrest days taken by respondents. Under both high and low conditions of trauma, those who reported low perceived health had more bedrest than those with hight perceived health, χ^2 = (1) 6.72, p<.01. The interaction, however, indicated that the health-care effect was significantly stronger under conditions of high trauma, χ^2 = (1) 9.42, p<.001.

Four of the variables had registered significant impact on prior steps; the strength of their impact on step 5 was unaffected by the addition of multiple-need. The three other variables, Sex, Wellbeing and Distress, although entered into the model on prior steps, only attained significance on step 5. Another variable, ADL impairments, which had lost significance on step 4, now re-emerged as significant. This suggested that multiple-need suppressed irrelevant variance, enabling the respective explanatory contribution of these four variables to emerge. Lastly, Trauma lost its unique association with bedrest on step 5, indicating that its association may have been partly mediated through its association with multiple-need.

Cutback-volume. With the entry of the multiple-need block on step 5, explained variance in cutback days increased from 43.5% to 48.5% (R^2), $\underline{F}$ (39,185) = 4.47, p<.0001. The R^2 change was not significant, $\underline{F}$ (39,185) = 1.18, p<.28. In the full model, seven variables that had been entered in prior steps, were significant.

10.5 Stage three summary: Explanatory capacity of the five-component model

10.5.1 Overall patterns

Summaries of the cumulative R^2 on each of the 5 steps in the full model as well as the corresponding percent contribution of each component to the explained variance are shown in Table 47 for contact-service variables and in Table 48 for volume-service variables.

Patterns that had emerged initially in stage one persisted in the full model with all components entered into the respective models for the various measures of health care. First, predisposition remained the single most important explanatory component. In stage-one analyses, predisposition accounted for three-quarters or more of the total explained variance for several services which included Inpatient-, Outpatient-, and GP-contact, and Hospital- and

Secondary-care-volume. Its relative contribution in stage one to all other services exceeded half of the total explained variance. With all components entered in stage three, predisposition's ***net*** contribution remained noticeably larger than the ***combined*** contribution of all other components in nine services, equalled the combined explanatory contributions in three services, and was less than the combined contributions in one service (Outpatient--contact). Thus, in the full model, its dominance diminished across all services. As Tables 47 and 48 show, its diminished impact relative to the other components was marked in formal care such as hospital care (both contact and volume measures) and Secondary-volume, and in informal care such as Bedrest-contact and Cutback-contact.

Table 47: Summary of contact-service logistic regressions, showing *cumulative* adjusted R^2, significance of the model at steps 1 to 5, and (percent) contribution of *each* component to the total explained variance.

	Steps[a]				
Health Care	1	2	3	4	5
Formal Contact					
Inpatient	.154*	*.175*b	*.189**	.248*	*.293**
	(53%)	(07%)	(05%)	(20%)	(15%)
Outpatient	.120*	*.141**	.203*	.233*	*.271**
	(44%)	(08%)	(23%)	(11%)	(14%)
GP	.187*	*.213**	*.226**	*.251**	*.283**
	(66%)	(09%)	(05%)	(09%)	(11%)
Secondary	.181*	*.206**	.229*	*.234**	*.278**
	(65%)	(09%)	(08%)	(02%)	(16%)
Informal contact					
Prescription items	.227*	.280*	.328*	*.347**	*.389**
	(58%)	(14%)	(12%)	(05%)	(11%)
Bedrest	.109*	.141*	.184*	*.190**	*.222**
	(49%)	(14%)	(20%)	(03%)	(14%)
Cutback	.147*	.175*	.229*	*.241**	*.281**
	(52%)	(10%)	(19%)	(05%)	(14%)

a = step 1 = predisposition; step 2 = predisposition + enablement; step 3 = predisposition + enablement + physical-need; step 4 = predisposition + enablement + physical-need + psychological-need; step 5 = predisposition + enablement + physical-need + psychological-need + multiple-need.
b = Italicised entries denote a non-significant increment on the corresponding step.
* $p < .0001$

Second, in the full model, physical-need remained the next most important explanatory component in nine of thirteen services, albeit much smaller than predisposition. As with predisposition, its relative contribution diminished with the subsequent entry of other

components. Across the four services in which physical-need failed to add the second largest increment, the 'runner up' component differed from service to service; that is, enablement and psychological-need were the second most important explanatory components for one service variable each (i.e, Prescription-contact and Hospital-volume, respectively, and multiple-need was the second largest component for two services (Secondary-volume and Bedrest-volume).

Table 48: Summary of contact-service OLS regressions, showing *cumulative* adjusted R^2, significance of the model at steps 1 to 5, and (percent) contribution of *each* component to the total explained variance.

	Steps[a]				
Health Care	1	2	3	4	5
Formal volume					
Hospital	.104*	*.119**	.150*	.181*	*.199**[b]
	(52%)	(07%)	(16%)	(16%)	(09%)
GP	.215*	.244*	.306*	*.310**	*.327**
	(66%)	(09%)	(19%)	(01%)	(05%)
Secondary	.139*	.166*	.183*	.206*	.251*
	(55%)	(11%)	(07%)	(09%)	(18%)
Informal volume					
Prescription	.201*	*.216**	.286*	*.289**	*.299**
	(67%)	(05%)	(24%)	(01%)	(03%)
Bedrest days	.259*	*.276**	.313*	.343*	.427*
	(60%)	(04%)	(09%)	(07%)	(20%)
Cutback days	.324*	*.343**	.426*	*.435**	*.485**
	(67%)	(04%)	(17%)	(02%)	(10%)

a = step 1 = predisposition; step 2 = predisposition + enablement; step 3 = predisposition + enablement + physical-need; step 4 = predisposition + enablement + physical-need + psychological-need; step 5 = predisposition + enablement + physical-need + psychological-need + multiple-need.
b = Italicised entries denote a non-significant increment on the corresponding step.
* $p < .0001$

Third, the explanatory role of enablement, weak or non-significant in the stage-one analyses, diminished further still in the full model. Although adding consistently small increments across all service variables, enablement was relatively more important in explaining the likelihood of respondents 'contact' with informal care that in explaining the frequency of informal care. By contrast, enablement was unimportant in explaining the likelihood of respondents' formal 'contact', but was relatively important in explaining the frequency of formal care.

Fourth, psychological-need contributed significantly to five service variables, with an inconsistent pattern regarding the comparative magnitude of its explanatory contribution. Psychological-need added significant increments to two formal contact services (Inpatient- and Outpatient-contact), two formal volume services (Hospital- and Secondary-volume) and one informal volume service (Bedrest-volume). It was the second most important component in explaining inpatient contact (20%) and hospital volume (16%). Psychological-need failed to contribute significant increments to five of thirteen services. Thus, its pattern of contribution across the service variables was similar to that of enablement which also failed to add significant increments to five services. Interestingly, on only one service, did psychological-need and enablement both contribute significant increments (Secondary-volume).

Fifth, the contribution of multiple-need to health-care by veterans and their wives was not large. Exceptions were its significant increments to one formal service (Secondary-volume and one informal service (Bedrest-contact).

Sixth, neither the 3- nor the 5-step model provided a good fit of their respective components for every service variable. However, in terms of each component registering a significant increment, the 3-step model was relatively more successful that the 5-step model. The three-step model achieved significant increments on each step for five service variables; these included three informal contact services and two formal volume services. The 5-step model, on the other hand, added a significant increment at each step to just one service variable, Secondary-volume. In another service, Bedrest-volume, the increment of four out of 5 steps was significant.

Relative to each other, the 3-step model provided a better fit in explaining informal health-

care contact, while the 5-step model provided a better fit in explaining the volume of secondary services consumed by veterans and wives who consumed secondary care.

10.5.2 Specific explanatory configurations

Formal and informal health-care contact. As shown in Table 47, total explained variance in the full model ranged from 27.1% to 29.3% across the four formal-contact variables, and from 22.2% to 39.9% across the three informal-contact variables. These represent noticeable increases in explained variance from those obtained in the basic three-step model. However, none of the increases represented significant increments over prior steps in any of the contact-service variables, and in only two of these variables (i.e., Inpatient- and Outpatient-contact) did entry of variables on step four produce a significant increment.

Formal and informal health-care volume. Total explained variance in the full model ranged from 19.9% to 32.7% across formal volume services and from 29.9%- to 48.5% across informal volume services. The fourth- and fifth-steps added significant increments to few service variables. On the fourth-step, significant increments were registered for Hospital-volume and Secondary-volume, and on the fifth step, Secondary-volume and Bedrest-volume.

10.5.3 Significant health-care predictors

Summaries of significant independent variables in the full model, including interactions, are displayed in Table 49 for contact services and in Table 50 for volume services.

Table 49: Summary of *significant* partial correlations, and adjusted R^2 values obtained from the fifth stage of the hierarchical logistic model of predisposition, enablement, physical-need, psychological-need and multiple-need on health-care contact by NZ Vietnam War veterans and their wives.

	Formal Health Care				*Informal Health Care*		
Variables	Inpatient	Outpatient	GP	Secondary	Prescription	Bedrest	Cutback
Predisposition							
Sex			-0.176	-0.105	-0.161		-0.092
Age					0.109	-0.071	
Ethnicity							-0.076
Qualifications				0.093			
Unemployed	-0.080					-0.063	
Fulltime Work							
Social Contacts		0.060					
GP-satisfaction	0.094				0.091		
Health Worry	0.171		0.185	0.188	0.218	0.065	0.095
Health Control				0.139	0.114		
Enablement							
Living Standard						0.094	
Income Adequacy							
Health Insurance					0.107		
CS Card							
GP-resources					0.130		0.094
GP-fee							
Physical-need							
Impaired ADLs					0.102		
Chronic Illnesses		0.128			0.078		0.062
Perceived Health						-0.103	-0.107
Psychological-need							
Wellbeing							
Distress							
PTSD							
Trauma							
Life Changes	0.146						
Multiple-need[a]							
ADL*Wellbeing							
ADL*Distress							
ADL*PTSD							
ADL*Trauma							
ADL*Changes							
Ills*Wellbeing							
Ills*Distress							
Ills*PTSD							
Ills*Trauma							
Ills*Changes							
Health*Wellbeing							
Health*Distress							
Health*PTSD							
Health*Trauma							
Health*Changes							
Adjusted R^2	.293	.271	.283	.278	.389	.222	.281
N	561	561	556	549	559	562	562

[a] ADL=Impaired ADLs; Ills=Chronic Illnesses; Health=Perceived Health; Changes=Life Changes

Health-care contact. In the full model for the contact-service variables, step 5 yielded no significant interactions. In addition, most variables that had registered an independent impact on steps 3 and 4, retained significance on step 5, with effect sizes marginally altered. However, there was relatively more 'fluctuation' in significance levels (gaining or losing) across physical-need variables than across the other variables.

Nine of the ten predisposing variables had an impact on at least one contact service variable, with several of them having an impact on more than one service variable[3]. No enabling variable emerged as a significant predictor of formal contact services, but three had an impact on informal care. There was only one instance of a physical-need variable having a significant impact on formal contact services, but several instances of physical-need variables having a significant impact on informal contact services. One psychological-need variable had an impact on one formal service, but none had an impact on informal contact services.

Volume health care. Table 50 displays the variables that had a significant impact on volume services. The profile of significant variables was largely unchanged across successive steps. As with contact variables, a greater number of predisposing than other variables had an impact on a wider range of volume-services. Few enabling variables emerged as significant volume health-care predictors, with the absence more noticeable across informal than formal volume services. The three physical-need variables each had a unique impact on three services, respectively. Each physical-need variable was most strongly associated with ***in***formal health-care, with each one having its strongest effect on a different service. There were five instances of psychological-need variables having a significant impact on volume-service variables and significant multiple-need interactions emerged in only two service variables.

[3]Specific significant variables and their effects are summarized in Section 10.5.3.1.

Table 50: Summary of *significant* semipartial correlations and R^2 values obtained from the fifth stage of the OLS hierarchical model of predisposition, enablement, physical-need, psychological-need and multiple-need on health-care volume by NZ Vietnam War veterans and their wives.

	Formal Health Care			*Informal Health Care*		
Variables	Hospital	GP	Secondary	Prescription	Bedrest	Cutback
Predisposition						
Sex		-.105		-.118	-.109	
Age						
Ethnicity						.123
Qualifications			.110	.083		
Unemployed				.099	.109	.133
Fulltime Work						
Social Contacts	.081					
GP-satisfaction	.075					
Health Worry	.096	.202	.206	.090		.170
Health Control						
Enablement						
Living Standard						
Income Adequacy						
Health Insurance		.087	.151			
CS Card						
GP-resources		.106				
GP-fee						
Physical-need						
Impaired ADLs		.092			.134	.123
Chronic Illnesses	.106	.129		.182		
Perceived Health		-.088		-.110		-.156
Psychological-need						
Wellbeing					-.114	
Distress	-.074				-.119	
PTSD						
Trauma	.096					
Life Changes	.091					
Multiple-need[a]						
ADL*Wellbeing						
ADL*Distress						
ADL*PTSD						
ADL*Trauma			.105			
ADL*Changes						
Ills*Wellbeing						
Ills*Distress						
Ills*PTSD						
Ills*Trauma					-.166	
Ills*Changes			.085			
Health*Wellbeing						
Health*Distress						
Health*PTSD						
Health*Trauma					-.169	
Health*Changes						
R^2	.199	.327	.251	.299	.427	.485
N	556	479	478	449	290	225

[a] ADL=Impaired ADLs; Ills=Chronic Illnesses; Health=Perceived Health; Changes=Life Changes.

10.5.3.1 Contact-versus-volume and formal-versus-informal predictors

In this section, the effects of specific significant health-care predictors are compared across two different dimensions: their capacity for predicting (1) contact versus volume service-variables and (2) formal versus informal service-variables.

Predictors of contact- and volume-care. Predisposing **Health Worry** was the most frequent predictor of contact and volume services, being significantly associated with eleven of thirteen service variables. It failed to predict Outpatient-contact and Bedrest-volume. No other variable was significant across as many services or even came close to having significant impact on as many service variables. Compared with others, those who worried more about their health were both more likely to seek health care and were more frequent in their use of it. **Being a veteran** (i.e., the Sex variable), a predisposing variable, was the second most important predictor, having significant impact on seven services, four involving contact services and three, volume services. Veterans were less likely than wives to make use of GPs, secondary-services, prescriptions and cutback days. They were also less frequent consumers of GPs, prescriptions and bedrest. **Chronic Illnesses**, a physical-need variable, registered a significant impact on three contact- and three volume services, making it equally useful as a predictor of likelihood and frequency of health-care utilization. A higher number of chronic illnesses was associated with an increased likelihood of contact with outpatient, prescription and bedrest care, as well as an increased volume of hospital, GP and prescription services. **Unemployed,** a predisposing variable and **Perceived Health,** a physical-need variable, ranked fourth as the most frequent health-care predictors. These two variables each had significant effects on two contact services and three volume services, and thus were relatively more useful in their prediction of frequency rather than of likelihood of use. Unemployed respondents were ***less*** likely than others to have had inpatient-care, but they were *more* likely

to have had bedrest care and **more** frequent in their use of informal types of care. Perceived Health was associated with a reduced likelihood of Bedrest and Cutback-contact and reduced frequency of GP-, prescription- and cutback-care. **ADL Impairments**, a physical-need variable, was significantly associated with only one contact service but three volume services, making it a better predictor of frequency than likelihood of utilization.

Four variables had significant and positive effects on three services each: Qualifications, GP-satisfaction, GP-resources and Health Insurance. **Qualifications**, a predisposing variable, and Health Insurance, an enabling variable, each predicted one contact and two volume services. Having educational qualifications was associated with an increased likelihood and frequency of secondary-care and increased use of prescription items. **Health Insurance** was associated with an increased likelihood of prescription use and more frequent use of GP- and secondary-care. Predisposing **GP-satisfaction** and enabling **GP-resources** each predicted two contact services and one volume service. GP-satisfaction was associated with an increased likelihood of Inpatient-contact, and higher Hospital- and Prescription-volume. GP-resources was associated with an increased likelihood of Prescription- and Cutback-contact, and more frequent use of GP-care. A further four predisposing variables exerted independent effects on two services each: Age, Ethnicity, Social Contacts and Health Control. **Age** was positively associated with Prescription-contact but negatively with Bedrest-contact. **Ethnicity** (i.e., being Maori) was negatively associated with the likelihood of Cutback-contact but positively associated with the Cutback-volume. Having more **Social Contacts** was associated with a greater likelihood of Outpatient-contact and also higher Hospital-volume. Lastly, having more **Health Control** was positively associated with a greater likelihood of Secondary- and Prescription-contact.

Predictors of formal- and informal-care. Absent from the results were distinctive sets of variables that 'exclusively' predicted either formal or informal services. Overall, most significant variables predicted both formal and informal services, with a slight 'edge' for one or other predictor in terms of its relative frequency for predicting formal versus informal care (and vice versa). For example, while Perceived Health predicted one formal and two informal services, Health Insurance predicted two formal services and one informal service. More clearcut exceptions include the following: Age and Ethnicity had no significant impact on formal services, but each registered significant impact on two informal services. Unemployed and ADL Impairments each had an impact on only one formal service each, but on four informal services.

Variables that registered the strongest impact on health-care are now summarized. Of the variables that had a larger effect size on one service than another, no consistent patterns emerged, such as stronger effects for contact services than volume or formal than informal care. In addition, no variable exerted a similar effect size across the services. For example, Health Worry's effect on contact-care ranged from 0.06 for bedrest to 0.21 for secondary care. Other variables whose effect sizes exceeded one percent of explained variance included Sex (for GP- and prescription-contact), Ethnicity and Unemployed (Cutback-volume), Chronic Illnesses (Outpatient-contact, GP- and Prescription-volume), Perceived Health (Cutback-volume), and Perceived Health-PTSD interaction effect (Bedrest-volume)[4].

[4]Comparisons of the size of partial correlations (*prs*) from the logistic model and semipartial correlations (*srs*) from the standard OLS model were done cautiously because they are not equivalent statistics. Partial correlations represent the correlation between the IV and the DV when the linear effects of other IVs have been removed from the DV. Semipartial correlations represent the correlation between the IV and the DV when the linear effects of other IVs have been removed from *both* the IV and the DV (Norusis, 1988a).

10.6 Chapter summary

Stages two and three of the present analyses have been reported in this chapter, and the results of stages two and three summarized. Summaries encompassed accounts of the explanatory capacity of the model at the end of each stage, and for stage three included a descriptive account of each components' explanatory contribution. The chapter concluded with a detailed summary of significant predictors in the full model.

The next chapter brings to a conclusion the present thesis and is organized into several sections. The first summarizes and discusses the present findings. The second reviews the significant predictors of health-care. The third section considers the limitations of the present study. The fourth section discusses the implications of the findings for future research and the fifth section outlines future research directions on Vietnam veterans and their wives.

CHAPTER ELEVEN

Discussion

11.1 Chapter overview

The purpose of this chapter is to summarize and discuss the present findings, consider their implications, and also assess methodological and theoretical issues. To achieve these goals, the chapter is divided into five major sections. The first focuses on summarizing findings in terms of the present hypotheses. In the second section, attention is given to the impact of individual predictors on measures of health-care and on the profile of predictors of selected measures of primary health services. Limitations of the present research design form the focus of the third section. Several critical issues are addressed including cross-sectional methodology, measures of independent and dependent variables, conceptualization, statistical procedures and sample selection procedures. The implications of present findings for future research on the Andersen (1968) model are considered in the fourth section. Recommendations for future research on veterans and their wives are the focus of the fifth section.

11.2 Degree of support for hypotheses

11.2.1 Stage one: the three-component model

Summarizing findings in which there are thirteen outcomes (i.e., health-care variables) of interest, without losing sight of main patterns can be a difficult task. That task is even more difficult when the use of a comprehensive measurement set necessitates reviewing the health-care impact of 24 predictor-variables, and 15 interaction-predictor variables. To minimise the risk of obscuring main patterns, findings relevant to the hypotheses are discussed separately from those relevant to individual predictor variables.

Hypothesis 1: **Each component of the Andersen model will contribute independently to the explanation of differences in veterans' and wives' use of health care.**

There was partial support for the first hypothesis. As shown in Table 51, services in which all components registered a significant contribution to health-care included the three informal contact variables and two formal-volume service variables (i.e., GP- and Secondary-care). Predisposition alone contributed significantly to all services, physical-need contributed to all but two, and enablement to only five service variables. On this basis, Andersen's (1968) model provided the best fit for informal-contact and, with one exception, formal-volume. Of interest is the failure of the 3-component model to account for use of either contact or volume measures of hospital-care.

Table 51: Summary of significant increments on steps 1 to 3 of the Andersen (1968) model for each health-care variable.

	Steps		
Health-care	1[a]	2	3
FORMAL			
Contact			
Inpatient	✓[b]		
Outpatient	✓		✓
GP	✓		
Secondary	✓		✓
Volume			
Hospital	✓		✓
GP	✓	✓	✓
Secondary	✓	✓	✓
INFORMAL			
Contact			
Prescription	✓	✓	✓
Bedrest	✓	✓	✓
Cutback	✓	✓	✓
Volume			
Prescription	✓		✓
Bedrest	✓		✓
Cutback	✓		✓

[a] = Steps 1 to 3 correspond, respectively, to the predisposing, enabling and physical-need components.
[b] = The component added a significant increment to the health-service variable.
✓ = Significant increment.

Present findings that predisposition contributed to each service measure supports previous research, as does the finding that predisposition was the most important component (Stoller, 1982; Wolinsky & Johnson, 1991). The failure of enablement to contribute significantly to over half the services is at odds with prior findings, although its substantially smaller contribution than the other two components is not; that is, while the importance of enablement has been affirmed in prior research, it has seldom, if ever, equalled or bettered the net contributions of either predisposition or physical-need.

The present finding that physical-need failed to contribute significantly to two measures of formal-contact health-care is also at odds with the research literature. In numerous studies, physical-need has been the most important explanatory component, and particularly so for non-elective care (i.e., mandatory care) (Andersen & Newman, 1973; Cheng, 1992; Wenzel et al., 1995; Wolinsky et al., 1985; Wolinsky et al., 1989). That physical-need was important in the explanation of whether respondents had contact with secondary services but not important in the explanation of whether respondents had contact with inpatient and GP services is puzzling.

Present limited support for the first hypothesis contrasts with a large body of research in which all components contributed to the explanation of health-care. Ambiguity exists, however, over the status of some prior reports on the significance of each component. In some studies, the reported magnitude of the increments for enablement has been extremely small, and of these studies, not all have stated whether individual components have added significant increments[1]. For example, although Wolinsky and Johnson (1991) reported that the contribution of enablement to bedrest by older adults was significant, the size of the effect

[1]In these studies, results report the significance of total R^2, but not the significance at each step in the model.

was trivial[2]. It is noteworthy that most prior instances of components contributing very small amounts have involved enablement (e.g., Wolinsky et al., 1983; Wolinsky et al., 1989).

The limited explanatory capacity of enablement in the present and prior research could be due to enabling characteristics being less important determinants of people's use of health-care than they were in the past. Over thirty years ago, Andersen (1968) suggested that income (a measure of enablement) was even then a less potent predictor of health-care than it had been in earlier decades. This change was attributed to the increased provision of targeted health-care programmes for low-income people, and the wider use (in the United States) of the Medicaid card which provided reduced-cost health-care for low-income older adults. While recent findings show that lower socio-economic groups are in poorer health relative to other groups, findings also show that these groups are often the most frequent consumers of primary health care (Mutchler & Burr, 1991; Nolan, 1994). Present findings suggest that having versus not having medical resources (e.g., health insurance), adds at best a modest amount to the explained variance in health services utilized by veterans and wives.

Hypothesis 2: **Each component of the Andersen model will vary in its explanatory capacity across different health services, with physical-need being the most important overall component of health care.**

No support was found for the second hypothesis. While need contributed significant increments to all but two service variables, predisposition contributed significantly to each service variable and was also the largest explanatory component.

[2]The size of the significant contribution was .005 (Wolinsky & Johnson, 1991).

Prior studies have yielded a variety of findings regarding the explanatory configuration of the three Andersen components, with most finding that physical-need has accounted for the largest proportion of explained variance. Some findings have supported the proposition that the explanatory capacity of the components varies across different health services (e.g., Bazargan et al., 1998; Wolinsky, 1978; Wolinsky & Coe, 1984). However, other findings showed that the extent to which the components contributed to a health service was not in the expected direction. For example, in Wolinsky and Johnson (1991), predisposition explained slightly more variability in hospital care than did physical-need, whereas physical-need explained more than predisposition for bedrest. Still other studies report that the capacity of the components to explain health-care remained the same across elective and non-elective services. Wolinsky et al. (1989), for example, found that physical-need was equally important in explaining GP-care and hospital-care.

Some studies have found that predisposition has accounted for the largest share of the explained variance. In her study on utilization of GP services by older adults, Stoller (1982) reported that predisposing variables accounted for twice as much of the explained variance as need in GP contact. Wolinsky and Johnson (1991) found that predisposition accounted for more of the explained variance in several measures of formal and informal health-care than did physical-need.

As stated, physical-need variables have emerged as the most important contributors to the explanation of health-care in the majority of studies, with predisposing and enabling variables contributing a second tier of importance. The core propositions derived from Andersen's (1968) model[3] have emphasized the expected explanatory configurations of the three

[3]See Chapter 2, Section 2.5.5.

components across various types of health services. An important consideration at this point is whether the method of analysis itself (i.e., hierarchical multiple regression) biases the sizes of the respective contribution of the components. Hierarchical multiple regression is vulnerable to 'method' effects'; that is, the explanatory dominance of specified components may be a function of the hierarchical entry-order of components into the model. To address this possibility in the present study, the impact of the three components was re-analyzed in reverse order (i.e., physical-need entered first). Entry-order had only minimal effects on minimal effects on the results. Section 11.4.1.4 discusses method effects in more detail, including the strategy for evaluating their effects in the present study.

Hypothesis 3: **The less elective that a health service is, the less non-need, and the more physical-need will explain its use.**

Preliminary comment about hypothesis 3. Present findings for hypothesis 3 formed inconsistent patterns across the health-care measures. These patterns are not amenable to straightforward description. Therefore, discussion will focus primarily on describing findings that confirm the hypothesis.

The third hypothesis received little support. As stated in Chapter 2, Section 2.5.3.4.1, distinctions between elective- and non-elective-care are feasible both ***between*** formal and informal health services and ***within*** formal or informal health services[4]. In comparisons between formal and informal-services there was virtually no support for hypothesis 3.

[4]Electivity of care represents a continuum rather than a category of care as it is not an absolute quality of any service. In addition, the degree of electivity is relative to other services. For example, hospital-care, according to Andersen, is less elective than GP-care because the patient has less choice in the use of hospital- than GP-care (Andersen, 1968). By contrast, formal and informal health-care represent discreet categories of care.

Contrary to expectations, physical-need was ***more*** important in explaining the likelihood of contact with informal than formal care. However, comparisons within formal or informal services provided some support. Within formal services in which the likelihood of contact was measured, physical-need was more important in explaining whether respondents had contact with outpatient services than in explaining whether they had contact with secondary-care-services. Within formal services in which the volume of use was measured, physical-need explained relatively more of the explained variance in the number of different hospital-services used than in explaining the number of different secondary-care services used.

Although not entirely consistent with propositions derived from the Andersen model, present findings of a larger role for physical-need in informal than formal care were consistent with published studies which have compared the role of physical-need in formal and informal health services (Strain, 1991; Wolinsky, 1978; Wolinsky & Coe, 1984; Wolinsky & Johnson, 1991)[5]. In Wolinsky and Johnson (1991), physical-need contributed 41% to the total explained variance in hospital-care, and contributed 56% to bedrest. Similarly, in Wolinsky et al. (1983), physical-need contributed 61% to hospital contact, 74% to GP-visit frequency and 93% to cutback volume[6].

There are several potential explanations for physical-need being a better predictor of informal- than formal-care. These explanations assume that barriers within the social system prevent access to formal-care. Barriers may include standard GP-access resources (e.g., Health

[5]Prior studies have compared the amount of variance explained in formal and informal services, but not explicitly linked the amount to the expected explanatory roles of the three components.

[6]Since the proposition that need-would-be-more-important-in-non-elective-care was not explicitly tested by Wolinsky and Johnson (1991), they do not comment on these theoretically anomalous findings. In fact, across the studies in which physical-need has contributed a greater amount to elective- than non-elective care, this pattern has seldom, if ever, been explicitly acknowledged.

Insurance), family resources (e.g., Income Adequacy), and predispositional characteristics (e.g., Fulltime Work). When people become aware of illness symptoms, informal-care may be easier to access in the first instance than formal-care (Wenzel et al., 1995). This may involve use of prescription treatments, reducing usual activities or having bedrest. The use of informal care instead of formal care is probably based on experiences regarding the effectiveness of a range of treatments. For example, informal-care may be preferred because of negative experiences with the health-care system, ***or*** positive experiences with self-treatment or both. In the literature, self-treatment has usually been viewed as the earliest response in an illness episode (Mechanic, 1979), and it may be all that is necessary for recovery. Another possible explanation for the greater role of physical-need in informal- than formal-care could be a greater willingness by respondents to report informal- than formal-care, especially when symptoms that actually led to GP-care were of minor seriousness. This may been the case when GP-care was prompted by symptoms that were disturbing at the time, but which were subsequently found to be medically unimportant. Contact with the GP may then be discounted or forgotten.

Hypothesis 4: **The more elective a health service is, the more non-need and the less physical-need will explain its use.**

Little support was found for the fourth hypothesis[7]. In comparisons ***between*** formal and informal-services, there was no support for the expectation that non-need (i.e., predisposing and enabling components) would explain more of the variance in more elective care. ***Within*** formal and informal services, however, provided some support. Within formal services in which volume of use was measured, non-need was more important in explaining frequency

[7]The above preliminary comment for hypothesis 3 also applies to hypothesis 4.

of use of different secondary-care-services than in explaining frequency of either GP- or hospital-care. Within informal services in which the likelihood of contact was measured, non-need was more important in explaining whether respondents had cutback days in the past year than in explaining whether they had prescriptions.

Hypothesis 5: **Physical-need will be more important in explaining GP-visit frequency than in explaining GP-contact.**

Findings supported hypothesis 5. Physical-need had a larger role in explaining the number of times respondents visited their GP than in whether or not they had contact with the GP in the first place. This pattern indicates that respondents with greater physical-need were more frequent consumers of GP services. Prior studies have compared contact and volume measures of primary health-services and found that physical-need was more important in explaining frequency than likelihood of use (Nelson, 1993; Wolinsky, 1978; Wolinsky et al., 1985; Wolinsky et al., 1989; Wolinsky & Johnson, 1991). These findings are congruent with the view that contact measures tap patient-initiated visits, while volume measures tap both patient-initiated ***and*** GP-directed visits (Mechanic, 1979; Wolinsky et al., 1983); that is, in an illness episode, the first contact with the doctor is usually initiated by the patient, whereas follow-up visits are more likely to reflect diagnosed physical-need, with the GP recommending follow-up visits.

11.2.2 Stage two: The four-component model

Hypothesis 6: **Psychological-need will contribute independently to the explanation of health-care use, and be positively associated with it.**

A number of general population studies have shown that people may seek medical care in response to their socio-emotional needs; that is, their use of medical-care may reflect underlying psychological-need (Bland et al., 1990; Van Hemert et al., 1993). Many of these studies, however, have not controlled for physical health. Tessler et al. (1976) and Cheng (1992) are two of a small number of studies which have investigated whether psychological-need has added to the explanation of health-care, after taking into account physical-health. In their study of a regional sample of employed adults' and their families' health-care use, Tessler et al. (1976) reported that psychological-need contributed significant increments to both likelihood and frequency measures of GP-contact. In her study of a regional sample of elderly women, Cheng (1992) found that stress and loneliness added a significant increment to the explanation of GP visits. The present study extends the previous research by including a more comprehensive measurement of psychological-need and by using regression analyses to systematically examine the relationship between psychological-need and health-care use.

Present findings provided some support for the sixth hypothesis. Psychological-need contributed significantly to five of thirteen health-care measures. These measures included the two measures of whether hospital services were contacted (Inpatient- and Outpatient-contact), and three volume measures of service use (Hospital-, Secondary- and Bedrest-volume). The relative size of psychological-need's contribution to the explained variance varied widely across the five services. It contributed the most to two measures of hospital care; namely, whether inpatient services were contacted, and the number of different hospital-services used[8]. In these latter two hospital services, its share of the explained variance was one-quarter and one-fifth, respectively. Its contribution to the two hospital-care measures equalled

[8]The volume measure of hospital care was a ***summed*** index of the number of different hospital services that had been used in the past year; these were outpatient, inpatient and A&E services.

or bettered that of physical-need. Furthermore, in four of the five services for which psychological-need contributed significantly, it was more important than enablement.

Few published studies have investigated the relationship of psychological-need to hospital-care. While the literature provides evidence of an association between psychological-need and GP-care, it has relatively little to report on the association between psychological-need and hospital-care. The tacit assumption is that hospital-treatment encompasses non-elective treatment. Relative to other types of health-care, the patient has less choice in consuming hospital-care because professionally-diagnosed physical-need determines its use. By Andersen's (1968) model, physical-need should be the major explanatory component underlying use of hospital-care. The contribution of other components to hospital-care would suggest that the hospitalization decision was not based entirely on physical-need. Present findings of a psychological element underlying hospital-care pose a challenge from an interpretive point of view. On the one hand, no association was found between psychological-need and GP-care, an association that has been reported in the literature. On the other hand, an association between psychological-need and ***three*** of the measures of hospital-care was found, a pattern without precedence in the literature. It is likely that veterans and wives who have received hospital-care have experienced illnesses which have been concurrent with or resulted from psychological-need. It is also likely that the illnesses themselves contributed to the psychological-need; that is, illnesses resulted in hospital-care and both of these contributed, in turn to increased emotional stress (Cohen & Williams, 1991). This latter interpretation differs from that usually suggested for the association between psychological-need and health-care. In that interpretation, psychological-need (e.g., loneliness, stress) is viewed as precipitating increased use of GP-care. In the present interpretation, being hospitalized is itself viewed as a plausible antecedent of increased psychological-need. It

seems unlikely that respondents' psychological-need itself would primarily influence the decision to receive hospital treatment, as it potentially could in the case of GP-care (i.e., the patient chooses GP-care as a means of coping with socio-emotional needs).

In view of the association found between psychological-need and hospital-care, the absence of one between psychological-need and GP-care warrants some comment. Findings suggest that respondents who either had contact with GPs in the past year or who frequently utilized GP services were no different psychologically from non-users or infrequent users. This suggests that use or non-use of GP-care by veterans and wives did not have an underlying psychological component. Thus, no evidence was found that poorer psychological functioning underlies the GP-care by veterans or wives.

Present findings are congruent with veterans research which has reported an association between veterans' psychological-need and health-care use. Studies on veterans have documented an association between psychological-need and primary health-care[9], with most concluding that greater psychological-need is correlated with increased use of medical services. In Kulka (1990), veterans with a diagnosis of PTSD were significantly more likely to have used outpatient services than were other veterans. Vincent et al. (1991) reported that New Zealand Vietnam veterans with PTSD were five times more likely than other New Zealand veterans to have used accident and emergency services and to have been admitted to hospital. Findings of a positive association between psychological-need and use of medical services parallel those for civilian populations (Cheng, 1992; Norris, 1990; Tessler et al., 1976). In a study of female crime victimization, Koss et al. (1990) reported that within a year of the crime, victims made twice as many GP visits as matched controls. In contrast, some

[9]Primary health-care encompasses GP- and hospital-care.

research on veterans has reported a ***negative*** association between psychological-need and health care. In Wenzel et al. (1995), veterans with high combat-stress levels were less likely to have utilized outpatient services, a finding also reported by Stern et al. (1996) in their study of over 1,000 American Vietnam veterans.

11.2.3 Stage three: The five-component model

Hypothesis 7: The multiple-need component will contribute independently to the explanation of health-care use, and psychological-need will strengthen the association between physical-need and health-care.

In the present study, multiple-need consists of interaction terms between the physical- and psychological-need variables. Comprising the fifth component, these terms were added to the Andersen (1968) model to investigate whether interactions between physical-need and psychological-need would significantly enhance the explanation of health-care above amounts already explained by the respective contributions of the physical-need and the psychological-need components. In both veterans and civilian research, attention has seldom focused on the impact of psychological-need on relationships between physical-need and health-care use. In particular, the question of whether the health-care impact of physical-need varies as a function of co-existing psychological-need remains largely uninvestigated. War veterans comprise a population whose use of health-care could be prompted by co-existing need (i.e., multiple-need), given the research documenting the debilitating psychological effects of combat stress on physical-health (Friedman & Schnurr, 1995; Kulka et al., 1991; Vincent et al., 1994). A study by Wenzel et al. (1995) investigated whether psychological-need modified the association between physical-need and health-care in a sample of homeless veterans. Wenzel et al. found that psychological-need modified the physical-need-health-care association. One

of the significant multiple-need measures comprised interaction terms between a measure of chronic medical problems[10] and a measure of alcohol abuse[11] Under the condition of having chronic medical problems (versus having none), veterans with a history of alcohol abuse were less likely than veterans with no such history to use outpatient services (Wenzel et al., 1995). The present study extended Wenzel's study by investigating whether psychological-need strengthened the association between physical-need and formal and informal health-care in a sample of veterans and their wives.

Limited support was found for the hypothesis 7. Despite its contribution being equal to or greater than the net contribution of enablement and physical-need, multiple-need (physical- and psychological-need interaction terms) failed to enhance the explanation of any contact-service variables (i.e., measure of the likelihood of use). However, it contributed significantly to two health-service variables measuring volume of health-care; that is, multiple-need enhanced the explanation of the number of different secondary-care services used and the number of bedrest days taken in the past year. Few interaction terms within these two services produced significant effects. Specifically, only two interaction terms apiece emerged out of a possible fifteen for each service. Findings for the four significant interactions supported the hypothesis that psychological-need would strengthen the impact of physical-need on health-care (Friedman & Schnurr, 1995). For the volume measure of secondary-care, the two significant interaction terms involved Trauma and Life Changes, respectively. In the first, the impact of ADL impairments on the number of different secondary-care services utilized was stronger among those who had a multiple-trauma history. In the second interaction, the impact of chronic illnesses on the number of different services utilized was stronger among

[10] "A serious or potentially serious condition such as diabetes" (Wenzel et al., 1995; p.1134).

[11] "Self-reported use of alcohol to intoxication for at least 1 year during the lifetime" (Wenzel et al., 1995, p.1135).

respondents who had experienced a greater number of life changes than other respondents. For the volume measure of bedrest, the two significant interactions both involved Trauma. In the first, the impact of chronic illnesses was stronger among those who had multiple traumatic experiences. In the second interaction, the impact of negative perceived health on the number of bedrest days was stronger for respondents who had multiple traumatic experiences.

Noteworthy in the findings for hypothesis 7 was the absence of any impact of multiple-need on hospital- and GP- services, services that fall within the 'primary' health-care ambit. Respondents, therefore, who were more likely to contact a primary service or who were more frequent in their use of it, were no different from either non-users or less frequent consumers, regarding the impact of psychological-need on the physical-need-health-care-use association.

11.3 Comparison of significant predictors of health-care use with prior research

The preceding section on the components explaining veterans' and wives' health-care focused on the broad conceptual picture. Attention now turns to the relationship of significant predictors to specified health-services. Predictors represent the measures of the components. Present findings are placed in the context of the Andersen (1968) model and the empirical research, with predictors compared across different types of health-care (e.g., formal versus informal) and different aspects of the same type of health-care (whether respondents contacted a service, and if so, the volume of use). Among issues raised in this section, two receive expanded attention. The first involves the health-care role of enabling predictors. This issue provides the basis for ascertaining whether, and how much, economic factors helped or hindered the present sample in its health-care use. The second issue involves the health-care role of psychological-need predictors. This provides the basis for evaluating the direction of the relationship between psychological-need variables and use of health-care. In the final part

of this section, profiles of predictors for measures of specific primary health services are placed in the context of prior research on the same measures. Prior to discussing the individual predictors, attention is given to the factors that guide the determination of whether a health-system equitably distributes its resources.

11.3.1 Ascertaining whether health-care is equitably distributed

The presence of non-need predictors (e.g., predisposing and enabling variables) in the use of health-care suggests uneven distribution of services, but not necessarily inequitable distribution. Inequitable distribution is present when the health-care system selectively allocates resources on criteria other than physical-need (Andersen et al., 1975). For example, inequity would be evident if medically serious treatment is delayed or denied because people do not have health insurance. By the (1968) Andersen model, the contribution of non-need components to the explanation of health-care could indicate two characteristics of a health system; namely, that services are either more available to some than others, controlling for physical-need (over-utilization), or that they are less available to those with greater physical-need than others (under-utilization).

Several interrelated issues guide the present attempt to ascertain whether veterans and their wives are disadvantged in their use of health-care, and whether that disadvantage represents impeded access to non-elective medical services. The first concerns the types of non-need variables that predict specified health services. Social-structural variables lead to different conclusions about access health-care than do attitudinal or medical-resource predictors. In health-care utilization research, the emergence of social-structural predictors such as employment status may prompt calls for more accessible medical-care for unemployed people. By contrast, attitudinal predictors may provide the rationale for campaigns to raise public

awareness, while medical-resource predictors such as health insurance may support the view that insured patients are more likely than uninsured patients to over-utilize specified services. The second issue involves the direction of effects since. For example, in the event that family-resource predictors such as perceived income adequacy register significant impact on the uptake of health-care, the direction may indicate greater utilization by those on limited incomes. The third issue in ascertaining equity of distribution concerns whether the direction of effects is consistent across related, as well as different types of health-care. In investigations which employ several measures of health-care, comparisons of predictor profiles across a range of health-care measures help determine the consistency of the availability of health-care. A fourth issue relates to the strength of effects. The identification of significant predictors is always of theoretical interest, but practical interest may be diminished when a significant predictor has a weak effect on the use of health-care. The fifth and final issue involves the substantive meaning of non-use of health care. It may signify impeded access, unwillingness to seek treatment, ignorance of a service's availability or something else. Non-use of a required service is not evidence of an inequitable health system, even if the lack of treatment is greater in more socially-disadvantaged groups. These groups may have alternatives to formal medical care, view existing medical-services with suspicion or have different cultural norms on appropriate illness behaviour, among other possible reasons. Thus, ascertaining whether or not the present sample has impeded access to health services is a complex task that needs to consider more than use or non-use, and frequency or infrequency of health-care utilization.

Tables 52 and 53 display the significant predictors for each health-care measure at each of the 5 steps in present analyses. The entry of successive blocks of variables into the model had the potential to impact on other predictors entered into the model on earlier steps. Since five

blocks of variables were successively entered in the present analyses, each new block could have diminished the strength of already-entered predictors (Tabachnick & Fidell, 1989). On the whole, while the strength of some predictors was noticeably diminished following subsequent entry of new blocks of variables, the strength of most significant predictors was only marginally affected, and in some instances, increased in size.

Table 52: Profile of significant predictors on steps 1 to 5 for each formal health-care measure.

Service	1	2	3	4	5
HOSPITAL-CARE					
Inpatient Contact	GP-satisfaction Health Worry	GP-satisfaction Health Worry	GP-satisfaction Health Worry	GP-satisfaction Health Worry *Unemployed*[a] Distress[b] Changes	GP-satisfaction Health Worry *Unemployed* Changes
Outpatient Contact	Social Contacts Health Worry	Social Contacts Health Worry	Social Contacts Health Worry Chronic Illness	Social Contacts Chronic Illness Trauma	Social Contacts Chronic Illness
Volume	GP-satisfaction Health Worry	GP-satisfaction Health Worry *Social Contacts*	GP-satisfaction Health Worry *Social Contacts* Chronic Illness	GP-satisfaction Health Worry *Social Contacts* Chronic Illness Trauma Changes	GP-satisfaction Health Worry *Social Contacts* Chronic Illness Trauma Changes
GP-CARE					
Contact	Sex Health Worry	Sex Health Worry	Sex Health Worry	Sex Health Worry	Sex Health Worry
Volume	Sex Unemployed Health Worry	Sex Unemployed Health Worry Health Insurance GP-resources	Sex Health Worry Health Insurance GP-resources Impaired ADLs Chronic Illness Perceived Health	Sex Health Worry Health Insurance GP-resources Impaired ADLs Chronic Illness Perceived Health	Sex Health Worry Health Insurance GP-resources Impaired ADLs Chronic Illness
SECONDARY-CARE					
Contact	Sex Qualifications Health Worry Health Control	Sex Qualifications Health Worry Health Control	Sex Qualifications Health Worry Health Control Impaired ADLs	Sex Qualifications Health Worry Health Control	Sex Qualifications Health Worry Health Control
Volume	Qualifications Health Worry	Qualifications Health Worry Health Insurance	Qualifications Health Worry Health Insurance Impaired ADLs	Qualifications Health Worry Health Insurance Impaired ADLs Wellbeing Distress	Qualifications Health Worry Health Insurance Trauma*ADL[c] Changes*Ills[d]

[a] = Italicized predictors attained significance on steps later than the step on which they were first entered into model.
[b] = Underlined predictors lost significance on later steps. These represent mediated variables.
[c] = Interaction term for Trauma and Impaired ADLs.
[d] = Interaction term for Life Changes and Chronic Illness.

Table 53: Profile of significant predictors on steps 1 to 5 for each informal health-care measure.

Service	1	2	3	4	5
PRESCRIPTION-CARE					
Contact	Sex	Sex	Sex	Sex	Sex
	Age	Age	Age	Age	Age
	Health Worry	Health Worry	Health Worry	Health Worry	Health Worry
		Health Control	Health Control	Health Control	Health Control
			GP-satisfaction[a]	*GP-satisfaction*	*GP-satisfaction*
		Health Insurance	Health Insurance	Health Insurance	Health Insurance
		GP-resources	GP-resources	GP-resources	GP-resources
			Impaired ADLs	Impaired ADLs	Impaired ADLs
			Perceived Health[b]		
					Chronic illness
Volume	Sex	Sex	Sex	Sex	Sex
	Age	Age			
	Qualifications	Qualifications			Qualifications
	Unemployed	Unemployed	Unemployed	Unemployed	Unemployed
	Health Worry	Health Worry	Health Worry	Health Worry	Health Worry
	Health Control	Health Control			
			Chronic Illness	Chronic Illness	Chronic Illness
			Perceived Health	Perceived Health	Perceived Health
BEDREST-CARE					
Contact	Age	Age	Age	Age	Age
	Health Worry	Health Worry	Health Worry	Health Worry	Health Worry
			Unemployed	Unemployed	Unemployed
		Living Standard	Living Standard	Living Standard	Living Standard
		Income Adequacy	Income Adequacy	Income Adequacy	
			Impaired ADLs	Impaired ADLs	
			Perceived Health	Perceived Health	Perceived Health
Volume	Unemployed	Unemployed	Unemployed	Unemployed	Unemployed
	Health Worry	Health Worry			
	Health Control	Health Control	Health Control		
					Sex
			Impaired ADLs		Impaired ADLs
				Trauma	
					Wellbeing
					Distress
					Trauma*Ills[c]
					Trauma*Health[d]
CUTBACK-CARE					
Contact	Health Worry	Health Worry	Health Worry	Health Worry	Health Worry
			Sex	*Sex*	*Sex*
			Ethnicity	*Ethnicity*	*Ethnicity*
		GP-resources	GP-resources	GP-resources	GP-resources
			Impaired ADLs		
			Chronic Illness		Chronic Illness
			Perceived Health	Perceived Health	Perceived Health
Volume	Ethnicity	Ethnicity	Ethnicity	Ethnicity	Ethnicity
	Unemployed	Unemployed	Unemployed	Unemployed	Unemployed
	Health Worry	Health Worry	Health Worry	Health Worry	Health Worry
			Impaired ADLs	Impaired ADLs	Impaired ADLs
			Perceived Health	Perceived Health	Perceived Health

[a] = Italicised predictors attained significance on steps later than the step on which they were first entered into model.
[b] = Underlined predictors lost significance on later steps. These represent mediated variables.
[c] = Interaction term for Trauma and Chronic Illness.
[d] = Interaction term for Trauma and Perceived Health.

11.3.2 Significant predisposing predictors

11.3.2.1 Demographic predictors

Sex. Sex had significant effects on seven out of thirteen health-service variables, with the direction of the effect indicating less health-care use by veterans. Veterans were less likely to have: contacted GPs and secondary-services, obtained prescriptions and taken cutback days; they were also less frequent consumers of care involving GPs, prescriptions and bedrest. Since prior studies have not compared veterans' and wives' health and use of health-care, there were no empirically-based expectations regarding each group's uptake of health-care. However, findings from two different lines of research, involving either general population groups or veterans, have found sex differences in the use of health-care. General population findings indicate that women have both a greater likelihood and frequency of consuming a range of medical practitioner services (Kandrack et al., 1991; Stern et al., 1996; Stoller, 1982; Wolinsky et al., 1985). Military research has also found sex differences in health-care. In one study (Romeis et al., 1991), female veterans consumed more GP services than their civilian peers and these two female groups, in turn, consumed more health-care than either male veterans or male civilian peers. The pattern found in Romeis et al. suggests that sex differences in health-care persist even in non-general population groups. Present sex-differences in health-care by veterans and wives, therefore, are broadly consistent with those found in general population research and military research. Veterans, in common with men in general, had a reduced propensity for seeking health-care. However, the absence of any sex-differences in use of hospital-care in the present sample contrasts with research showing relatively greater use of hospital-care by middle-aged and older men compared with similar age groups of women (Bernard et al., 1993; Statistics New Zealand, 1993; The American National Center for Health Statistics, 1992).

Age. Age had a significant impact on Prescription- and Bedrest-contact, but on no other service. The direction of impact differed for the two services. Older respondents were more likely to have obtained prescriptions but were less likely to have had bedrest. Through its relationship with physical-need, age was also indirectly associated with frequency of prescription usage. In prior research, no differences were found in the likelihood of men or women having bedrest; however, among those who had bedrest, older men were confined to bed for longer periods than were older women (Nelson, 1993; Wolinsky & Johnson, 1991). The absence of association between age and formal health-care in the present study parallels prior findings for civilian populations in which increasing age does not inevitably lead to increased medical-care consumption (Andersen et al., 1975; Wolinsky, 1990). The finding that older respondents were more likely to have obtained prescriptions, but were not also more likely to have seen GPs (who authorize prescriptions), could be due to these older respondents utilizing more 'repeat' prescriptions or obtaining new prescriptions over the telephone from their GP. A third possibility is that older respondents maximise their GP visits by obtaining more prescription items per visit than do younger respondents.

Ethnicity. Ethnicity had significant effects on only two health-care variables, both of which tapped different aspects of the same type of health-care (i.e., likelihood of contact and volume of cutback). Maori respondents were less likely than non-Maori to have taken cutback days. However, among those who did have cutback days, Maori had a greater number of these compared with non-Maori. Contrary to the extant civilian literature, there were no ethnic differences in the consumption of formal health-care (Mutchler & Burr, 1989; Wolinsky et al., 1989). In the literature, greater use of specified health-care by one ethnic group compared with another has been interpreted as 'health-disadvantage' (i.e., one group's greater difficulty in accessing care). In the case of formal-care, differences have been further viewed as

demonstrating inequitable distribution of health services, particularly when physical-need plays a relatively smaller role in one group's ***greater*** consumption of ***non***-elective care (Wolinsky et al., 1989). In the case of informal-care, greater use of self-treatment has been interpreted as a substitute for formal-care. This interpretation implies that financial or other resource-barriers to formal-care have necessitated the use of self-treatment. For example, Wolinsky and Johnson (1991) viewed elderly adults relatively greater use of informal care and their reduced use of medical-care, compared with other elderly adults, as an indicator of poorer socio-economic status.

The greater frequency of cutback days by Maori respondents may have indicated that informal care served as a substitute for formal care. Although no ethnic differences in formal health-care use were found, Maori respondents may have had greater physical-need. A comparisons of scores on measures of physical- and psychological-need showed that Maori respondents had significantly greater need than did non-Maori respondents. This finding of greater need is in harmony with studies documenting a poorer health-status among adult Maori compared with non-Maori counterparts (Durie, 1994). It is also possible that more frequent cutback days by Maori respondents may reflect cultural norms in which more time is allowed for recovery.

Qualifications. Qualifications had a significant impact on three health-service variables, but none involved primary health-care. Compared with other respondents, those with educational qualifications were more likely to have used secondary-health services and were also more frequent consumers of these services; they also obtained more prescriptions. These effects are consistent with the literature which documents a positive relationship between educational attainment and health-care use, and of GP-care in particular (Bazargan et al., 1998; Becker, 1974; Hershey et al., 1975; Mutchler & Burr, 1991; Stoller, 1982; Wenzel et al., 1995).

Through its relationship with physical-need, Qualifications was also indirectly associated with Prescription-volume. Greater use of health-care by those with more educational attainment has been attributed to their greater knowledge and awareness of health and health-care (Snider, 1980; Stoller, 1982). Use of more prescription items by those with educational qualifications suggests they may have utilized their GP-care more efficiently than other respondents, by requesting additional treatments during the same visit.

The absence of effects of the Qualifications measure on primary health-care contrasts with the published literature. The present measure was a dichotomous variable indicating whether or not respondents had any educational qualifications. It differed from the measure typically used in utilization research; namely, number of years of education. Although a significant predictor of relatively more elective services (e.g., Secondary-care), it may have lacked sufficient sensitivity to differentiate consumers of primary-care from non-consumers. Alternatively, education may well have been an irrelevant variable in the prediction of formal health-care in the present sample of veterans and their wives. In this regard, most of the prior research which has found education to be a significant predictor of primary care has been based on samples of older adults (Bazargan et al., 1998; Nelson, 1993; Stoller, 1982).

11.3.2.2 Social-structural predictors

Social Contacts. Having social contacts had a significant effect on two health-care variables, both involving hospital-care. Respondents with more social contacts were more likely to have received outpatient treatment and to have also used more hospital services. This is congruent with the view that ailing people may be encouraged by friends and kin to contact health professionals (Kandrack et al., 1991; Nelson, 1993; Wolinsky & Johnson, 1991). An alternative view is that hospitalization may have given rise to increased contact with friends

and kin, especially when people depend on informal care during recuperation (Wolinsky & Johnson, 1991). However, in the present sample, there was an absence of effects of social contacts on informal care.

Unemployed. Being unemployed had significant impact on five services, two involving contact and three, volume. The direction of impact was different for contact-services than it was for volume-services; that is, unemployed respondents were ***less*** likely than employed respondents to have received inpatient-care and to have had bedrest. However, unemployed respondents who did have inpatient-care and bedrest, consumed more of these services than employed respondents. Being unemployed also had an indirect and positive impact on GP-visit frequency through its relationship with physical-need. The lower probability of contact with inpatient- and bedrest-care on the one hand, and the increased consumption of all three formal sources of care on the other, forms a pattern of considerable interest. The ***lower*** probability of inpatient-care differs from prior findings in which unemployment is associated with greater consumption of medical care (Kandrack et al., 1991; Verbrugge, 1989; Vincent et al., 1991). Unemployed respondents may have been disadvantaged due to their lower probability of hospitalization; that is, their unemployed status may have had some influence on their eligibility for hospital treatment. An alternative conclusion is that unemployed respondents may have been less inclined to present for GP-care with medically-significant symptoms but ***among those who did so***, the frequency of their use of different hospital services was the same as for employed respondents. The association between unemployment and GP-care, albeit an indirect one through physical-need, is consistent with the published research in which unemployed people have had poorer health than employed people (Verbrugge, 1989).

The more frequent use of informal-care by unemployed respondents suggested that their health was poorer compared with employed respondents. It could have also meant that they had more time available for informal care than did employed respondents. In other words, employed respondents may well have needed more informal-care than they utilized but were unable to utilize it as much as unemployed respondents because of work committments. As noted, although unemployed respondents were less likely to use informal care, when they did so, they were more frequent in their use of it. None of the foregoing explanations can be explored with the available data, and further research is needed to address the issue of employment status and use of health-care by veterans and their wives.

11.3.2.3 Health beliefs predictors

Health Control. Health Control had significant impact on only two health-care variables, both involving contact measures. Veterans and wives who felt they had control over their health were more likely to have used secondary-care services and to have obtained prescriptions. An expectation is that higher levels of perceived health control would be associated with reduced use of primary health-care (Rodkin, 1986; Wolinsky & Johnson, 1991). Present findings failed to find any differences in patterns of formal health-care between respondents with and without control over their health. Nevertheless, the finding of an increased likelihood of secondary-care fits the picture of greater health control being associated with greater awareness of and initiative in taking care of health (Snider, 1980). Secondary-care consists of a variety of services that, with few exceptions, involve more elective types of health care (e.g., dental-care, homeopathy, naturopathy, mental-health care, etc.). Health Control had an indirect impact on two other informal services, Prescription- and Bedrest-volume.

Prior research is mixed concerning the association between health-control and use of primary care. Using the same measure of health-care as presently used, Wolinsky and Johnson (1991) also reported no significant associations between Health Control and use of health-care for their sample of older American adults. However, Bazargan et al. (1998) found a significant relationship between their multi-dimensional measure of health-control and use of hospital and GP services. Their measure comprised several items assessing the extent to which older Black American adults felt specific aspects of health were their responsibility. The absence of effects on formal health-care in the present study may have been because the measure lacked specificity for formal health-care.

GP-satisfaction. Satisfaction with GP-care had significant impact on three health-care variables, two involving hospital-care and one, informal care. Compared with other respondents, those who reported higher satisfaction with GP-care were more likely to have been hospitalized, consumed more hospital services and were also more likely to have obtained prescriptions. These effects met with prior expectations that higher levels of GP-satisfaction lead to a greater use of medical services (Robbins et al., 1993; Roghmann et al., 1979; Zastowny et al., 1989). A reasonable deduction regarding the GP-satisfaction-hospital-care association is that hospital-care resulted from GP referrals. Compared with those who either had no GP-contact or whose visits were prompted by less serious health-need, respondents who received GP-referred hospital treatment would undoubtedly perceive items on the GP-satisfaction measure as having greater personal relevance. Equally, it seems likely that respondents whose GP-visits were prompted by relatively less serious need would not have been as attuned to questionnaire items pertaining to the GP's competence of care. That higher levels of satisfaction were associated with higher consumption of hospital services suggests that respondents were not only attuned to items on their doctor's competence, but

also highly rated it. An alternative interpretation is that respondents who were in more frequent contact with hospital services than others were more favourably disposed towards the medical-care system anyway. This latter explanation regards the satisfaction-response as predispositional, and thus stable across time and health services (Robbins et al., 1993). Either interpretation is consistent with the higher-satisfaction-higher-consumption view expressed in the literature. Notwithstanding their plausibility, all of these interpretations are speculative since they cannot be confirmed with the present data. Of interest, higher levels of GP-satisfaction were linked neither to the likelihood nor the frequency of GP-service use; it was linked, however, to a greater likelihood of prescription use. This pattern suggests that highly satisfied respondents, compared with others, may have contacted their GP for more serious medical problems (i.e., ones which resulted in more prescriptions) or were more efficient consumers of GP-care.

Health Worry. Health Worry registered a significant impact on all health-care variables, although for two services (Outpatient-Contact and Bedrest-Volume), its impact was mediated by physical-need. Compared with others, those who worried about their health were more likely to have had contact with inpatient-, GP- and secondary-services and to have been more frequent in their use of these formal services. They were also more likely to have had prescriptions, bedrest and cutback-care, and to have been more frequent in their use of prescriptions and cutback days. These effects are consistent with the notion that attitudes about health influence the uptake of health-care (Andersen et al., 1975; Nelson, 1993; Wolinsky & Johnson, 1991).

11.3.3 Significant enabling predictors

The enabling component accounted for a small share of the total explained variance in use of health-care by veterans and wives. It failed to have an impact on several services, as shown in Table 54. In addition, few enabling variables had independent effects on health-care.

Table 54: Health-care services in which the enabling component contributed significant increments

	Contact	*Volume*
Formal	NONE	GP Secondary
Informal	Prescription Bedrest Cutback	NONE

Living Standard. Living Standard failed to exert an impact on any measure except one, Bedrest-contact. Those who were more satisfied with their living standard were more likely to have had bedrest. This positive association was one of the strongest predictors of bedrest. The absence of an association with measures of contact with and volume of use of formal services is consistent with findings in a study by Eve (1988) of health-care use by elderly Canadian women. Eve, however, did find that those who reported higher satisfaction with the household living standard were less likely to put off necessary health-care than those who reported higher satisfaction. A potential interpretation of the present positive association is that the higher satisfaction with living standard reflected financial wellbeing that enabled respondents to take time off from responsibilities to have some rest. Less satisfied respondents may have been less financially able to take time off for bedrest.

GP-resources. GP-resources had a significant effect on three health-care measures, only one of which involved GP-care. Respondents with more GP-access resources were more likely to

have had prescriptions and cutback-care, and they were also more frequent consumers of GP services. Thus, having (1) a regular GP (2) the same GP more for than five years and (3) waiting fewer than fifteen minutes before being seen by the GP increased the frequency of GP-visits and the likelihood of obtaining prescriptions and taking cutback. The association found between having GP-resources and increased use of GP-care is consonant with prior findings (Andersen et al., 1975; Gribben, 1992; Wolinsky et al., 1985). It is noteworthy that having more of the access resources increased neither the likelihood of GP-contact nor the likelihood or frequency of use of any hospital- and secondary-care.

Health Insurance. Health Insurance registered significant impact on three health-care measures; these were Prescription-contact, and GP- and Secondary-care-volume. Respondents who had health insurance were more likely to have obtained prescriptions in the past year and were more frequent consumers of GP- and Secondary-care. Absence of effects for likelihood of GP-visits, but effects for their frequency, suggests that insured respondents may have had greater health-need than uninsured respondents. This interpretation derives from the view that the initial GP-visit in an illness episode is more likely to be at the discretion of the patient, while subsequent visits during the illness are more likely to be at the GP's discretion (e.g., prescribing treatment that entails follow-up visits). Alternatively, it could indicate that, among those who had contact, insured respondents were more responsive to their health needs than were uninsured respondents. More visits by insured than uninsured respondents provides support for the expectation that health insurance facilitated access to GP-care (Verbrugge, 1989; Wolinsky & Johnson, 1991). The absence of any effect on hospital-based services is consistent with research showing that health insurance does not increase access to hospital-care (Mutchler & Burr, 1991; Wolinsky et al., 1989). As noted above, the Andersen (1968) model conceptualizes hospital-care as non-elective, and if resources such as private insurance

led to increased use of hospital services, supply of these services would be inequitable (i.e., more likely to be allocated to those with insurance).

Community Services Card. The Community Services Card (CS Card) failed to impact on any health-care measure. The absence of any effect of the card on use of formal health services is intriguing, given prior findings that reduced-cost health-care leads to an increased pattern of health-care consumption, and of GP-care, in particular (Nolan, 1994; Wolinsky & Johnson, 1991). A possible explanation is that the CS Card is not issued according to health-need, but is universally available to low-income New Zealand adults (and their dependents). To test whether or not respondents who had the CS Card had greater health-care need than those who did not have the card, t-tests or chi-square analyses were calculated, as appropriate, between need variables and the CS Card measure. On all measures of need, those who had the CS Card had significantly greater need than those who did not have the card. Therefore, despite greater need, those who had the CS Card were neither more likely nor more frequent in their use of health-care.

Income Adequacy. No significant effects on any health-care measures were found for Income Adequacy. The absence of any effects for Income Adequacy, a proxy for income, is congruent with the view that income has less salience in the prediction of formal health-care in societies that provide income-based subsidized care (Andersen, 1968; Andersen & Newman, 1973). Nevertheless, prior research has also found that lower socio-economic status groups consume more GP services than other groups (Gribben, 1992; Nolan, 1994). These findings have been attributed to the relatively poorer health status of economically poorer groups (Mutchler & Burr, 1991). Using the same measure of income adequacy that was used in the present study, Eve (1988) found significant bivariate correlations between it and various measures of health-

care. However, in subsequent multivariate analyses, income adequacy lost its association with these services but remained a significant predictor of putting off necessary health-care in the past year. Similarly, in the present study, significant bivariate correlations between Income Adequacy and measures of health-care disappeared in the multivariate analyses. Thus, despite differences in sample and methodology, Eve's findings of non-significant associations for volume measures were replicated in the present sample.

GP-fee. The absence of ***any*** effect of GP-fee on current use of any health services adds to the picture of veterans' and wives' access to health-care. Of all enabling variables in the present study, GP-fee had the potential to directly identify a specific barrier to GP-care (i.e., the cost of the visit). However, the present GP-fee measure may have lacked sensitivity to current financial difficulties in accessing health services. Had this measure been assigned a more recent time frame (e.g., the past year), an association between putting off care and reduced consumption may have emerged. Respondents who had put off care in earlier years may have comprised a different group from those who put off care in the past year. Similarly, the absence of effects on informal-care may indicate that self-treatment was not a substitute for primary health-care or that the measure was too broad in its time frame to differentiate more recent barriers to health-care.

To summarise findings for enabling predictors: There were three instances in which enabling predictors had a significant impact on formal measures of health-care. Two of these predictors, Health Insurance and GP-resources, had an impact on GP-volume, and the third, also Health Insurance, had an impact on Secondary-care-volume. Insured respondents used more GP- and Secondary-care services. Those with more GP-resources also consumed more GP services.

There were four instances in which enabling predictors had a significant impact on informal care. GP-resources had an impact on Cutback-contact, Living Standard on Bedrest-contact and Health Insurance and GP-resources on Prescription-contact. In each instance, for both formal and informal care, the resources facilitated access to health care; that is, having the resources was associated with an increased likelihood or increased frequency of utilization. This pattern of findings implies that there may have been barriers to health-care for those respondents who did not possess health insurance or who lacked 'GP resources' (as measured by whether they had a regular GP, how long they had been visiting the same GP and how long they had waited before the GP saw them). To the extent that these 'unresourced' respondents seek medical care, they probably attended community medical clinics where they waited until the next available GP could see them.

11.3.4 Significant physical-need predictors

Each of the three physical-need variables had independent effects on several different service variables. The effects were consistent with both the prior war veterans' research (Romeis et al., 1991; Stern et al., 1996; Vincent et al., 1992; Wolinsky et al., 1985) and the civilian research (Cheng, 1992; Gribben, 1992; Stoller, 1982; Verbrugge, 1989).

Impaired ADLs. Impaired ADLs had significant effects on one formal and three informal service-variables. Respondents who reported a greater number of Impaired ADLs were more likely to have obtained prescriptions and were also more frequent in their use of GPs, bedrest- and cutback-care. Impaired ADLs also had indirect effects on several health-care variables through its relationship with two of the later entered components. Specifically, its impact on Secondary- and Cutback-contact was mediated by psychological-need, and its impact on Bedrest-contact and Secondary-volume by multiple-need. Present findings for direct effects

are similar to those reported by Wolinsky and Johnson (1991), in which older adults with Impaired ADLs were more likely to have had contact with a range of formal and informal services, and were also more frequent in their consumption of these services. The pattern of effects in the present findings suggests that while Impaired ADLs were treated primarily by self-care, they also prompted more frequent GP visits. This supports the literature which reports that measures of ADLs are sensitive indicators of primary-care used by older adults (Thomas & Lichtenstein, 1986). Noteworthy are the presence of effects on the three informal services (i.e., prescription-, bedrest- and cutback-care, and the absence of any effects on hospital-care. This pattern invites two different interpretations, neither of which can be resolved with the present data. First, impairments were not severe enough to lead to hospital treatment, but they did result in increased use of self-care. Second, impairments may have been severe but beyond hospital intervention; that is, treatable mainly through GP-care and informal care.

Chronic Illnesses. Having chronic illnesses registered significant impact on six service-variables, evenly spread across formal and informal measures; that is, those who reported having more chronic health problems than others were more likely to have had outpatient-treatment, bedrest and prescriptions. They were also more frequent in their use of hospital- and GP-services and prescriptions. These findings parallel the published research on veterans and more general populations. In the New Zealand veterans research, having multiple chronic illnesses was associated with more frequent use of primary medical care (Vincent et al., 1991), and a recent study of elderly adults' health-care, found that chronic illnesses were among the strongest predictors of Accident and Emergency services and GP-care (Bazargan et al., 1998).

Perceived Health. Perceived health registered significant effects on two formal and four informal service-variables and had indirect effects on two other services. Respondents who had positive health perceptions were less likely to have had contact with outpatient-care, and to have taken bedrest and cutback days. Indirect effects of Perceived Health on two other services, Prescription-contact and GP-volume, were through its relationship with psychological- and multiple-need, respectively. They also had fewer GP visits, prescription items and cutback days. These findings are entirely consistent with the literature documenting a relationship between self-rated health and use of a range of health services (Nelson, 1993; Strain, 1991; Wolinsky et al., 1989; Wolinsky & Johnson, 1991). The prior research has also found perceived health to be a valid indicator of general health status (Idler & Kasl, 1991). Noteworthy in the present data is an absence of effects of Perceived Health on the likelihood of GP-contact: Respondents with positive perceived health were just as likely as other respondents to have contacted GPs in the past year. However, when those with positive perceived health did have contact, they had fewer visits than those with negative perceived health. This pattern indicates that those with positive perceived health may have had contact for preventative care such as an annual checkup (Mechanic, 1979).

11.3.5 Significant psychological-need predictors

Across the thirteen measures of health-care, there were very few instances of psychological-need variables exerting a significant impact on use of health-care. In addition, there were several instances in which these predictors lost their direct effects once multiple-need (i.e., interaction terms between physical- and psychological-need) was entered into the model.

Distress. Distress had significant effects on one formal- and two informal-service variables. These three variables were volume measures of hospital-, bedrest- and cutback-care. In each

of these measures, distress was associated with ***less*** frequent use of health-care. Three issues arise for discussion, all involving the relationship of present findings to published findings. First, as noted in Section 11.2.2, the significant effects of Distress on Inpatient-care appear to be have no precedent in prior general population research. While prior research has found a positive association between psychological-need and ***GP***-care, few studies have investigated relationships between hospital-care and psychological-need. Second, the direction of significant effects of Distress on volume of hospital-, bedrest- and cutback-care was unexpected. Nevertheless, some studies have reported that veterans who exhibited high levels of combat stress were less frequent consumers of outpatient services that other veterans (Stern et al., 1996; Wenzel et al., 1995). This effect was interpreted as veterans' being too overwhelmed by stress to negotiate the health-care system (Wenzel et al., 1995). However, it is not clear whether present effects should be interpreted this way because of the absence of any effects on whether or not other formal services were contacted. Highly distressed respondents were no less likely than others to have had Outpatient-, GP- and Secondary-care. Third, the absence of effects of Distress on GP-care was unexpected, given the literature documenting an association between the two (Andersen et al., 1977; Kulka et al, 1990; Tessler et al., 1976). Again, how this absence should be interpreted in the light of the presence of effects on inpatient services is not clear. The absence of effects on GP-care may reflect an ability to cope with relatively high distress levels without turning to the 'first-line' of professional help, the doctor (Bland et al., 1990; Cheng, 1992). The findings that highly distressed veterans and wives made use of fewer informal health services suggests an inability or unwillingness to use informal care. These respondents may have had employment or family committments that made it difficult for them to take time off when they were ill, and this could have led, in turn, to greater distress compared with respondents who utilized informal health-care.

Wellbeing. Wellbeing had a significant impact on only one service-variable, Bedrest. Those who had lower levels of wellbeing took more days of bedrest in the past year than those who had higher levels. This effect is in harmony with documentation of an association between impaired psychological status and poorer physical health (Andersen et al., 1977; Kulka et al., 1990; Manning & Wells, 1992; Vincent et al., 1992; Vincent et al., 1994). On the other hand, the absence of any effects on the use of ***GP*** services is at variance with prior findings of an association between lowered wellbeing and GP-care (Bland et al., 1993; Van Hemert et al., 1993). This suggests that veterans and their wives did not turn to their GP in response to lower levels of wellbeing, but turned instead to self-care.

As stated, the direction of the effect of Wellbeing on Bedrest is consistent with prior findings. Nevertheless, the direction of its present effect needs to be reconciled with that of Distress on Bedrest, discussed above. While lower levels of Wellbeing were associated with ***more*** bedrest days, higher levels of distress were associated with ***fewer*** such days. In other words, poorer psychological functioning (i.e., higher distress) as well as better psychological functioning (higher wellbeing) led to reduced bedrest. This anomalous pattern defies straightforward interpretation; however, it is not without precedent in the literature. Using the same subscales of the Mental Health Inventory as were used in the present study, Manning and Wells (1992) found that distress and wellbeing "had opposite partial effects on medical care" (p.548); that is, higher levels of both were associated with increased care consumption. The counter-intuitive results were explained as a function of wellbeing modifying the effects of distress, and the positive association between higher wellbeing and increased care interpreted as "an indicator of an ability to respond to psychological distress by seeking help" (Manning & Wells, 1992; p.550). A possible interpretation is that, among respondents who reported higher distress ***and*** also higher wellbeing, the expected harmful effects of distress

were moderated by wellbeing. The moderating effects enabled respondents to 'get by' on fewer days bedrest than those who reported high distress and ***low*** wellbeing, although distress levels remained relatively high. Present data do not allow an exploration of this interpretation. and any interpretation remains speculative.

Life Changes. Life Changes had significant effects only on two hospital-based services, but on no others. Respondents who experienced more past-year life changes than other respondents were more likely to be hospitalized and they also consumed a higher number of different hospital services. Although the association between Life Changes and health-care was expected, its confinement to hospital-care is difficult to explain[12]. Prior research has found that life changes may lead to increased use of GP services (Koss et al., 1990; Sarason et al., 1978; Williams et al., 1981). If Life Changes had exerted an impact on GP-care and other health services, as expected, the association could have been explained in terms of the increased-stress-greater-medical-care model. However, since hospital-care typically involves treatment for non-elective medical conditions, it seems improbable that past-year changes precipitated the hospital-care. Recent life changes may nevertheless have exposed respondents to situations that impacted on their health status, necessitating hospital-care. A further possibility is that the need for hospital-care coincided with a life stage that already had its own 'developmental' adjustments, such as children leaving home and employment changes. An additional explanation is that hospitalization itself may have precipitated some of the recent changes, and in particular, those related to living arrangement and employment.

Trauma. Trauma failed to have significant impact on all service variables except one,

[12]The life-changes-health-care association cannot be attributed to the personal illness/injury item on the life-changes checklist because this item was excluded from the multivariate analyses.

Hospital-volume. Respondents who reported having more lifetime trauma than others utilized more hospital services in the past year. While this is consistent with the view that frequency of exposure to trauma compromises general health (Kulka et al., 1990; Norris, 1992; Norris et al., 1990), its effects on the number of different hospital services utilized is puzzling. One interpretation is that the experience of being hospitalized, especially for treatment of medically serious conditions, may have overly sensitized respondents to key experiences in their life. These respondents may have been more prepared to view the prior experiences as having been traumatic compared with respondents who had not experienced serious health conditions. Equally puzzling is the absence of effects on other measures of health-care, and in particular GP-care, a service that has been associated with traumatic experiences in the literature (Kimmerling & Calhoun, 1996; Koss et al., 1990). The measure of Trauma consisted of the total number of different types of trauma that had been experienced over the lifetime, whether or not their effects were still present. The absence of effects may have due to the measure being too broad to differentiate experiences that had been traumatic at the time but whose effects had dissipated and experiences that continued to have an impact on health. Information on the recency, intensity and frequency of each trauma may have yielded a measure that had increased sensitivity to continuing health effects (Norris, 1990), and have enabled a differentiation according to whether effects were still present.

PTSD. PTSD was the one psychological-need variable that failed to have an impact on any measure of health care. The short-form PTSD scale used in the present study was derived from the Mississippi Scale which had been initially developed for classifying veterans as having or not having PTSD (Keane et al., 1986; Wolfe et al., 1993). Therefore, the absence of independent health-care effects is intriguing, especially given the frequency of effects reported in both the veterans (Kulka et al., 1990; Vincent et al., 1991) and civilian literature

(Koss et al.,1990; Norris et al., 1990). It is possible that the effects of PTSD may have been indirect because PTSD has often been associated with poorer physical health in the literature (Kulka et al., 1990; Vincent et al., 1994). Consequently, PTSD may have exerted its health-care effects through physical health (Friedman & Schnurr, 1995). Additional analyses were conducted to test this proposition (i.e., that the association of PTSD on health-care use would be through physical-need). In these analyses, physical-need variables were entered into the model prior to the entry of the measure of PTSD, and then the order was reversed. Regardless of the entry order, the measure of PTSD had neither direct nor mediated effects on health-care. It is probable that the short-form scale was unable to differentiate among levels of severity of PTSD symptoms, and the absence of effects warrants further investigation.

Comparisons with general population data. Scores on the measures of psychological-need were relative rather than absolute indicators of psychological functioning. Therefore, the absence of more pervasive effects on measures of health-care may have indicated that respondents with elevated scores were not experiencing sufficient psychological-need for it to register effects on their use of health services. Another way of determining the meaning of respondents' scores in terms of psychological-need is to compare them with normative data on the measures of psychological-need. Unfortunately, no normative data exists on any of the present measures. However, a community study of adult New Zealanders has provided general population data for two measures of psychological-need, Distress and Wellbeing (Flett et al., 1998). Table 55 displays scores on these two measures for veterans, their wives and age-matched general population men and women. Veterans reported poorer psychological health than general population men, while the wives of veterans reported better psychological health than general population women. Of interest, general population men reported substantially better scores than general population women. This sex difference is consistent with the

research on general population samples which has also found that women usually report poorer psychological health than men (Kandrack et al., 1991; Verbrugge, 1989). In contrast, veterans in the present study reported poorer psychological health than their wives.

Table 55: Wellbeing and Distress: Comparative mean scores (and SDs) for present sample of NZ Vietnam War veterans and wives and aged-matched NZ civilian males (N=269) and females (N=478).

	Present sample		Civilian sample[a]	
Variables	Partners	Veterans	Females	Males
Wellbeing	72.27[b]	69.58	54.18	78.36
	(15.07)	(15.64)	(23.70)	(14.52)
Distress	56.79	61.22	76.89	47.94
	(25.18)	(27.26)	(14.90)	(19.38)

[a] = Flett, Millar, Long & MacDonald (1998).
[b] = Scores from the present study and Flett et al. (1998) have been compared for descriptive purposes only.

11.3.6 Profile of predictors of primary measures of health-care[13]

The first part of this section discussed the association of individual predictors to measures of health-care. The second part discusses specific primary health-care measures and the profile of predictors for each.

Inpatient-contact. This service variable measured whether or not respondents had been hospitalized for at least one night in the past year. In the present study, there were four predictors of Inpatient-contact: GP-satisfaction, Health Worry, Unemployed and Life Changes. GP-Satisfaction and Health Worry measured predisposing health beliefs. In Wolinsky and Johnson's (1991) study of older adults (aged 70 years and older), the same measure of Health Worry as presently used was also a significant predictor of Inpatient-contact. Thus, the Health Worry measure has predicted inpatient contact in two differently composed samples of adults.

[13]The basis for selection of measures of primary health services in this section was the availability of published research which had used the same measures of primary health services as used in the present study.

Another study that found a significant correlation between health beliefs and Inpatient-contact was Strain's (1991) study of older adults (aged 60 years and older). The measure of health beliefs was a multi-item medical skepticism scale which emerged as one of the strongest predictors of Inpatient-contact. In the present study, the measure of Health Worry also emerged as the strongest predictor of Inpatient-contact. Therefore, whether conceptualized as worry over health or medical skepticism, the concept of health beliefs has been salient in the prediction of the likelihood of being hospitalised in various adult samples.

Andersen and Newman (1973) proposed that people who were satisfied with their health-care would be more inclined to use it than those who were not satisfied. There appear to be no published studies that have investigated this proposal in the context of the Andersen (1968) model. The present finding of a significant relationship between satisfaction with GP-care and Inpatient-contact adds to the literature and supports Andersen and Newman's proposal. GP-satisfaction was also significantly associated with the number of different hospital services utilized in the past year, but with no other health-care measure. Most of the research on the relationship of health-care satisfaction to health-care utilization has not been explicitly guided by any model of health-care. As discussed in Chapter 3, Section 3.3.5.1, findings on satisfaction and use of health-care are difficult to summarise. One finding is that, when measures of satisfaction have been applied to specified medical-care clinics within an identified community (as opposed to GP-care in general), satisfaction has significantly improved the prediction of GP-care (Zastowny et al., 1989). As stated earlier, the items in the GP-satisfaction scale may have had greater relevance for those who were more dependent on medical care in the past year. If this was the case, then it means that lower satisfaction levels may simply indicate that respondents who were not dependent on medical-care were more casual in their ratings of GP-satisfaction. To improve the predictive utility of measures of

health-care satisfaction, future research may need to hold constant both the location and the volume of health-care (Zastowny et al., 1989).

The present study found that being unemployed was negatively associated with the likelihood of being hospitalized. Of several studies which have examined the relationship between employment status and hospitalization, only one has found a significant relationship. In Wolinsky et al.'s (1985) comparative analysis of war veterans' and non-veterans' use of health services, being unemployed was associated with an increased likelihood of being hospitalized. While the present study used the same measures of employment status and Inpatient-contact as Wolinsky et al., the samples were different. The veterans sample in Wolinsky et al. comprised nearly 16,000 male and female war veterans from several different wars. These veterans also comprised a higher proportion of older adults than in the present study. Consequently, a higher proportion of unemployed respondents in the Wolinsky et al. study may have been older adults who were in poorer health than other respondents.

The present finding of a positive and significant relationship between the number of past-year life changes and being hospitalized is important because few, if any, utilization studies have included any measure of life-changes as a predictor of hospital-care. The measure comprised the total number of past-year changes respondents had experienced.

In the present study, no physical-need measure was significantly related to the likelihood of being hospitalised. This contrasts with the general population research which has consistently shown significant relationships between the two. Prior measures have included the same ones used in the present study; that is, Activities of Daily Living impairments (Bazargan et al., 1998; Nelson, 1993; Wolinsky & Johnson, 1991) chronic illnesses (Strain, 1991), and

perceived health (Bazargan et al., 1998; Nelson, 1993; Wolinsky et al., 1983; Wolinsky et al., 1985). The study by Stern et al. (1996) is the only study that could be found that has examined predictors of Inpatient-contact in a sample of Vietnam war veterans. Using a similar measure to the one used in the present study, they found a significant association between ADL Impairments and the likelihood of being hospitalized. With the exception of Stern et al., all the other studies that have found a relationship between physical-need and hospitalization have been confined to adults whose ages have ranged from 60 to 89 years. It is possible that the absence of effects of the ADL Impairments measure on the present sample of veterans and their wives was due to its being developed for assessing physical-need in samples of older adults. Several of the items in the measure reflect age-related difficulties with mobility. It is also possible that the present measures of physical-need lacked sufficient sensitivity to differentiate medically serious physical-need from non-medically serious physical-need in a non-elderly sample of consumers and non-consumers of inpatient-care. If relatively high levels of physical-need already existed in the sample, the measures may have inadequately differentiated those who were hospitalised from those who were not. In this regard, the present measures of Impaired ADLs and Chronic Illnesses, in common with those used in most of the prior research, simply required respondents to indicate the presence or absence of specified conditions. Given the documentation of poor physical-health in sizeable proportions of Vietnam War veterans (Long et al., 1992; Vincent et al., 1994), it may have been prudent to modify the scales for ADL Impairments and Chronic Illnesses so that they measured levels of severity of physical-need rather than its presence or absence. In this regard, when Bazargan et al. (1998) measured the severity of ***individual*** chronic illnesses in their general population sample of older Black Americans, several chronic illnesses registered significant association with the use of hospital services.

Outpatient-contact. This dichotomous service variable measured whether or not respondents had received outpatient care in the past year. There were only two significant predictors of this service, Social Contacts and Chronic Illnesses. Prior research has also found few significant predictors of this service variable. In Wenzel et al.'s (1995) sample of homeless American veterans from various wars, significant predictors were education, chronic illnesses and combat-stress In Stern et al.'s (1996) community sample of American war veterans, significant predictors were "functional health" (a measure similar to ADL Impairments), income and combat stress. The present study used a similar measure of chronic illnesses as Wenzel et al. (1995) and replicated their results. Thus, Wenzel et al.'s finding for homeless American veterans generalizes to New Zealand Vietnam veterans and their wives.

Stern et al. used a measure of combat exposure developed specifically to assess stress in Vietnam veterans (Boulanger & Kadushin, 1986, cited in Stern et al., 1996). Wenzel et al. (1995) provided little information on their measure of combat stress. Veterans were classified as having combat stress if they "reported at least two of three symptoms (i.e., intrusive combat memories, flashbacks or nightmares) in the prior month" (p. 1135). In the present study, a measure of PTSD symptoms rather than of combat stress was used. Absence of effects of any psychological measures on Outpatient-contact in the present study possibly reflects differences in sample composition and measures compared with the prior research.

GP-contact. This dichotomous service variable measured whether or not respondents had past-year contact with a GP. There were only two significant predictors of this service variable: Sex (i.e., being a veteran) and Health Worry. These findings will be compared with three other published studies which have investigated the predictors of the likelihood of GP-contact: Nelson (1993), Wolinsky and Johnson (1991) and Wolinsky et al. (1985). These studies failed

to find significant sex effects for GP-contact, but one study found that Health Worry significantly predicted GP-contact (Wolinsky & Johnson, 1991).

In the present study, no physical-need measures significantly predicted GP-contact. The prior studies found that ADL Impairments was significantly related to GP-contact. While one study (Wolinsky et al., 1985) reported no relationship between perceived health and GP-contact, the other two studies did (Nelson, 1993; Wolinsky & Johnson, 1991). These latter studies, in contrast to Wolinsky et al. (1985) and the present study, were based on samples of older adults.

No enabling variables significantly predicted GP-contact in the present study. In each of the three prior studies, having health insurance was significantly associated with an increased likelihood of GP-contact. The present study, using a similar measure of health insurance, failed to find a significant association.

GP-volume. This continuous service variable measured the number of past-year GP visits by respondents. Thus, analyses were confined to respondents who made at least one such visit. There were six predictors of GP-volume: Sex (i.e., being a veteran), Health Worry, Health Insurance, GP-Resources, ADL Impairments and Chronic Illnesses. These findings will be compared with six other studies: Bazargan et al. (1998), Gribben (1992), Nelson (1993), Strain (1991), Wolinsky et al. (1985) and Wolinsky and Johnson (1991).

Two prior studies also found a significant relationship between sex and GP-volume (Bazargan et al., 1998; Wolinsky & Johnson, 1991); however, the older men in these studies were more frequent consumers of GP services than were the older women. The discrepancy between

present and prior findings is possibly due to age differences in the respective samples (i.e., the present study included a large proportion of adults in their 40s and 50s, whereas the prior research was confined to adults who were at least 60 years old).

The finding of a significant relationship between Health Worry and GP-volume, again, replicates Wolinsky and Johnson's (1991) study. Two other studies also found that measures of health beliefs were significantly related to GP-volume. In Bazargan et al. (1998), the predictor was a measure of internal locus of health control, and in Strain (1991) it was a measure of medical skepticism. Bazargan et al.'s finding supports the view that the greater people's perceived sense of control over their health, the less they consume formal health-care (Kravits, 1975). The present study also included a measure of perceived health control. It was not related to GP-volume or any of the other measures of primary health-care. This measure was a single item asking respondents how much control they felt they had over their health, while the measure used in Bazargan et al. was multi-dimensional, with items tapping specific areas of perceived responsbility for health. The absence of effects in the present study could reflect the non-specificity of the measure.

Two enabling resources emerged in the present study as significantly related to GP-volume: Health Insurance and GP-resources. The significance of Health Insurance converges with Bazargan et al. (1998) who also found this predictor was significantly associated with frequency of GP-visits. The present finding of a significant relationship between GP-resources and increased use of GP services is consistent with Gribben's (1992) study of GP-care by a regional sample of New Zealand adults. Gribben found two enabling measures significantly predicted frequency of GP-visits; these were, years with the same GP and time spent waiting to see the GP. The present study combined these two measures and a third (i.e., having a

regular GP) into a summed index of GP resources. Therefore, the present study replicated Gribben's (1992) findings with an expanded measure of GP-resources and on a different sample of New Zealanders. In Bazargan et al. (1998), medical resources significantly predicted GP-visit frequency. Medical resources comprised a 4-item index measuring whether respondents perceived that their access to GPs was impeded. These three studies, each employing somewhat different measures of medical resources, and involving different samples, have found that possession of medical resources is significantly associated with an increased frequency of GP-service use.

The present finding of a significant association between ADL Impairments and GP-volume is consistent with the prior research. Five of the six studies that examined the predictors of GP-volume included measures of ADL Impairments and each one found these were significantly and positively related to the frequency of GP-visits (Bazargan et al. 1998, Nelson 1993; Strain, 1991; Wolinsky et al., 1985; Wolinsky & Johnson, 1991).

11.3.7 Summary of significant predictors of health-care use

The first part of this section reviewed the significant predictors of health-care, while the second part concentrated on the profile of predictors for specified measures of primary health-care. A context for present findings was provided by the published literature. Several findings from the present study converged with the literature and these were discussed in terms of replicating and extending the research on a different sample (i.e., New Zealand Vietnam veterans and their wives) than those reported in the literature. There were also some discrepant findings. The main conclusions from these discrepant findings were, first, that some measures used in the present study may have lacked sensitivity, and second, that the present sample included relatively younger adults than the "older adults" in prior utilization samples.

11.4 Limitations of the present study

Generalizability of the present findings to the respondent populations of New Zealand Vietnam War veterans and their wives depends on several issues which pertain to either internal validity or external validity. Internal validity involves the extent to which effects have been caused by the independent variables. Issues of internal validity encompass research methodology, independent and dependent variables, conceptualization of variables and statistical procedures. External validity concerns the extent to which findings generalize to others, and especially to those in the population from whom the present sample were selected.

11.4.1 Internal validity

11.4.1.1 Research design

The present data was gathered by cross-sectional design and analyses involved correlational statistical procedures. Neither the method nor the statistics allowed the determination of cause and effect relationships. Nevertheless, their use was justified because one purpose of the present study was to test and extend the Andersen (1968) framework.

Potential limitations of the present data were its reliance on self-report and retrospective data, which are vulnerable to bias. Respondents provided information on their current health and past-year health-care utilization; they also responded to questions about potentially more distant events, such as traumatic experience. Research on human memory indicates that when people are asked to retrospectively provide details on a series of experiences, they may unintentionally be influenced by non-memory-based but plausible explanations for those experiences (e.g., Ross, McFarland & Fletcher, 1981). Other research has shown that people's memories for events are not copies of past experience, but are reconstructed to accomodate current knowledge and concerns (Loftus & Loftus, 1980; Loftus & Zanni, 1975).

One solution to reliance on self-report and retrospective accounts is to use methodologies that are more reliable in recording health-care use over time such as the longitudinal method. The strength of this method would be its systematic gathering of information from respondents at the time illness symptoms were first experienced, including the circumstances prevailing at that time. Respondents could record this information in diaries at periodic intervals, and attempts could be made to support their responses with reports from secondary sources such as medical records, as has been done in prior research (Tessler et al., 1976)[14]. In-depth interviews could also be used to further reveal potential complexities in people's responses to illness symptoms. Their responses may suggest other factors underlying health-care use that, to date, have not been investigated, such as community or familial health 'scares' (e.g., publicity about potentially life-threatening illnesses) on people's patterns of health-care. These unanticipated influences may trigger uncharacteristic use of health-care among targeted populations and also explain why illness leads to health-care use at one time but not another.

11.4.1.2 Measurement

Independent variables. Section 11.2 showed that present findings added meagre support to the core propositions of the Andersen (1968) model. It was suggested that the failure may be due in part to measurement of variables. In this section, measurement issues are considered in greater detail, with examples of ways in which the model could be investigated more rigorously. Suggested improvements centre around two areas: First, obtaining information from respondents on the circumstances surrounding their use of health-care and second, adopting methodologies more suited to measuring the process of health-care over time.

One possible reason for the present relatively limited contribution of physical-need to the

[14]See Chapter 4, Section 4.4 for a description of the study by Tezzler et al. (1976).

explanation of health-care involves the different time frames for the measures of health-care utilization (which covered the past year), and measures of health status (which covered the present). The assumption that current health status will explain use of health-care over the past year has seldom, if ever, been tested in the research. This could be tested by asking respondents to compare their present and past-year health. Examples of measures that could be used include the following: (1), 'Is your ***current*** health better, worse or about the same as it has been over the past year?' and (2), 'In general, how changeable has your health been over the past year?'. This measure would have a multi-point response scale ranging from 'Highly Changeable' to 'No Change At All'. Comparisons of the predictive utility of the model could then be made according to the reported changeability of health status. A reasonable assumption would be that the relationship between physical-need and health-care would be weaker among respondents whose health has recently worsened compared with those whose health has remained poor over the past year.

A further reason for the limited contribution of physical-need, could have been a lack of sensitivity of the physical-need measures. The measures of ADL Impairments and Chronic Illnesses assessed the presence or absence of each item on the respective checklists. The poor health of some respondents may have involved conditions that were not severe enough to warrant ongoing formal treatment or that was effectively managed by informal care such as bedrest and prescriptions. Similarly, it is likely that mild chronic illnesses would not be as highly correlated with use of health-care as would severe chronic illnesses. The sensitivity of the present measures could have been increased by assessing the severity of each rather than its presence or absence. For example, as noted earlier, Bazargan et al. (1998) attributed the predictive success of their study on older Black Americans use of health-care to finer grained measures of chronic illnesses than had been used in the prior research.

Dependent variables. In the literature, little information exists on the circumstances underlying ***non***-use or infrequent use of specified services. The context within which non-use occurs is important for determining whether or not people face barriers when they attempt to seek treatment. Measures of health services that have been used in the prior research - and that were also used in the present study - do not tap the reasons for non-use. Non-use may represent avoidance, failure to seek treatment, inability to do so, or something else. 'Avoidance' implies refraining from seeking care, 'failure', neglect of care and 'inability', impeded access. In the literature, there has been a tendency among researchers to assume that low levels of health-care utilization by some groups relative to others represents a health-care disadvantage (Kandrack et al., 1992; Wolinsky et al., 1989; Wolinsky & Johnson, 1991). By 'broadening' the inquiry to include measures which tap the reasons for use or non-use, making assumptions about the reasons for non-use or infrequent use becomes unnecessary.

In the present study, there were fewer predictors of dichotomous measures than continuous measures of health-care, and one possible explanation is that dichotomous measures had reduced sensitivity to the effects of IVs. These measures could be refined so that, rather than measuring whether or not a service was used, they tapped the reasons for use or non-use of a service. An example of one such DV was provided in Eve's (1988) study of older women's use of health-care. In addition to the traditional measures (e.g., number of GP visits), Eve measured whether women had put off necessary health-care in the past year due to financial reasons. Enabling predictors were not significant predictors of traditional measures, but they were significant predictors of whether or not health-care had been put off in the past year.

Similarly, a DV could measure whether respondents are currently receiving treatment from a health professional for a specific medical condition. To further refine the measure,

additional information on the condition could be obtained, including its severity, chronicity and prognosis, and the frequency and types of treatment received (e.g., formal and informal). This refined measure could be expected to have greater sensitivity to physical-need than existing dichotomous measures of contact or continuous measures of the number of times a service has been used. Clearly, the reasons underlying people's use of health-care need to be included in future analyses, particularly when an important aim is to determine whether or not health treatments are accessible to those who need them.

Findings suggest that when the IV is developed into a fine-grained measure, it is a stronger predictor of health-care (Bazargan et al., 1998). They also suggest that when the DV taps the reason underlying use or non-use, it is a more sensitive measure of health-care (Eve, 1988).

11.4.1.3 Conceptualization

Interpretation of the present findings depends on the conceptualization of IVs in terms of the components of the Andersen (1968) model. The model provides a framework for justifying the location of variables in one component rather than in others. However, for some variables, there is ambiguity regarding which component they represent because the model has not been developed in terms of a comprehensive theory of health-care. For example, Chapter 3, Section 3.3.5.1, presented arguments supporting the inclusion of measures of health-care satisfaction in either the predisposing or enabling components. In the present study, there was at least one ambiguously located variable, Health Worry. This variable measured the extent to which respondents had worried about their health in the past year. Health Worry was conceptualized as a measure of predisposing health beliefs, following the research by Wolinsky and Johnson (1991). However, it has also served as a measure of physical-need in the prior research (e.g., Stoller, 1982). The extent to which the explanation of health-care changes when a variable

is moved from one component to another is a concern in the case of Health Worry because it was the most pervasively significant predictor across the measures of health-care.

In their study of older adults use of health services, Wolinsky and Johnson (1991) also found Health Worry to be an important predictor of health-care utilization. They interpreted its importance as "evidence that worried well and worried ill [elderly adults] place[d] greater demands on the system than need alone would indicate" (p. S355). There are at least two problems with this interpretation. First, the statement about both worried well and worried unwell utilizing health-care is based on the inclusion of the measure in a non-need component (i.e. predisposition). Wolinsky and Johnson (1991) seem to have concluded that, if respondents had no health worries, they must have been in good health. Yet the Health Worry measure was included as a measure of health beliefs, not health status. Secondly, Health Worry (both the concept and the variable), seems to tap perceived health-need, and is not dissimilar from the Perceived Health item, a measure of physical-need in the present study. Both of these variables require respondents to bring their predisposing perceptions to the issue of health status. Whether the most appropriate component for Health Worry is predisposition or physical-need is less important than the suggestion that it ***could*** justifiably be characterized as a measure of either predisposition or physical-need and lead to different conclusions about factors underlying health-care.

The ambiguity of aspects of Andersen's (1968) model and its later revisions (Andersen & Newman, 1973; Andersen, 1995), underscores the need for the development of more theoretically refined links among the variables that represent the components. As it presently stands, the model serves as a framework for a diverse collection of potential predictors of health-care whose links to one another are not well defined in terms of a coherent theory. In

the present example of Health Worry, it would require researchers to closely examine the justification for operationalizing health beliefs in terms of perceived health worry.

11.4.1.4 Statistical procedures

Choice of multivariate procedure. A major aim of the present study was to use multiple regression-based methods to investigate whether expanding the Andersen (1968) model would increase its explanatory capacity beyond that of the basic model. Use of these procedures also enabled present findings to be compared with previous findings. Notwithstanding the rationale for use of multiple regression techniques, their limitations have become evident with the increased emphasis in the research on the use of more comprehensive measurement sets. Multiple regression techniques have limited usefulness in establishing relationships among measures and are also vulnerable to method effects which are discussed below.

An appropriate alternative to regression techniques is structural equation modeling (SEM) which combines two approaches to model fitting: multiple regression and factor analysis (Kline, 1998). SEM provides parameter estimates of the direct and indirect associations between variables and tests how well a model explains covariation in the data. SEM also integrates theory construction with theory testing. The theory to be tested is specified and then expressed in a series of structural equations which represent the network of direct and indirect relationships amongst theoretical constructs. SEM allows inferences and conclusions to be drawn including the overall fit of a model and the significance of the individual components and relationships among them. In contrast, traditional regression techniques do not explicate relationships among components of a model. A further advantage of SEM is that elements of a larger unified model can be analyzed on an incremental basis, permitting finer grained investigation of relationships among components with a model (Kline, 1998).

Method effects. In the literature, two different sequences of entering the basic Andersen (1968) components into the model have been used. Prior to 1990, physical-need was entered first into analyses, while in more recent analyses, predisposition and enablement have been entered first. Since hierarchical regression analyses have known sensitivity to entry-order effects (Tabachnick & Fidell, 1989), researchers need to have demonstrated that findings are not a function of method effects (i.e., effects changing when a different entry-order is used). However, it is apparent from the utilization literature that entry-order effects of hierarchical regressions have neither been acknowledged nor tested.

Table 56 compares findings from studies that have entered physical-need first with those that have entered it last. There is a trend for physical-need to be more important relative to the non-need components when it has been entered first. There is also an opposing trend for it to be less important than the other two components when it has been entered last, a pattern mirrored in the present study. For example, when Wolinsky and Johnson (1991) entered predisposition first, it emerged as the most important component[15].

[15]Curiously, Wolinsky and Johnson (1991) concluded that these results were "consistent with the extant literature" (p.S350).

Table 56: Comparison of health-care utilization research by entry order of components into the model, displaying *cumulative* R^2 increments and total R^2.

	Entry Order 1[a]			*Entry Order 2*		
Study	N	E	P	P	E	N
Hospital Contact						
Wolinsky (1978)	.100	.100	.120			
Wolinsky et al.(1983)	.080	.100	.130			
Wolinsky et al.(1985)			.060			
Wolinsky et al.(1989)[b]						
Puerto Rican	.066	.082	.097			
Cuban	.028	.038	.049			
Mexican	.056	.061	.070			
Black	.063	.069	.084			
White	.059	.063	.068			
Strain (1991)	.260	.270	.290			
Wolinsky & Johnson (1991)				.054	.060	.102
Cafferata (1987)						.130
Nelson (1993)						.074
Wenzel et al.(1985)						.070
Present Study				.073	.083	.090
Hospital Volume						
Wolinsky (1978)	.100	.100	.100			
Wolinsky et al.(1985)			.230			
Wolinsky et al.(1989)						
Puerto Rican	.122	.214	.267			
Cuban	.029	.107	.227			
Mexican	.092	.152	.229			
Black	.109	.163	.206			
White	.170	.281	.313			
Wolinsky & Coe (1984)				.003	.006	.079
Wolinsky & Johnson (1991)				.054	.064	.107
Nelson (1993)						.055
Bazargan et al.(1998)				.107	.131	.263
Present Study				.104	.119	.150
GP Contact						
Stoller (1982)	.031	.068	.130			
Wolinsky et al.(1985)			.080			
Wolinsky & Johnson (1991)				.033	.051	.069
Nelson (1993)						.032
Wenzel et al.(1995)						.090
Present Study				.102	.116	.123
GP Volume						
Wolinsky (1978)	.070	.000	.090			
Stoller (1982)	.093	.179	.223			
Wolinsky et al.(1983)	.170	.220	.230			
Wolinsky et al.(1985)			.170			
Wolinsky et al.(1989)						
Puerto Rican	.283	.310	.328			
Cuban	.194	.222	.275			
Mexican	.256	.269	.276			
Black	.172	.177	.212			
White	.134	.142	.154			
Strain (1991)	.200	.000	.240			
Wolinsky & Coe (1984)				.014	.061	.196
Wolinsky & Johnson (1991)				.081	.093	.173
Gribben (1992)						.230
Nelson (1993)						.127
Bazargan et al.(1998)				.128	.230	.550
Present Study				.215	.244	.306
Bedrest Contact						
Wolinsky et al.(1983)	.250	.000	.260			
Wolinsky & Johnson (1991)				.074	.079	.149
Present study				.082	.106	.138
Bedrest Volume						
Cafferata (1987)						.070
Wolinsky & Johnson (1991)				.114	.121	.252
Present study				.259	.276	.313

[a] = Entry order of components into model: N = Physical-need; E = Enablement; P = Predisposition.
[b] = Wolinsky et al. (1989) reported separate R^2 increments for each ethnic group.

A second consideration bearing upon the choice of entry-order involves several predisposing and enabling variables which are known to be related to physical-need. These variables include sex, age, ethnicity, income and education, among others, all of which have demonstrated differential impact on health-care use (Kandrack et al., 1991; Nelson, 1993; Verbrugge, 1989). More importantly, whether or not method effects are demonstrated, the choice of hierarchical multiple regression presupposes theoretical justification; that is, the entry-order is based on a claimed cause-and-effect sequence (Tabachnick & Fidell, 1989).

The shift from entering physical-need first to entering it last in the recent research undoubtedly reflects an increased awareness of the need to control for potential confounds. It may also reflect a more explicit 'take' on Andersen's (1968) model in which the predisposing characteristics underlying health-care are viewed as predating and subsequently influencing people's perception of physical-need and inclination to use health-care.

In the present study, concern about method effects was addressed in two ways. Firstly, in re-analyses, the three components were entered into the model in reverse order, with physical-need entered first, enablement entered second and predisposition third. This provided an estimate regarding the stability of findings reported in Chapter 9. Across all service variables, there was a tendency for the contribution of physical-need to increase relative to that of predisposition. However, patterns found when predisposition had been entered first were unchanged. Second, as well as methodological considerations, the present entry order (predisposition first, enablement second, and physical-need third) had theoretical justifications. The methodological consideration involved controlling for potential confounds among the two non-need components, as discussed above. The theoretical justification, derived from Andersen's (1968) framework, proposed that predisposing characteristics had causal priority

over enabling characteristics, which, in turn, had priority over physical-need characteristics. By this view, seeking health-care in response to physical-need depends on the predisposition to use health-care and the means to obtain required services. Priority is accorded predisposition because perception of physical-need is not inevitably linked to use of health-care. Therefore, predisposition was introduced first because it represents intra-individual awareness of physical-symptoms and the inclination to use health care; enablement was introduced next because it provides the means of linking recognition of the need for care and obtaining that care, and physical-need was introduced last because its relationship to health-care differs according to the predisposing and enabling components.

11.4.2 External validity

The overall response rate of veterans in the present study (72%) was the highest for any studies involving New Zealand Vietnam war veterans (Vincent et al., 1991: 62%; Vincent et al. 1994: 55%). The higher response rate can be attributed in part to the use of telephone books and electoral rolls to trace current addresses of veterans whose questionnaires had been returned as undeliverable because addresses on the list were no longer current. In prior research, attempts were not made to obtain current addresses for undeliverable questionnaires. Thus, the present sample probably comprised a larger proportion of veterans than previously who were residentially mobile. Several other developments related to the present sample also have implications for the generalizability of present findings to the wider populations of New Zealand Vietnam veterans and their wives. These issues include the address list from which the present sample of veterans was initially contacted, veterans' prior involvement in research, the procedure for contacting the wives, and the confinement of the study to cohabiting couples.

The mailing list. The present mailing list was compiled by the New Zealand Defence Department in 1991, with the original list containing the names of 2,046 veterans. Little is known about the sources from which names on the list were first obtained. In addition, since estimates of New Zealand personnel in Vietnam have ranged from 2,500 to 3,500, conclusions on the comprehensiveness of the list remain tentative[16]. In little more than five years, just over one-third of the names were left on the list (i.e., N = 728), with most deletions due to non-response to mailouts or current addresses not being known. Therefore, the extent to which the list was representative of the population of veterans who served in the Vietnam War is unknown. As a result, it is not possible to gauge the extent to which those who were included in the original Defence Department list differed in crucial ways from non-listed veterans. Equally impossible is gauging whether those on the list who subsequently participated in the research differed from those who were also on the list but who did not respond to invitations to participate. There is also the likelihood that a proportion of the original group on the list would not now be alive. Notwithstanding these uncertainties regarding sample composition, the list provides a useful basis for determining the comparability of the samples of veterans who have participated in the research.

Prior participation. A total of three postal surveys of New Zealand Vietnam war veterans, including the present one, have been conducted. All veterans in the present study have participated in at least one prior study. However, sizeable proportions of veterans did not respond to subsequent invitations to participate in later surveys[17]. As a result, there is a risk that the later samples have become increasingly dissimilar from the first one. A series of

[16]Based on the lower estimate, the 1991 list comprised approximately 82% of New Zealand military personnel in Vietnam, whereas, based on the upper estimate, it comprised less than two-thirds (58%).

[17]The most frequent reasons for non-participation included non-response to mailouts, and mailouts returned due to current addresses not being known. Response rates for each of the three surveys are given in Chapter 7.

analyses involving demographic and military data across the three samples was included in Chapter 8 to ascertain the level of cross-sample comparability. On almost all demographic variables, differences were found. The most noticeable difference was the present sample consisting entirely of veterans who were in marital relationships. In prior surveys, at least one-fifth of veterans identified themselves as single or separated. Also noticeable from the first to the present sample were increases in educational qualifications and occupational status. By contrast, military experience characteristics remained largely unchanged across the surveys. Changes in the demographic variables prompt at least two different conclusions. The first suggests that the composition of the veteran samples ***has*** changed across surveys due to greater attrition of veterans from lower socio-economic background. The second conclusion suggests that changes involving education and occupation represent typical lifespan changes (i.e., educational and career advancement) within the larger pool of veterans on the address list. Given the stability of military characteristics across surveys, it is more likely that identified changes in the present sample reflect lifespan changes rather than the sample biasing effects of self-selection or attrition.

Procedure for involving wives in the research. Both practical and ethical constraints precluded the direct mailing of research invitations to veterans' wives. Practical reasons included the unknown current marital status of veterans. Ethical reasons centred around the issue of veterans first consenting to their wives' participation. The original address list had been compiled as a means of contacting veterans, not members of their family. Consequently, an approach was followed that enabled veterans to decide whether they wanted their wives to participate. Wives could then respond to the invitation if they consented to participate. Whilst ethically well-motivated, this procedure undoubtedly led to some selection bias. For example, husbands who did not want their wives to participate may have differed in important

ways from those who had no objections. Equally unknown is whether wives who chose to participate were different in important respects from those who did not participate. Since there has been no prior survey research involving wives of New Zealand Vietnam veterans, cross-comparisons of demographic variables could not be undertaken.

Confinement to couples. Differences in health status between men with and men without wives have been previously demonstrated in general population research (Verbrugge, 1989; Kandrack et al., 1992). On the whole, married men are in better physical and psychological health than their non-cohabiting counterparts (i.e., single, separated, divorced and widowed men). Since the present study examined the health of cohabiting war veterans, findings may not generalize to veterans who do not have wives. A related issue is that the exclusion of veterans who had wives but whose wives did not respond, as well as veterans who were not in relationships may have further biased the sample. Of the 198 veterans who responded but who were subsequently excluded, 153 (53%) were married or in de facto relationships. Cross-comparisons between all excluded veterans and the present sample of veterans on all variables used in the present study failed to find any significant differences. Therefore, veterans who were included in the study did not differ from those who were excluded on any variables featured in the present study.

Present findings have unknown generalizability to the wider population of New Zealand men who served in the Vietnam War. Even so, there is a reasonable basis (i.e., stability of military data, and demographic changes indicative of within-group changes) for generalizing findings to the earlier samples. However, given the marital status of the present sample, present findings may be more generalizable to married or cohabiting veterans than to other veterans.

11.5 Implications for future research

Present findings highlight the need for a more critical evaluation of the explanatory utility of the Andersen (1968) model and the validity of its core propositions.

11.5.1 The explanatory utility of the Andersen (1968) model

Since the initial formulation of the Andersen model, researchers have attempted to account for greater levels of explained variance in people's use of health-care. However, expanded measurement sets and increased sensitivity of measures have yielded little, if any, improvement in levels of explained variance. An exception is the study by Bazargan et al. (1998) which accounted for over half of the explained variance in the use of GP-care. These researchers attributed the improvement to more refined measures of physical-need and to the choice of Poisson regression analysis. In the present study, levels of explained variance clustered towards the higher end of the range reported in the literature. Indeed, for two measures of informal care, total explained variance was higher than that obtained in prior research on informal types of health-care; namely, in the full model, the percentage of explained variance in use of Bedrest-volume and Cutback-volume was 43% and 49%, respectively.

The present study sought to expand the explanatory utility of the model by including two further components, psychological-need and multiple-need. Potential for development of the expanded model was apparent from findings showing that psychological-need added significant increments to several health-care measures. That it failed to add significant increments to several other service variables, however, invites questions about alternative conceptualizations of psychological-need. In the present study, the rationale for treating psychological-need as a separate component from physical-need was twofold. Firstly, it was

seen as being qualitatively distinct from physical-need and, secondly, an important aim was to examine the contribution of psychological-need only after first taking into account the contribution of physical-need. An alternative conceptualization would have involved viewing psychological-need and physical-need as different dimensions of the ***same*** need component. Their joint contribution could have challenged the explanatory dominance of the predisposing component.

Analyses were re-run with physical-need and psychological-need variables entered on the same step. Results showed that their simultaneous entry contributed significantly to the same service measures that physical-need had contributed to when entered alone (i.e., physical-need enhanced the explained variance of eleven of the thirteen service measures). While the magnitude of the joint contribution to explained variance increased, it was still substantially lower than that required to rival the net contribution of predisposition. Thus, reconceptualizing psychological-need as a dimension of need increased its relevance to more than twice as many service variables as when it was entered alone. The magnitude of its joint contribution with physical-need, however, did not substantially increase the explanatory contribution of need over that of predisposition.

Potential for development of the Andersen model was further evident in the significant contribution of the multiple-need component to two service variables: Secondary-care- and Bedrest-volume. When multiple-need (i.e., interaction terms between physical- and psychological-need) was added to the model, it explained a significant amount of the variance in health-care above that already explained by predisposing, enabling, physical-need and psychological-need. The explanatory utility of multiple-need has provided important knowledge regarding both the underlying components of health-care utilization and

relationships between predictors. As discussed more fully in earlier sections, findings suggested that the relationship between physical-need and use of some types of health-care use may depend on the level of psychological-need. The explanation of use of Secondary-care-volume and Bedrest-volume improved when interactions between psychological-need and physical-need were taken into account.

Some potential exists for further developing the Andersen (1968) model in terms of expanding the basic components to include either new dimensions within the core components or adding new components to the existing model.

11.5.2 The validity of the Andersen (1968) model's core propositions

Several of the core propositions (i.e., hypotheses) of the Andersen model did not hold in the present study. The first was the proposition that each of the three components would individually make a significant contribution to the explanation of health-care. The basic model was of limited usefulness in explaining the present measures of health-care. That is, each of the three components contributed independently to the explanation of only five of the thirteen health-care variables.

The proposition that the explanatory configuration of the three components would vary according to treatment-electivity also did not hold in the present study. Across the service variables, the same component (i.e., predisposition) accounted for most of the explained variance, with the runner-up component (i.e., physical-need) also remaining the same.

The proposition that physical-need would be the most important explanatory component did not hold in the present study. Andersen (1968) proposed that, if ***non***-need components

explained most of the variance in the use of a health service, it represented inefficient use of medical resources. Therefore, from a policy perspective, the present finding that predisposition was the main explanatory component across all health service measures would suggest that veterans and their wives were over-utilizing health services. However, this conclusion is questionable for several reasons. As Wolinsky and Johnson (1991) have counter-argued, assertions about over-utilization make sense only when the bulk of the variance has been explained. In addition, research shows that relationships between physical-need measures and health-care measures differ across different groups (e.g., older males utilize more health services than older females). Furthermore, aspects of the research methodology itself such as sensitivity of IVs and DVs and type of statistical procedures also determine the extent to which a model can explain the variance health-care use (Stoller, 1982; Strain, 1991).

The proposition that non-need components (i.e., predisposition and enablement) would have greater explanatory relevance for elective than non-elective services received little support from the present findings. The contribution of the non-need components failed to reflect the level of presumed electivity of a health-service. A major assumption of the Andersen (1968) model is that formal health-care represents less elective types of health-care than does informal care. The electivity issue is important because it provides the basis for determining whether or not health services are equitably distributed to specified groups of consumers. From a social equity perspective, the issue is not that all health services should be equally available to all groups within the same social system. Rather, the issue concerns the equal availability of non-elective (i.e., medically required) services to all groups. Consumers choose to use elective-care because physical-need does not determine its use. By contrast, consumers have relatively little choice in using non-elective care because medical seriousness determines its use. The Andersen (1968) model takes for granted that specified health services represent

elective or non-elective care. However, unless the reason for use of a health service are specified, it is difficult to determine its electivity. For example, according to the Andersen (1968) model, hospital services represent non-elective care. Consequently, hospitalization for cosmetic surgery[18] and preventive surgery[19] would qualify as ***non***-elective, even though actual physical-need is less important than non-need components in the uptake of these elective types of hospital care.

11.6 Future research directions

While present findings have clarified the relationship of components of the Andersen (1968) model to health-care use by veterans and their wives, these findings also highlight the need for extending the research beyond the present cross-sectional approach. Three different research directions are recommended, each entailing the longitudinal approach. The first calls for health comparisons of veterans and their wives with their civilian peers. The second calls for an examination of the process of health-care, and the third direction calls for an examination of the veterans' and their wives' marital relationship, particularly aspects that may enhance the explanation of health-care utilization.

Comparisons with civilian peers. Identifying and comparing the predictors of health-care for veterans and their wives were important aspects of the present research. These, however, comprise only one part of the picture. Future research needs to investigate the bigger picture which involves comparing veterans' and their wives' health status and health-care with their age-sex civilian peers. No published New Zealand research has cross-compared the health of Vietnam war veterans with general population men. Conclusions about the health status of

[18]Surgical procedures to improve appearance and not for medical reasons.

[19]Surgical procedures to avoid anticipated health problems.

veterans, therefore, have been in relation to each other, and in particular those with and those without PTSD. It is not known whether and to what extent Vietnam veterans differ from their civilian peers in terms of their health and health-care. Comparisons would place questions about the veterans' health behaviour in a more meaningful context than within-group comparisons and provide a firmer basis for determining whether veterans comprise a group who experience a health disadvantage relative to other groups. Equally, these comparative analyses would provide the basis for separating the effects of sex and combat trauma on health differences between veterans and their wives.

The resulting comparative analyses would have important implications for programmes developed for veterans. Substantive health differences, particularly in the direction of poorer health among veterans, would lead to different recommendations than would minimal health differences. On the other hand, research may find that the problems of health and health-care experienced by veterans are also experienced by their civilian peers. The implications of different health outcomes in terms of health policy development and programmes for veterans - and for men in general - is beyond the scope of the present thesis. However, systematic, comparative research would provide the necessary basis for determining the relative health needs of the veterans.

The process of health-care. As Strain (1991) has argued, more is involved in utilizing health-care than the number of times a health service has been used during a specified interval of time. An important additional aspect of health-care utilization, but one which, to date, has been little studied, is the process of health-care (i.e., people's responses to perceived illness symptoms). Information on the underlying circumstances of health-care use would add to the present knowledge on health-care utilized by Vietnam veterans and their wives. Cross-

sectional analyses could not show the present sample's responsiveness to perceived illness symptoms or the 'route' followed in seeking treatment. By contrast, longitudinal analyses could address[20] several issues that were beyond the capacity of present data to resolve. These issues include whether: informal care precedes, follows or substitutes for visits to health professionals during illness episodes; curative or preventive purposes prompt use of health-care and health-care is elective or non-elective. Moreover, the following comparisons between veterans and their wives could also be investigated: the stage in an illness when informal treatment is first taken and the stage when formal treatment is first utilized; the frequency of treatment following initial contact with a health professional during an illness episode; talking to others about illness symptoms; seeking alternatives to formal and informal health-care; seeking formal treatment in response to others' influence; failing to seek health-care due to either predisposing or enabling characteristics. Longitudinal research on the process of health-care would provide a sounder basis than cross-sectional research for interpreting patterns of health-care utilization and, in particular, determining the extent to which there is inequitable distribution of health services. It would also reduce the need for speculating about the components precipitating the care.

Spousal influences on health-care. The present study provided a comparative picture of the relative health status and patterns of health-care use by veterans and their wives. An important area for extending the present research involves the wives' role in their husbands' health status and health-care behaviours. Anecdotal reports based on general populations indicate that wives often prompt their husbands' use of health-care (Verbrugge, 1989). It has been suggested that, because men may be less responsive to illness symptoms, they need to be prompted by others, and in particular their wives, to seek treatment. Presently, however, there

[20] Analyses would control for illness symptoms to further enhance the appropriateness of comparisons.

is little, if any, research on spousal influences on patterns of health-care seeking. Given the research, including present findings, on health problems experienced by Vietnam veterans, it is likely that they are dependent on their wives for their health-care needs. This dependence may be even greater among veterans with PTSD because wives of PTSD-veterans are known to have a heavier caregiver burden than are the wives of non-PTSD-veterans (Beckham et al., 1996).

Spousal influence is also an important area because information on the wives' role may enhance the explanation of veterans' health-care and clarify links between predictors of health-care. Andersen (1968) acknowledged the salience of familial influences on health-care utilization. This influence has usually been assessed by measures of social contacts which have comprised items on the recency of contacts with family members and friends (Nelson, 1993, Wolinsky & Johnson, 1991). However, no research could be found that has attempted to measure the influence of spouses on use of health services. Information on spousal influences would also be useful in the development of programmes designed to meet health and health-care needs of veterans. If, for example, wives are an important influence on veterans' use of health-care, programmes would need to be tailored to recognise the wives' role. A longitudinal investigation on the wives' role has the potential to identify and clarify factors that explain veterans' use of health-care. Moreover, this research would provide information whose value would extend beyond military research to general population research on men's health because, to date, the topic of wives' influence on their husbands' uptake of health-care has generated little research.

11.7 Conclusions

The present study has built on a vast literature that has applied the Andersen (1968) model to the health-care behaviour of various populations. It has extended the model to include components that have been infrequently investigated in research guided by the Andersen (1968) model. Moreover, the study has applied the model to Vietnam veterans and their wives, which has contributed to a substantial literature on veterans and to less abundant literature on the wives. Information in the study is useful for health professionals who may be caring for veterans and their families, and for others, including those whose interest is in developing health-care policies and programmes. The present study is the third to survey the health of community-dwelling Vietnam veterans throughout New Zealand, and the first to have extended the survey to their wives. The inclusion of the wives represents a strength of the present study since they have attracted little prior research interest. Their inclusion has enabled a series of health-based comparisons between veterans and their wives.

The present study was confined to couples who both participated in the survey (i.e., the veteran and his wife both completed their respective questionnaires). Thus, the composition of the veteran sample differs from prior samples which included married and non-married veterans. Even so, the present study largely mirrored findings from the prior New Zealand research; namely, while a notable minority of veterans were in very poor health, most enjoyed good health. Moreover, no health differences were found between present veterans and those who were excluded because they did not meet the 'couple' criterion for inclusion. The wives of veterans enjoyed even better health than their husbands, and their rates of health-care were also higher. Of interest, findings were consistent with the general population research on sex differences in use of health-care by men and women, although those for health status did not (i.e., veterans reported poorer health than the wives).

With its interest in the psychological health of veterans and their wives, the present study found that psychological-need did not have widespread associations with the use of health-care. Significant associations were confined to services such as hospital care. On the other hand, the present sample did not appear to be using GP-care in response to psychological-need.

Interest in multiple-need (i.e., interaction terms between physical- and psychological-need), served as the second area of extension in the present study. This component also did not have widespread associations with health-care use. Findings showed that multiple-need was an important explanatory component of the frequency of use of Secondary-care and Bedrest, but it was not important in the explanation of primary health-care.

Enabling characteristics were important but secondary predictors of formal and informal health-care. Findings suggested that respondents use of GP services was constrained by economic barriers. Respondents who possessed health insurance and other health resources utilized GP-care more frequently than respondents who did not possess these resources. This finding warrants closer examination in future research because it suggests that under-resourced veterans and their wives may put off health-care or find it more difficult to access.

Present findings highlight the need to address several research design issues. Specifically, a major limitation of cross-sectional methods is their failure to capture the dynamic nature of people's health-care behaviour. More refined measures of health-care utilization are also needed, and in particular, measures that reduce speculation about the reasons underlying patterns of use (or non-use) of health-care. Predictors also need to be rigorously developed and tested so that the absence of association (for example) reflects an actual absence rather

than an artifact of crude measurement. Attention to these issues in future research will increase the confidence in findings.

Several concerns emerged in the present study regarding the explanatory utility of the Andersen (1968) model. It was concluded that the model consists more of a loosely developed network of variables rather than a theoretically cohesive account of factors underlying health-care. The model has been subject to differences among researchers regarding both the conceptualization of variables and their location within the framework. More theoretically explicit links among the explanatory components need to be developed, and then measures developed that represent reliable and valid representations of the components. The more refined measures need to be tested with research designs capable of capturing the dynamic process of health-care.

The present study has argued that a more explicit account of reasons underlying veterans' and their wives' use (or non-use) of health-care needs to be provided in future research. This seems particularly crucial in the case of minority groups such as veterans whose health-care behaviours may reflect causes that are not easily deduced from standard measures of health-care. The present descriptive account and multivariate analyses have provided important health information on the New Zealand population of Vietnam veterans and their wives. The need continues, however, for improving the understanding of health status differences between veterans and their wives and further clarifying the relationship of their health status to health-care utilization.

REFERENCES

American Psychiatric Association (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington D.C.,: Author.

American Psychiatric Association (1987). *Diagnostic and statistical manual of mental disorders* (Rev. 3rd ed.). Washington D.C.,: Author.

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington D.C.,: Author.

Andersen, R. (1968). *A behavioral model of families' use of health services.* Chicago: Center for Health Administrative Studies.

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

Andersen, R. & Newman, J.F. (1973). Societal and individual determinants of medical care utilization in the United States. *Milbank Memorial Fund Quarterly, 51*, 95-125.

Andersen, R., Francis, A., Lion, J., & Daughety, V.S. (1977). Psychologically related illness and health services utilization. *Medical Care, 15*, 59-73.

Andersen, R., Kravits, J., & Anderson, O.W. (1975). *Equity in Health Services: Empirical Analyses in Social Policy.* Cambridge: Ballinger.

Anderson, J.C. & Bartkus, D. (1973). Choice of medical care: A behavioral model of health and illness behavior. *Journal of Health and Social Behavior, 14,* 348-356.

Antonovsky, A. (1972). A model to explain visits to the doctor: With specific reference to the case of Israel. *Journal of Health and Social Behavior, 13,* 466-472.

Bazargan, M., Bazargan, S., & Baker, R.S. (1998). Emergency Department utilization, hospital admissions, and physician vists among elderly African American persons. *The Gerontologist, 38*, 25-36.

Beck, A.T., & Steer, R.A. (1987). *Beck Depression Inventory: Manual.* New York: The psychological Corporation, Harcourt Brace Jovanovich, Inc.

Becker, M.H. (1974). The health belief model and sick role behaviour. *Health Education Monograph, 2,* 409-416.

Becker, M.H., Haefner, D.P., Kasl, S.V., Kirscht, J.P., Maiman, L.A., & Rosenstock, I.M. (1977). Selected psychosocial models and correlates of individualhealth-related behaviors. *Medical Care, 15,* 27-46.

Beckham, J.C., Lytle, B.L., & Feldman, M.E. (1996). Caregiver burden in partners of Vietnam veterans with posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology, 64,* 1068-1072.

Belloc, NB, Breslow, L, & Hochstim, JR. (1971). Measurement of physical health in a general population survey. *American Journal of Epidemiology 93,* 328-336.

Bernard, A.M., Hayward, R.A., Rosevear, J.S., & McMahon, Jr., L.F. (1993). Gender and hospital resource use. *Evaluation & The Health Professions, 16*, 177-189.

Bland, R.C., Newman, S.C., & Orn, H. (1990). Health care utilization for emotional problems. *Canadian Journal of Psychiatry, 35*, 397-400.

Boscarino, J.A. (1995). Post-Traumatic Stress and associated disorders among Vietnam veterans: The significance of combat exposure and social support. *Journal of Traumatic Stress, 8,* 317-336.

Breslau, N., & Davis, G.C. (1992). Posttraumatic stress disorder in an urban population of young adults: risk factors for chronicity. *Amercian Journal of Psychiatry, 149,* 671-675.

Broadhead, W.E., Gehlbach, S.H., deGruy, F.V., & Kaplan, B.H. (1989). Functional versus structural social support and health care utilization in a family medicine outpatient practice. *Medical Care, 27*, 221-233.

Cafferata, G.L. (1987). Marital status, living arrangements, and the use of health services by elderly persons. *Journal of Gerontology, 42,* 613-618.

Carroll, E.M., Rueger, D.B., Foy, D.W., & Donahue, Jr, C.P. (1985). Vietnam combat veterans with Posttraumatic Stress Disorder: Analysis of marital and cohabiting adjustment. *Journal of Abnormal Psychology, 94*, 329-337.

Centers for Disease Control Vietnam Experience Study (1988). Health status of Vietnam veterans: I: Psychosocial characteristics. *Journal of the American Medical Association, 259*, 2701-2707.

Chamberlain, K., Vincent, C., & Long, N. (1994). *The New Zealand Vietnam War veterans twenty years on: Part 2: Post-traumatic stress disorder and its effects.* Palmerston North, New Zealand: Massey University, Department of Psychology.

Cheng, S-T. (1992). Loneliness-distress and physician utilization in well-elderly females. *Journal of Community Psychology, 20,* 43-56.

Cohen, S., & Syme, L. (1985). *Social support and health.* New York: Academic Press.

Cohen, S., & Williamson, G.M. (1991). Stress and infectious disease in humans. *Psychological Bulletin, 109,*5-24.

Coughlan, K., & Parkin, C. (1987). Women partners of Vietnam vets. *Journal of Psychosocial Nursing, 25,* 25-27.

Durie, M. (1994). Whaiora: Maori health development. Auckland, N.Z: Oxford University Press.

Eisen, S.A., Goldberg, J., True, W.R., & Henderson, W.G. (1991). A co-twin study of the effects of the Vietnam War on the self-reported physical health of veterans. *American Journal of Epidemiology, 134,* 49-58.

Eve, S.B. (1988). A longitudinal study of use of health care services among older women. *Journal of Gerontology: MEDICAL SCIENCES 43,* 31-39.

Flett, R., Millar, M., Long, N.R., & MacDonald, C. (1998). Community survey of trauma. Palmerston North, New Zealand: Massey University, School of Psychology.

Fleiss, J.L., Williams, J.B.W., & Dubro, A.F. (1986). The logistic regression analysis of psychiatric data. *Journal of Psychiatric Research, 20,* 145-209.

Friedman, M.J., & Schnurr, P.P. (1995). The relationship between trauma, post-traumatic stress disorder and physical health. In M.J Friedman, D.S. Charney and A. Y. Deutch (Eds.) *Neurobiological and Clinical Consequences of Stress in PTSD.* Philadelphia: Lippincott-Raven Publishers.

Goldberg, J., True, W.R., Eisen, S.A., & Henderson, W.G. (1990). A twin study of the effects of the Vientam War on Posttraumatic stress disorder. *Journal of the American Medical Association, 263,* 1227-1232.

Gribben, B. (1992). Do access factors affect utilisation of general practitioner services in South Auckland? *New Zealand Medical Journal, 105,* 453-455.

Harrison, J.A., Mullen, P.D., & Green, L.W. (1992). A meta-analysis of studies of the Health Belief Model with adults. *Health Education Research: Theory & Practice, 7,* 107-116.

Hershey, J.C., Luft, H.S., & Gianaris, J.M. (1975). Making sense out of utilization data. *Medical Care, 13,* 838-854.

Holmes, T.H., & Rahe, R.H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research, 11,* 213-218.

Horowitz, K., Weine, S., & Jekel, J. (1995). PTSD symptoms in urban adolescent girls: Compounded community trauma. *Journal of American Academic Child Adolescent Psychiatry, 34,* 1353-1361.

Hosmer, D.W., & Lemeshow, S. (1989). *Applied logistic regression.* New York: John Wiley and Sons.

Idler, E.L., & Kasl, S. (1991). Health perceptions and survival: Do global evaluations of health status really predict mortality? *Journal of Gerontology, 46,* 555-565.

Janz, N.K., & Becker, M.H. (1984). The Health Belief Model: A decade later. *Health Education Quarterly, 11,* 1-47.

Jordan, B. K., Marmar, C.R., Fairbank, J.A., Schlenger, W.E., Kulka, J.A., Hough, R.L., & Weiss, D.S. (1992). Problems in families of male Vietnam Veterans with Posttraumatic Stress Disorder. *Journal of Consulting and Clinical Psychology, 60,* 916-926.

Kandrack, M-A., Grant, K.R., & Segall, A. (1991). Gender differences in health related behaviour. *Social Science and Medicine, 32,* 579-590.

Katz, S., Ford, A.B., Moskowitz, R.W., Jackson, B.A., & Jaffe, M.W. (1963). Studies of illness in the aged. The index of ADL: A standardized measure of biologic and physiological function. *Journal of the American Medical Association, 185,* 914-919.

Keane, T.M., Caddell, J.M., & Taylor, K.L. (1986). *The Mississippi Scale.* Boston: VA Medical Center.

Keane, T.M., Caddell, J.M., & Taylor, K.L. (1988). Mississippi Scale for combat-related post traumatic stress disorder: Three studies in reliability and validity. *Journal of Consulting and Clinical Psychology, 56,* 85-90.

Kimmerling, R., & Calhoun, K.S. (1994). Somatic symptoms, social support and treatment seeking among sexual assault victims. *Journal of Consulting and Clinical Psychology, 62,* 333-340.

Kline, R.B. (1998). Principles and practice of structural equation modeling. New York: Guilford Press.

Kohn, R., & White, K.L. (1976). *Health Care - An International Study: Report of the World Health Organization/International Study of Medical Care Utilization.* London: Oxford University Press.

Koss, M.P., Woodruff, W.J., & Koss, P.G. (1990). Relation of criminal victimization to health perceptions among women medical patients. *Journal of Consulting & Clinical Psychology, 58,* 147-152.

Kravits, J. (1975). The relationship of discretionary physician and dentist use by race and income. In R. Andersen, J. Kravits & O.W. Anderson (Eds.), *Equity in Health Services: Empirical Analyses in Social Policy.* Cambridge: Ballinger.

Krupnock, J.L., & Horowitz, M.J. (1981). Stress response syndromes. *Archives of General Psychiatry, 38,* 428.

Kulka, R.A., Schlenger, W.E., Fairbank, J.A., Hough, R.L., Jordan, B.K., Marmar, C.R., & Weiss, D.S. (1990). *Trauma and the Vietnam War Generation: Report of findings from the National Vietnam Veterans Readjustment Study.* New York: Brunner/Mazel.

Loftus, E.F., & Loftus, G.R. (1980). On the permanence of human memory. *American Scientist, 67,* 312-320.

Loftus, E.F., & Zanni, G. (1975). Eyewitness evidence: The influence of the wording of a question. *Bulletin of the Psychonomic Society, 5,* 86-88.

Long, N., Chamberlain, K., & Vincent, C. (1992). The health and mental health of New Zealand Vietnam War veterans with post-traumatic stress disorder. *New Zealand Medical Journal, 104, 285-288.*

Maclachlan, J.M. (1958). Cultural factors in health and disease. In E.G. Jaco (Ed.), *Patients, Physicians and Illness.* Glencoe: Illinois: Free Press.

Madison-Smith, G. (1998). *Correlates of health-care utilization in a sample of New Zealand women.* Unpublished doctoral dissertation, Massey University, Palmerston North, N.Z.

Magee, L. (1990). R^2 measures based on Wald and Likelihood Ratio joint significance tests. *The American Statistician, 44,* 250-253.

Maloney, L.J. (1988). Post traumatic stresses on women partners of Vietnam veterans. *Smith College Studies in Social Work, 58,* 122-143.

Mann, K.J., Medalie, J.H., Lieber, E, Groen, J.J., & Guttman, L. (1970). *Visits to Doctors.* Jerusalem: Jerusalem Academic Press.

Manning, W.G., & Wells, K.B. (1992). The effects of psychological distress and psychological well-being on use of medical services. *Medical Care, 30,* 541-553.

McFall, M.E., Smith, D.E., Roszell, D.K., Tarver, D.J., & Malas, K.L. (1990). Convergent validity of measures of PTSD in Vietnam combat veterans. *American Journal of Psychiatry, 147,* 645-648.

Mechanic, D. (1979). Correlates of physician utilization: Why do major multivariate studies of physician utilization find trivial psychological and organizational effects. *Journal of Health and Social Behaviour, 20,* 387-396.

Millar, M.A. (1996). *Utilization of health-care services by older adults: A New Zealand study.* Unpublished Master's Thesis, Massey University, Palmerston North, N.Z.

Ministry of Health (1993). *A picture of health.* Wellington: Statistics New Zealand

Mutchler, J.E. & Burr, J.A. (1991). Racial differences in health and health care service utilization in later life: The effect of socioeconomic status. *Journal of Health and Social Behaviour, 32,* 342-356.

Nagelkerke, N.J.D. (1991). A note on a general definition of the coefficient of determination. *Biometrika, 78,* 691-692.

Nagi, S.Z. (1976). An epidemiology of disability among adults in the United States. *Millbank Memorial Fund Quarterly, 54,* 439-486.

Nelson, M.A. (1993). Race, gender and the effect of social supports on the use of health services by elderly individuals. *International Journal of Aging and Human Development, 37,* 227-246.

Newman, J.F. (1975). Health status and utilization of physician services. In R.M. Andersen, J Kravits & O.W. Anderson (Eds.). *Equity in health services: Empirical Analyses in Social Policy.* Cambridge, M.A. Ballinger.

Nolan, B. (1994). General practitioner utilisation in Ireland: The role of socio-economic factors. *Social Science and Medicine, 38,* 711-716.

Norris, F.H. (1990). Screening for traumatic stress: A scale for use in the general population. *Journal of Applied Social Psychology, 20*, 1704-1718.

Norris, F.H., (1992). Epidemiology of trauma: Frequency and impact of different potentially traumatic events on different demographic groups. *Journal of Consulting and Clinical Psychology, 60*, 409-418.

Norris, F.H., Kaniasty, K.Z. & Scheer, D.A. (1990). Use of mental health services among victims of crime: Frequency, correlates and subsequent recovery. *Journal of Consulting and Clinical Psychology, 58,* 538-547.

Norusis, M.J. (1992a). SPSS/PC+ Base system user's guide. Version 5.0. Chicago: SPSS Inc.

Norusis, M.J. (1992b). SPSS/PC+ Advanced statistics. Version 5.0. Chicago: SPSS Inc.

Norusis, M.J. (1992c). SPSS/PC+ Professional Statistics. Version 5.0. Chicago: SPSS Inc.

Penchanksy, R., & Thomas, J.W. (1981). The concept of access: Definition and relationship to consumer satisfaction. *Medical Care, 19,* 127-140.

Pennebaker, J.W. (1982). *The psychology of physical symptoms.* New York: Springer-Verlag.

Robbins, J.A., Bertakis, K.D., Helms, L.J., Azari, R., Callahan, E.J., & Creten, D.A. (1993). The influence of physician practice on patient satisfaction. *Family Medicine, 25,* 17-20.

Rosenstock, I.M. (1966). Why people use health services. *Milbank Memorial Fund Quarterly, 44,* 94-124.

Rosenstock, I.M. (1974). Historical origins of the health belief model. *Health Education Monograph, 2,* 328.

Roberts, W.R., Penk, W.E., Gearing, M.L., Robinowitz, R., Dolan, M.P., & Patterson, E.T. (1982). Interpersonal problems of Vietnam combat veterans with symptoms of Posttraumatic Stress Disorder. *Journal of Abnormal Psychology, 91,* 444-450.

Rodkin, J. (1986).Aging and health: Effects of the sense of control. *Science, 233,* 1271-1275.

Roghmann, K.J., Hengst, A., & Zastowny, T.R. (1979). Satisfaction with medical care: Its measurement and relation to utilization. *Medical Care, 17,* 461-479.

Romeis, J.C., Gillespie, K.N., Virgo, K.S., & Thorman, K.E. (1991). Female veterans and nonveterans' use of health care services. *Medical Care, 29,* 932-936.

Ross, M., McFarland, C., & Fletcher, G.J. (1981). The effect of attitude on the recall of personal histories. *Journal of Personality & Social Psychology, 40,* 627-643.

Rotter, J.B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs, 80,* 1-10.

Rubio, C.T. & Lubin, B. (1986). College student mental health: A person-environment interactional analysis. *Journal of Clinical Psychology, 42,* 205-212.

Sarason, I.G., Johnson, J.H. & Siegel, J.M. (1978). Assessing the impact of life changes: Development of the Life Experiences Survey. *Journal of Consulting and Clinical Psychology, 46*, 932-946.

Shehan, C.L. (1987). Spouse support and Vietnam veterans' adjustment to Post-traumatic Stress Disorder. *Family Relations, 36,* 55-60.

Siegel, J.M. (1990). Stressful life events and use of physician services among the elderly: The moderating role of pet ownership. *Journal of Personality and Social Psychology, 58,* 1081-1086.

Snider, E.L. (1980). Factors influencing health service knowledge among the elderly. *Journal of Health and Social Behavior, 21*, 371-377.

Spielberger, C.D. (1968). *Manual for the State-trait Anxiety Inventory.* Palo Alto, CA: Consulting Psychologists Press, Inc.

Statistics New Zealand: Te Tari Tatau (1997). New Zealand census of population and dwellings: Maori. Wellington: Statistics New Zealand.

Stern, A.M., Casey, T.T., King, D.W., King, L.A., & Meehan, J.C. (1996, November). *Effects of military experience and health status on service utilization.* Paper presented at the meeting of the International Society for Traumatic Stress Studies, San Francisco.

Stoller, E.P. (1982). Patterns of physician utilization by the elderly: A multivariate analysis. *Medical Care, 20,* 1080-1086.

Strain, L.A. (1991). Use of health services in later life: The influence of health beliefs. *Journal of Gerontology: SOCIAL SCIENCES, 46,* S143-S150.

Suchman, E.A. (1967). Preventive health behavior: A model for research on community health campaigns. *Journal of Health and Social Behavior, 8,* 197-204.

Tabachnick, B.G., & Fidel, L.S. (1989). *Using multivariate statistics.*(2nd ed.). New York: Harper Collins Publishers, Inc.

Tessler, R., Mechanic, D., & Dimond, M. (1976). The effect of psychological distress on physician utilization: A prospective study. *Journal of Health and Social Behavior, 17* 353-364.

The American National Center for Health Statistics. (1992). *National ambulatory medical survey: 1990 Summary.* Washington, D.C.: United States Department of Health and Human Services.

Thomas, J.W., & Lichtenstein, R., (1986). Functional health measure for adjusting health maintenance oganization captiation rates. *Health Care Financing review, 7,* 85-95.

Ullman, S.E., & Siegel, J.M. (1996). Traumatic events and physical health in a community sample. *Journal of Traumatic Stress, 9,*703-720.

Vàzquez-Barquero, J.L., Diez-Manrique, J.F., Gaite, L., Garcìa, C.I., Artal, J., Roberts, S.E., & Wilkinson, G. (1992). Why people with probable minor psychiatric morbidity consult a doctor. *Psychological Medicine, 22,* 495-502.

van Hemert, A.M., Bakker, C.H., Vandenbrouke, J.P., & Valkenburg, H.A. (1993). Psychologic distress
as a long term predictor of medical utilisation. *International Journal of Psychiatry in Medicine, 23,* 295-305.

Verbosky, S.J. & Ryan, D.A. (1988). Female partners of Vietnam veterans: Stress by proximity. *Issues in Mental health Nursing, 9,*95-104.

Verbrugge, L. (1989). The twain meet: Empirical explanations of sex differences in health and mortality. *Journal of Health and Social Behavior, 30,* 282-304.

Vincent, C., Chamberlain, K., & Long, N. (1994). *The New Zealand Vietnam War veterans twenty years on: Part 1: Mental health and stress.* Palmerston North, New Zealand: Massey University, Department of Psychology.

Vincent, C., Long, N., & Chamberlain, K. (1991). *Health, mental health, and well-being of New Zealand Vietnam veterans.* Palmerston North, New Zealand: Department of Psychology.

Waigandt, A., Evans, D., & Davis, L.G. (1986). The health status of the Vietnam veterans and implications for the health educator. *Health Education Research, 1,* 337-341.

Ware, J.E., Davies-Avery, A., & Stewart, A.L. (1978). The measurement and meaning of patient satisfaction. *Health & Medical Services Review, 1,* 2-15.

Ware, J.E., & Snyder, M.K. (1975). Dimensions of patient attitudes regarding doctors and medical care services. *Medical Care, 13,* 669-682.

Watson, G.C., Plemel. D., DeMotts, J., Howard, M.T., Tuorila, J., Moog, R., Thomas, D., & Anderson, D. (1994). A comparison of PTSD convergent validities in Vietnam veterans. *Journal of Traumatic Stress, 7,* 75-82.

Williams, C.M. (1980). The veteran system with a focus on women partners. In WT. Williams (Ed.), *Post-Traumatic Stress Disorders of the Vietnam Veteran. Cincinnati: Disabled American Veterans.*

Williams, A.W., Ware, Jr, J.E., & Donald, C.A. (1981). A model of mental health, life events, and social supports applicable to generaL populations. *Journal of Health and Social Behavior, 22,* 324-336.

Wolfe, J., Keane, T.M., Kaloupek, D.G., Mora, C.A., & Wine, P. (1993). Patterns of positive readjustment in Vietnam combat veterans. *Journal of Traumatic Stress, 6,* 179-193.

Wolfe, J., Schnurr, P.P., Brown, P.J., & Furey, J. (1994). Post traumatic stress and war-zone exposure as correlates of perceived health in female Vietnam war veterans. *Journal of Consulting and Clinical Psychology, 62,* 1235-1240.

Wolinsky, F.D. (1978). Assessing the effects of predisposing, enabling, and illness morbidity characteristics on health service utilization. *Journal of Health and Social Behavior, 19,* 384-396.

Wolinsky, F.D. (1990). *Health and Health Behavior Among Elderly Americans: An Age-Stratification Perspective.* New York: Springer.

Wolinsky, F.D., Aguirre B.E., Fann L-J, Keith V.M., Arnold C.L., Niederhauer J.C., & Dietrich, K. (1989). Ethnic differences in the demand for physician and hospital utilization among older adults in major American cities: Conspicuous evidence of considerable inequalities. *The Milbank Quarterly, 67,* 412-449.

Wolinsky F.D., & Coe, R.M. (1984). Physician and hospital utilization among noninstitutionalized elderly adults: An analysis of the Health Interview Survey. *Journal of Gerontology, 39,* 334-341.

Wolinsky, F.D., Coe, R.M., Miller, D.K., Prendergast, J.M., Creel, M.J., & Chavez, M.N. (1983). Health services utilization among the noninstitutionalized elderly. *Journal of Health and Social Behaviour, 24,* 325-337.

Wolinsky, F.D., Coe, R.M., Mosely, R.R., & Homan, S.M. (1985). Veterans' and nonveterans' use of health services. *Medical Care, 23,* 1358-1371.

Wolinsky, F.D., & Johnson, R.J. (1991).The use of health services by older adults. *Journal of Gerontology: SOCIAL SCIENCES, 46,* 345-357.

Wolinsky, F.D., & Johnson, R.J. (1992). Widowhood, health status and the use of health services by older adults: A cross-sectional and prospective approach. *Journal of Gerontology: SOCIAL SCIENCES, 47,* 58-16.

Zastowny, T.R., Roghmann, K.J., & Cafferata, G.L. (1989). Patient satisfaction and th use of health services: Explorations in causality. *Medical Care, 27,* 705-723.

APPENDIX ONE

October 16, 1996

Dear Veteran,

Some time ago you participated in our research on the health and wellbeing of New Zealand Vietnam War veterans. The same team of researchers from Massey University is now carrying out a project on the use of health care services by veterans and their partners. This research is funded by the Ministry of Health, and the research team consists of Professor Nigel Long, Dr Ross Flett, Mr Kerry Chamberlain and Mr Rody Withers, all of the Department of Psychology.

This study arises from our previous research on the health of veterans, and from the pilot project we organised to provide counselling services to the families of veterans. The general aim of the study is to investigate and understand the use of health-care services by veterans and their partners, and to look at factors which help or hinder their use.

Details of the study are provided in the attached information sheet. Please read through this carefully, and if you are willing to take part in the study, complete the enclosed questionnaire and return it in the free-post envelope provided. This questionnaire will take about three-quarters of an hour to complete.

We want to gather the same information from partners. However, because we do not know if you have a partner, we have included two questionnaires in this posting. If you do not have a partner, simply discard the second questionnaire. If you do have a partner, please pass this letter, the information sheet, and the second questionnaire to your partner, so that they can decide whether to take part in the study or not.

Please do not hesitate to contact a member of the research team if you have any queries about the questionnaire or the research in general. You can contact us at the Department of Psychology, Massey University. Your assistance with this research would be greatly appreciated.

Yours sincerely,

Rody Withers
Research Officer

The Use of Health Care

Information Sheet

A team of researchers from Massey University is carrying out a project to look at the use of health care services by Vietnam veterans and their partners. This research is funded by the Ministry of Health, and the research team consists of Professor Nigel Long, Dr Ross Flett, Mr Kerry Chamberlain, and Mr Rody Withers, all of the Department of Psychology.

What the study is about

The general aim of the study is to investigate and understand the patterns of use of health care services by veterans and their partners, and to explore factors which help or hinder their use. We want to ask about your use of medical and related services in past year, your general health, about major events you have experienced, and some background demographic questions.

What you will be asked to do

We have developed a questionnaire which asks about the use of health care services and these other factors. This questionnaire will take about 45 minutes to complete. We would like to gather the same information from partners. However, because we do not know if you have a partner, we have included two questionnaires in this posting. If you do not have a partner, simply discard the second questionnaire. If you do have a partner, please pass the letter, this information sheet, and the second questionnaire on to your partner, so that they can decide whether to take part in the study or not. We have also included two return envelopes so that you and your partner can return your questionnaires separately.

Your rights as a participant

All participants:

* have the right to contact the researchers at any time during the research to discuss aspects of the study.
* have the right to refuse to answer any question, or withdraw from the study at any time.
* provide information on the understanding that it is completely in confidence to the researchers, to be used only for the purposes of the research. It will not be possible to identify individuals in any reports of the results.

Our contact phone number is (06) 356 9099 (Nigel Long ext 5116, Ross Flett ext 4127, Kerry Chamberlain ext 4123 and Rody Withers ext 4198).

November 13, 1996

Dear Veteran,

We are carrying out a project on the use of health-care services by veterans and their partners and, as part of that project, we recently mailed a package of two questionnaires to you. We note that you have not yet returned your completed questionnaire and are contacting you to find out if you are experiencing any difficulties with the questionnaire. On the other hand, it may be that you have simply misplaced your questionnaire. Whatever the case may be, please phone me. I am only too happy to answer any of your queries and, if required, mail out to you replacement questionnaires.

Your past participation in our research has been greatly appreciated and we would also very much appreciate your completing the questionnaire for our latest research project on use of health-services.

My phone number is (06) 350 4198. You can reach me on this number week-days between 8.30am and 4.00pm. Alternatively, you may **phone me collect (06) 356 2035 any evening or weekend.**

Thanking you in anticipation of hearing from you.

Rody Withers
Research Officer

APPENDIX TWO

[1] In the questionnaire, items tapping a component were sometimes included in the same section as items tapping another component. Therefore, page numbers represent the main sections in which the items that tap a component can be found.

Use of Health Care[2]

A research project funded by the New Zealand Ministry of Health and conducted by independent researchers from Massey University

Veterans Questionnaire[3]

Please read the following instructions carefully.

* **All the information you give us is in confidence and will be used only for the purposes of this study.**

* **Please attempt every question and be careful not to skip any pages.**

* **There are no right or wrong answers, we want the response that is best for you.**

* **It is important that you give your own answers to the questions. Please do not discuss your answers with others.**

* **Do not linger too long over each question; usually your first response is best.**

When you have completed the questionnaire, please fold it and return it to us in the freepost envelop provided. Note that you do not have to put a stamp on this because the return postage is pre-paid.

[2]The presentation of some measures in this questionnaire has been modified to accomodate the margin requirements of the present thesis.

[3]The questionnaire for wives, entitled "Partners Questionnaire", was identical to the one shown here for veterans.

In this first section, we are interested in gathering some general information about you.

Are you: Male Female

(Sex)[4]

In what year were you born? 19_____

(Age)

What is your present marital or relationship status?[5]

Never married 1
Married 2
Living in a de facto relationship . . . 3
Separated / divorced 4
Widowed 5

Which one of the following groups best describes who you usually live with (Do not include people who are visiting or temporarily residing with you such as family or friends of family)?

Live alone 1
Live with spouse / partner 2
Live with children (single-parent household) 3
Live with spouse / partner and children 4
Live with mother and / or father 5
Live with extended family: spouse / partner, children ***and*** other relatives 6
Live with other adults (e.g, flatting) 7
Other (please specify):_____ 8

Which one of the following groups best describes the ethnic group you belong to?

(Ethnicity)

New Zealander of Maori descent 1
New Zealander of European descent 2
New Zealander of Pacific Island descent . . 3
Other (please specify)_____ 4

Are you engaged in any community volunteer work (ie, unpaid work)?

Yes No

If yes, how many hours of community volunteer work[6] do you do each week on average? _____ hours

[4]Boldened words on the right side of each page are variable labels used in the present thesis for the corresponding measures in the questionnaire. Chapter 8 provides the algorithms for the measures.

[5]Several items in the questionnaire were not used as measures in the multivariate analyses, but instead provided additional background information with which to categorise respondents (e.g., married, not married, etc.).

[6]Item in the Social Contacts scale. Deleted from analyses due to exceeding limit for missing data.

What is the highest level of education you have reached?

(Qualifications)

No school qualification 1
School Certificate passes in one or more subjects 2
Sixth Form Certificate or University Entrance
in one or more subjects 3
University Bursary or Scholarship 4
Trade or Professional Certificate or Diploma 5
University Undergraduate Degree or Diploma 6
University Postgraduate qualification 7
Other (eg, overseas) (please specify) 8

What is your annual ***household*** income before tax? Please include income from ***all*** sources[7]:

Below $10,000 1
$10,000 - $19,999 2
$20,000 - $29,999 3
$30,000 - $39,999 4
$40,000 - $49,999 5
$50,000 - $59,999 6
$60,000 plus 7

Do you have a community services card?

(C.S.Card)

Yes 1
I have applied for one, but haven't received it yet 2
No 3

Do you have a high use health card or a 'chronically ill' certificate?

Yes 1
I have applied for one, but haven't received it yet . . 2
No 3

Would you classify yourself as ***mainly***: . . . . . .

(Fulltime Work; Unemployed)

Employed fulltime 1
Employed part-time 2
Taking care of a home 3
Looking for work 4
Too unwell to work 5
Retired 6
Other (please specify)_____7

[7]Deleted from multivariate analyses due to exceeding limit for missing data and severe non-normality of distribution.

What is your main paid job? _____

Which statement best describes how satisfied you are with your overall standard of living?

(Living Standard)

Very dissatisfied 1
Dissatisfied 2
Satisfied 3
Very satisfied 4

Which of the following statements best describes how you feel about your ability to get along on your income?

(Income Adequacy)

Can't make ends meet 1
Have just enough money 2
Have enough money with a little left over . 3
Always have money left over 4

Do you belong to a health insurance scheme which refunds some or all of the money that you've paid for health care (eg, doctor's fees, prescription fees)? . . . . . Yes No

(Health Insurance)

Do you have any living brothers or sisters? . . . . . Yes No

(Social Contacts)

Do you have any living children? . . . . . Yes No

(Social Contacts)

Have you spoken on the phone with your relatives or friends over the past two weeks? . . . . . Yes No

(Social Contacts)

Have you got together with your relatives or friends over the past two weeks . . . . . Yes No

(Social Contacts)

Have you gone out to any group events (eg, meals with others, sports functions, classes etc) over the past two weeks? . . . . Yes No

(Social Contacts)

Have you attended a religious service (eg, church) in the past two weeks? . . . . . Yes No

(Social Contacts)

Over the past 12 months, which statement best describes the degree of worry your overall health has caused you?

(Health Worry)

A great deal of worry 1
Some worry 2
Hardly any worry 3
No worry at all 4

Which statement best describes how much control you think you have over your future health?

(Health Control)

A great deal of control 1
Some control 2
Very little control 3
No control 4

In this section, the questions concern your view of the overall medical care you receive from your family doctor or GP. ***If you do not have a regular doctor, please answer the questions according to the overall treatment you may have received from one or more doctors (eg, from a medical centre).*** **We are interested in your honest opinion so circle the number that comes closest to describing how much you agree or disagree with each of the statements.**

(GP-satisfaction)

1	2	3	4	5
Strongly agree	Agree	Unsure	Disagree	Strongly disagree

My doctor could give better care 1 2 3 4 5

My doctor is not as thorough as he or she should be . . . 1 2 3 4 5

There are things about the medical care I receive from my doctor that could be better 1 2 3 4 5

My doctor doesn't explain ways to avoid illness or injury 1 2 3 4 5

I'm very satisfied with the medical care I receive from my doctor 1 2 3 4 5

My doctor encourages me to get a regular examination . 1 2 3 4 5

The care I receive from my doctor is just about perfect 1 2 3 4 5

My doctor is very careful to check everything when examining me 1 2 3 4 5

The next set of questions are about long-term health problems you may have. Long-term health problems are more serious health problems that you have had for *six months or more*, or health problems that are likely to last for at least six months or more. Please circle 'Yes' or 'No' to indicate if a doctor, nurse or other health care worker has told you that you have any of the following long-term health problems.

(Chronic Illnesses)

Cancer	Yes No
Diabetes	Yes No
Epilepsy	Yes No
High blood presure or hypertension	Yes No
Heart trouble (for example, angina or myocardial infarction)	Yes No
Asthma	Yes No
Other respiratory conditions (for example, bronchitis)	Yes No
Stomach ulcer or duodenal ulcer	Yes No
Chronic liver trouble (for example, cirrhosis)	Yes No
Bowel disorders (for example, colitis or polyps)	Yes No
Hernia or rupture	Yes No
Chronic kidney or urinary tract conditions	Yes No
Chronic skin conditions (for example dermatitis or psoriasis)	Yes No
Arthritis or rheumatism	Yes No
Hepatitis	Yes No
Hearing impairment or loss	Yes No
Sight impairment or loss	Yes No

Overall, how would you say your health is? (Circle a number)

(Perceived Health)

1	2	3	4
excellent	good	not so good	poor

Here is a list of activites of daily living that people sometimes have trouble with. Do you have trouble doing any of these things because of your health?

(Impaired ADLs)

Bathing . . . . . Yes No

Dressing . . . . . Yes No

Getting out of bed . . . . . Yes No

Walking . . . . . Yes No

Toileting . . . . . Yes No

Meal preparation . . . . . Yes No

Shopping . . . . . Yes No

Light housework . . . . . Yes No

Heavy housework . . . . . Yes No

Managing money . . . . . Yes No

Using the telephone . . . . . Yes No

Eating . . . . . Yes No

Walking half a kilometre (about one-quarter mile) . . . . . Yes No

Walking up 10 steps without rest . . . . . Yes No

Standing or being on your feet for two hours . . . . . Yes No

Stooping, crouching or kneeling . . . . . Yes No

Lifting or carrying 10 kilos (22 lbs) . . . . . Yes No

Sitting for two hours . . . . . Yes No

Reaching up over your head . . . . . Yes No

Reaching out as if to shake hands . . . . . Yes No

Using fingers to grasp objects . . . . . Yes No

The next set of questions seek information about your medical care.

Do you have a regular doctor (e.g., family GP)? . . . . . Yes No

(GP-resources)

If yes, how long have you been seeing this doctor?

(GP-resources)

0 - 3 months	1
4 - 12 months	2
1 - 2 years	3
3 - 5 years	4
Over 5 years	5

How long do you usually have to wait in the doctor's waiting room before being seen by the doctor?

. . . . . _____ minutes

(GP-resources)

Has the cost of the visit ever stopped you from going to see the doctor when you really need to be seen by a doctor?

(GP-fee)

Not at all	1
Occasionally	2
Some of the time	3
Often	4

How many times in the last 12 months have you seen ***any*** GP or been visited by one (e.g., family doctor, but **not** a specialist)?

. . . . _____ visits

(GP-visits)

How many nights altogether have you stayed in hospital as a patient in the last 12 months? . . . . . _____ nights

(Inpatient-contact; Hospital-volume)

How many times in the past 12 months have you used an outpatient service of a hospital or medical clinic?

. . . . . _____ times

(Outpatient-contact; Hospital-volume)

In the past 12 months, how many times have you personally used the accident and emergency department of a public hospital?

. . . . . _____ times

(Hospital-volume)

How many days during the past 12 months did you spend ***in bed*** at home due to your health? _____ days

(Bedrest-contact and -volume)

How many prescription items have you had for ***yourself*** from the chemist in the past 12 months _____ items

(Prescription-contact and -volume)

How many days over the last three months has ill health interfered with your ability to perform normal daily activities (for example, going to work, playing sport, doing housework, and so on)? _____ days

(Cutback-contact and -volume)

Have you sought advice or help in the previous 12 months from the following professional groups?

(Secondary-care-contact and -volume)

Medical specialist other than a GP or family doctor	Yes	No
Chemist or pharmacist	Yes	No
Dentist or dental nurse	Yes	No
Optometrist or optician	Yes	No
Physiotherapist	Yes	No
Chiropractor	Yes	No
Psychologist	Yes	No
Psychiatrist	Yes	No
Occupational therapist	Yes	No
Counsellor	Yes	No
Social worker	Yes	No
Naturopath or homeopath	Yes	No

Other _____

The questions which follow are about how you feel, and how things have been with you over the *last month.* For each question, please circle the number for the one answer that comes closest to the way you have been feeling.

How happy, satisfied, or pleased have you been with your personal life during the past month?

(Wellbeing)

1	2	3	4	5	6	7
extremely happy						extremely unhappy

How much of the time have you felt lonely during the past month?

(Wellbeing)

1	2	3	4	5	6	7
all of the time						none of the time

How often during the past month did you become nervous or jumpy when faced with excitement or unexpected situations?

(Distress)

1	2	3	4	5	6	7
always						never

How much of the time during the past month have you felt that the future looks hopeful and promising?

(Wellbeing)

1	2	3	4	5	6	7
all of the time						none of the time

During the past month, how much of the time has your daily life been full of things that were interesting to you?

(Wellbeing)

1	2	3	4	5	6	7
all of the time						none of the time

During the past month, how much of the time did you feel relaxed and free of tension?

(Wellbeing)

1	2	3	4	5	6	7
all of the time						none of the time

During the past month, how much have you generally enjoyed the things you do?

(Wellbeing)

1	2	3	4	5	6	7
all of the time						none of the time

During the past month have you had any reason to wonder if you were losing your mind or losing control over the way you act, talk, think or feel or of your memory?

(Distress)

1	2	3	4	5	6	7
not at all						very much

Did you feel depressed during the past month?

(Distress)

1	2	3	4	5	6	7
very much						not at all

During the past month, how much of the time have you felt loved and wanted?

(Wellbeing)

1	2	3	4	5	6	7
all of the time						none of the time

How much of the time, during the past month, have you been a very nervous person?

(Distress)

1	2	3	4	5	6	7
all of the time						none of the time

When you got up in the morning, this last month, about how often did you expect to have an interesting day?

(Wellbeing)

1	2	3	4	5	6	7
always						never

During the past month, how much of the time have you felt tense or "high-strung"?

(Distress)

1	2	3	4	5	6	7
all of the time						none of the time

Have you been in firm control of your behaviour, thoughts, emotions, and feelings during the past month?

(Distress)

1	2	3	4	5	6	7
very much						not at all

How often during the past month have your hands shook when you have tried to do something?

(Distress)

1	2	3	4	5	6	7
always						never

During the past month, how often have you felt that you had nothing to look forward to?

(Distress)

1	2	3	4	5	6	7
always						never

During the past month, how much of the time have you felt calm and peaceful?

(Wellbeing)

1	2	3	4	5	6	7
all of the time						none of the time

How much of the time during the past month have you felt emotionally stable?

(Distress)

1	2	3	4	5	6	7
all of the time						none of the time

During the past month, how much of the time have you felt down-hearted and blue?

(Distress)

1	2	3	4	5	6	7
all of the time						none of the time

During the past month, how often have you felt like crying?

(Distress)

1	2	3	4	5	6	7
always						never

During the past month, how often have you felt that others would be better off if you were dead?

(Distress)

1	2	3	4	5	6	7
always						never

How much of the time, during the past month, were you able to relax without difficulty?

(Distress)

1	2	3	4	5	6	7
all of the time						none of the time

During the past month, how much of the time did you feel that your love relationships, loving and being loved, were full and complete?

(Wellbeing)

1	2	3	4	5	6	7
all of the time						none of the time

How often during the past month have you felt that nothing turned out for you the way you wanted it to?

(Distress)

1	2	3	4	5	6	7
always						never

During the past month, how much have you been bothered by nervousness, or your "nerves"?

(Distress)

1	2	3	4	5	6	7
extremely						not at all

During the past month, how much of the time has living been a wonderful adventure for you?

(Wellbeing)

1	2	3	4	5	6	7
all of the time						none of the time

How often, during the past month, have you felt so down in the dumps that nothing could cheer you up?

(Distress)

1	2	3	4	5	6	7
always						never

During the past month did you ever think about taking your own life?

(Distress)

1	2	3	4	5	6	7
all of the time						none of the time

During the past month, how much of the time have you felt restless, fidgety, or impatient?

(Distress)

1	2	3	4	5	6	7
all of the time						none of the time

During the past month, how much of the time have you been moody or brooded about things?

(Distress)

1	2	3	4	5	6	7
all of the time						none of the time

How much of the time, during the past month, have you felt cheerful, light-hearted?

(Wellbeing)

1	2	3	4	5	6	7
all of the time						none of the time

During the past month, how often did you get rattled, upset, or flustered?

(Distress)

1	2	3	4	5	6	7
always						never

During the past month have you been anxious or worried?

(Distress)

1	2	3	4	5	6	7
extremely so						not at all

During the past month, how much of the time were you a happy person?

(Wellbeing)

1	2	3	4	5	6	7
all of the time						none of the time

How often during the past month did you find yourself having difficulty trying to calm down?

(Distress)

1	2	3	4	5	6	7
always						never

During the past month, how much of the time have you been in low or very low spirits?

(Distress)

1	2	3	4	5	6	7
all of the time						none of the time

How often, during the past month, have you woken up feeling fresh and rested?

(Wellbeing)

1	2	3	4	5	6	7
always						never

During the past month, have you been under, or felt you were under, any strain, stress or pressure?

(Distress)

1	2	3	4	5	6	7
yes, more than I could bear						no, not at all

The questions on this page are also about how you have been thinking and feeling about things over the last month or so. Please indicate the number which best describes your experiences at present.

(PTSD)

1	2	3	4	5
never	rarely	sometimes	frequently	very frequently

Being in certain situations makes me feel as though I am back in my past

I am able to get emotionally close to others

Unexpected noises make me jump

I am an even-tempered person

I have nightmares of experiences in my past that really happened

I have trouble going to sleep and staying asleep

I lose my cool and explode over minor everyday things

I try to stay away from anything that will remind me of the things that happened in my past

1	2	3	4	5
not at all true	slightly true	somewhat true	very true	extremely true

In the past I had more close friends than I have now

It seems that I am emotionally numb, that I have no feelings

I feel guilt over things that I did in the past

Circle either 'Yes' or No' to indicate if any of the following events occurred in your life during the past 12 months.

		(Life Changes)
You had an operation, injury or major illness	Yes	No
A close family member had an operation, injury or major illness	Yes	No
You married	Yes	No
You separated or divorced	Yes	No
You reconciled after a period of separation	Yes	No
You, or your partner, became pregnant	Yes	No
You, or your partner, had a baby or adopted a child	Yes	No
A new person, other than a new baby, came to live in your household	Yes	No
A child or other close relative left home, (other than separation)	Yes	No
You retired	Yes	No
You started a new job or changed jobs	Yes	No
You lost your job or business	Yes	No
You were unemployed and seeking work for one month or more	Yes	No
You moved house	Yes	No
You had major financial difficulties	Yes	No
Your finances improved considerably	Yes	No
You had serious legal problems with the police or authorities	Yes	No
A close family member had serious legal problems with the police or authorities	Yes	No
Your partner or spouse died	Yes	No
A close family member other than your partner or spouse died	Yes	No

In this section, we would like you to think about any traumatic experiences you may have had during your life. Several of the questions below involve personal and sensitive events. Please circle either 'Yes' or 'No' to each statement:

(Trauma)

Has anyone ever taken or tried to take something from you by force or threat of force, such as robbery, mugging, or hold-up?	Yes	No
Have you ever been in a serious motor vehicle accident in which one or more people were seriously injured or killed?	Yes	No
Have you ever been seriously injured in an accident other than a vehicle accident, such as at work?	Yes	No
Have you ever been engaged in military combat in which you have witnessed one or more people being seriously injured or killed?	Yes	No
Have you ever suffered serious injury and/or property damage because of a disaster such as a fire, flood, or earthquake?) . . .	Yes	No
Have you ever been forced to leave your home or take other precautions because of an approaching disaster such as a flood, earthquake or cyclone?	Yes	No
Have you ever experienced the violent or very unexpected death of a loved one, such as through an accident, homicide or suicide?	Yes	No
Has anyone very close to you such as a loved one ever experienced violent assault, serious accident or serious injury?	Yes	No
During your childhood, did anyone ever make you have sex by using force or threatening to harm you?	Yes	No
As an adult, have you ever been made to have sex by anyone who used force or threatened to harm you?	Yes	No
Have you ever been seriously beaten or attacked by a member of your family (such as your spouse, partner, parent or child)? . .	Yes	No
Have you ever been seriously beaten or attacked by someone who was not a member of your family?	Yes	No
Have you ever had any ***other*** experience which you feel was shocking, terrifying or otherwise traumatic, including any event which you find too difficult to name or to talk about?	Yes	No

APPENDIX THREE

Table 3-A: Comparison of NZ Vietnam war veterans' across the three New Zealand studies, showing percentage distributions of military background characteristics.

	1991	1993	1996
Length of military service (years)			
5 & less	35	31	32
6 - 10	12	13	12
11 - 15	7	8	8
16 - 20	14	14	12
21 - 25	17	18	19
26 & over	15	16	17
Total months in Vietnam			
1 - 6	16	17	17
7 - 12	65	63	63
13 - 18	12	15	16
19 & over	7	5	4
Tours of duty	[a]		
1		89	90
2 or more		11	10
Main role in Vietnam			
Combat	61	62	62
Combat support	21	16	19
Administration/Technical support	18	22	19
Highest rank in Vietnam			
Private, Lance Corporal	53	48	51
Non-commissioned Officers	36	36	35
Officers	11	16	14
Military specialisation in Vietnam	[a]		
Infantry		52	48
Artillery		29	32
Headquarters		5	8
Other		14	12

[a] = 1991 study did not report this information.

APPENDIX FOUR

Table 4-A: Bivariate intercorrelations between predisposing, enabling and need variables

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Sex	1																							
2	Age	.103*	1																						
3	Ethnicity	.007	-.012	1																					
4	Qualifications	.062	.030	-.030	1																				
5	Unemployed	-.095*	.171****	-.048	-.046	1																			
6	Fulltime Work	.257****	-.040	.060	.059	-.652****	1																		
7	Social Contacts	-.077	-.042	-.001	.217****	-.058	.022	1																	
8	GP-satisfaction	-.096*	.007	.027	.017	.000	.041	-.034	1																
9	Health Worry	.130**	-.059	-.025	-.032	.069	-.045	-.069	-.116**	1															
10	Health Control	-.082	.051	.060	.034	-.153****	.119**	.012	.052	.019	1														
11	Living Standard	-.038	.233****	.005	.062	-.018	.088*	.325****	.073	-.139***	.091*	1													
12	Income Adequacy	.066	.064	.005	.105*	-.138***	.198****	.337****	.063	-.100*	.086*	.575****	1												
13	Health Insurance	.035	.026	-.000	.113**	-.043	.158****	.273****	.038	.003	.011	.530****	.455****	1											
14	CS Card	.011	-.023	-.010	.274****	.213****	.184****	-.398****	-.076	.067	-.089	.370****	.276****	.330****	1										
15	GP-resources	-.043	-.048	-.027	-.045	-.033	.051	.046	.306****	.019	.005	.060	.085*	.057	.013	1									
16	GP-fee	.022	-.059	.007	-.079	.035	-.044	.198****	-.161****	.029	-.159****	.153****	.094*	.147***	.408****	-.009	1								
17	Impaired ADLs	-.039	-.025	-.026	-.093*	.234****	-.188****	-.088*	-.052	.300****	-.154****	-.232****	-.197****	-.012	.074	.021	.053	1							
18	Chronic Illnesses	.202****	.049	.074	.042	.094*	-.038	-.006	-.044	.318****	-.091*	.045	.017	.106*	.149****	.007	.001	.201****	1						
19	Perceived Health	-.160****	-.019	.021	.050	-.217****	.122**	.190****	.078	-.289****	.179****	.356****	.290****	.211****	.116**	.000	-.031	-.242****	-.130**	1					
20	Wellbeing	-.066*	.103*	.010	.007	-.000	.023	.093*	.193****	-.325****	.235****	.212****	.133**	-.023	-.109**	.053	-.214****	-.256****	-.144***	.225****	1				
21	Distress	.077	-.157****	.003	-.028	.029	-.039	-.084*	-.161****	.412****	-.218****	-.214****	-.176****	.002	.122**	-.064	.205****	.298****	.179****	-.237****	-.800****	1			
22	PTSD	.285****	-.040	.159****	-.080	.076	-.044	-.184****	-.121**	.409****	-.235****	-.209****	-.153****	-.044	.059	-.042	.201****	.299****	.216****	-.284****	-.601****	.687****	1		
23	Trauma	.163****	.087*	.057	-.016	.025	-.016	.013	-.032	.168****	-.069	-.172****	-.112**	-.049	-.006	-.015	.111**	.259****	.117**	-.102*	-.155****	.152****	.234****	1	
24	Life Changes	.089*	-.076	.036	.146****	-.022	-.028	.057	-.060	.129**	-.051	-.110**	-.128**	-.073	.161****	.049	.097*	.103*	.031	-.028	-.164****	.208****	.217****	.143****	1

*p<.05, **p<.01, ***p<.001, ****p<.0001

Table 4-B: Bivariate intercorrelations between health-care variables and predisposing, enabling and need variables.

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Inpatient-contact	1												
2	Outpatient-contact	.658****	1											
3	GP-contact	.025	.026	1										
4	Secondary-contact	.012	.044	.008	1									
5	Hospital-volume	.621****	.684****	.056	.270****	1								
6	GP-volume	.036	.085*	.552****	.045	.130**	1							
7	Secondary-volume	.068	.124**	.100*	.303****	.173****	.210****	1						
8	Prescription-contact	.048	.080	.156****	.196****	.322****	.390****	.194****	1					
9	Bedrest-contact	.077	.114**	.063	.036	.105*	.129**	.176****	.138***	1				
10	Cutback-contact	.111**	.121**	.047	.007	.130**	.140***	.240****	.157****	.464****	1			
11	Prescription-volume	.102*	.156****	.257****	.085*	.215****	.608****	.303****	.638****	.187****	.249****	1		
12	Bedrest-volume	.084*	.119**	.066	.034	.115**	.134**	.18****	.142***	.997****	.477****	.197****	1	
13	Cutback-volume	.127**	.129**	.039	-.001	.149****	.138***	.240****	.249****	.464****	.985****	.261****	.470****	1
14	Sex	.071	.052	-.026	.044	.079	-.127**	-.022	.006	.015	.009	-.068	.013	.006
15	Age	.060	.044	-.018	-.057	.038	-.035	-.051	-.034	-.129**	.098*	.016	-.132**	-.093
16	Ethnicity	-.000	-.037	.251****	-.019	-.007	.032	.005	-.004	.061	-.059	-.018	.063	-.062
17	Qualifications	-.021	.047	.016	-.012	-.017	-.000	.089*	-.025	-.017	-.053	.005	-.019	-.070
18	Unemployed	.047	.116**	-.117**	-.116**	.025	-.043	-.063	-.060	-.051	.014	.086	-.035	.053
19	Fulltime Employed	-.001	-.057	.056	.076	-.012	-.003	.056	.036	.024	-.015	-.057	.007	-.045
20	Social Contacts	.197****	.225****	.114**	-.027	.121**	.041	.049	-.005	.073	.002	.007	.071	-.017
21	GP-satisfaction	.070	.020	.013	.022	-.002	.041	.041	.104*	.028	-.033	.063	.026	-.032
22	Health Worry	.079	.112**	.097*	.162****	.311****	.220****	.316****	.369****	.226****	.257****	.300****	.241****	.284****
23	Health Control	-.060	-.054	.210****	.168****	.131**	.089*	.011	.268****	-.070	-.086*	-.005	-.081	-.096*
24	Living Standard	.361****	.254****	.048	-.011	.129**	.051	-.008	-.002	.011	-.073	-.015	.004	-.097*
25	Income Adequacy	.297****	.255****	.198****	.019	.162****	.081*	.010	.036	-.021	-.033	.009	-.030	.046
26	Health Insurance	.340****	.254****	.041	.001	.147***	.124**	.102*	.098*	.048	.009	.122**	.047	.006
27	CS Card	.387****	.416****	-.041	-.064	.236****	.008	-.009	.023	.092*	.066	.045	.098*	.067
28	GP-resources	.065	.014	.081	.034	.053	.156****	.038	.079	.061	.058	.144***	.064	.062
29	GP-fee	.493****	.499****	.003	-.023	.279****	-.029	.021	-.008	.107*	.088*	.010	.111**	.090*
30	Impaired ADLs	.014	.106*	-.005	-.039	.133**	.117**	.236****	.106*	.175****	.245****	.240****	.203****	.296****
31	Chronic Illnesses	.064	.147***	.125**	-.015	.152****	.125**	.096*	.082	.078	.137***	.191****	.085*	-.141**
32	Perceived Health	-.086*	.089*	-.013	-.005	-.126**	-.037	-.074	-.064	-.075	-.179****	-.132**	-.088*	-.215****
33	Wellbeing	-.054	-.126**	-.084*	.002	-.078	-.143***	-.138***	-.106*	-.137***	-.166****	-.211****	-.149***	-.181****
34	Distress	.028	.123**	.081	.005	.079	.137***	.229****	.114**	.166****	.167****	.208****	.181****	.188****
35	PTSD	.078	.150****	.067	.016	.142***	.088*	.223****	.072	.171****	.203****	.135**	.187****	.225****
36	Trauma	.039	.081	.017	.004	.116**	-.043	.156****	.056	.093*	.103*	.070	.108*	.126**
37	Life Changes	.089*	.101*	.026	.001	.136***	.110**	.065	.063	.118**	.083*	.102*	.126**	.089

*p<.05, **p<.01, ***p<.001, ****p<.0001

APPENDIX FIVE

Table 5-A: Step 5 of the logistic hierarchical regressions of predisposition, enablement, physical-need, psychological-need and multiple-need on formal health-care contact, showing odds ratios (OR), partial correlations (*pr*), generalized R^2, adjusted R^2 and R^2 change for New Zealand Vietnam War veterans and their partners.

	Inpatient		Outpatient		GP		Secondary	
Variables	OR	*pr*	OR	*pr*	OR	*pr*	OR	*pr*
Predisposition								
Sex	0.846		0.699		0.263***		0.399*	
Age		.071		.000		.000		.000
Ethnicity	0.508		0.548		0.637		0.499	
Qualifications	0.758		1.094		1.148		2.054*	
Unemployed	0.324*		0.909		0.518		1.602	
Fulltime Work	0.621		0.695		0.736		1.379	
Social Contacts		.000		.060*		.036		.000
GP-satisfaction		.094*		.000		.000		.000
Health Worry		.171**		.000		.185***		.188***
Health Control		.000		.000		.000		.139**
Enablement								
Living Standard		.000		.000		.025		.000
Income Adequacy		.000		.000		.000		.035
Health Insurance	0.869		0.791		1.524		1.402	
CS Card	1.339		1.057		0.461		1.040	
GP-Resources		.026		.000		.000		.000
GP-Fee	0.433		1.105		0.654		1.995	
Physical-need								
Impaired ADLs		.000		.000		.022		.051
Chronic Illnesses		.062		.128**		.000		.000
Perceived Health		.000		-.024		.000		.000
Psychological-need		.000		.000		.000		.000
Wellbeing		-.064		.000		.000		.000
Distress		.000		.043		.000		.000
PTSD		.000		.045		.000		.000
Trauma		.146**		.080*		.000		.000
Life Changes								
Multiple-need[a]								
ADL*Wellbeing		.000		.000		.000		-.008
ADL*Distress		.000		.000		.000		.000
ADL*PTSD		.000		.000		.000		.000
ADL*Trauma		.000		.000		.056		.000
ADL*Changes		.000		.000		.000		.000
Ills*Wellbeing		.000		-.036		.000		.000
Ills*Distress		.000		.000		.000		.000
Ills*PTSD		.000		-.070*		.000		.000
Ills*Trauma		.000		.000		.000		.000
Ills*Changes		.000		.000		.000		.000
Health*Wellbeing		.000		.000		.000		.000
Health*Distress		.073*		.000		.001		.000
Health*PTSD		-.129**		.000		.001		.000
Health*Trauma		.000		.000		.000		.000
Health*Changes		.000		.006		-.011		.001
R^2	.139		.171		.154		.146	
Adjusted R^2	.293***		.271***		.283***		.278***	
R^2 change	.021		.024		.017		.022	
N	561		561		556		549	

* p < .05, ** p < .01, *** p < .001

[a] ADL=Impaired ADLs; Ills=Chronic Illnesses; Health=Perceived Health; Changes=Life Changes

Table 5-B: Step 5 of the logistic hierarchical regressions of predisposition, enablement, physical-need, psychological-need and multiple-need on informal health-care contact by New Zealand Vietnam War veterans and their partners, showing odds ratios (OR), partial correlations (*pr*), generalized R^2, adjusted R^2 and R^2 change.

	Prescriptions		Bedrest		Cutback	
Variables	OR	*pr*	OR	*pr*	OR	*pr*
Predisposition						
Sex	0.292***		0.939		0.503**	
Age		.109*		-.071*		.000
Ethnicity	1.367		0.918		0.482*	
Qualifications	1.187		0.943		1.150	
Unemployed	0.691		0.489*		0.557	
Fulltime Work	0.720		0.928		1.148	
Social Contacts		.000		.000		.000
GP-satisfaction		.091*		.000		.000
Health Worry		.218****		.065*		.095**
Health Control		.114**		.000		.000
Enablement						
Living Standard		.000		.094**		.000
Income Adequacy		.000		-.000		.000
Health Insurance	2.271**		1.213		0.905	
CS Card	0.484		1.036		0.972	
GP-Resources	1.591**		1.070			.094**
GP-Fee		.041		.000		.000
Physical-need						
Impaired ADLs		.102*		.039		.000
Chronic Illnesses		.078*		.000		.062*
Perceived Health		-.006		-.103**		-.107**
Psychological-need						
Wellbeing		.000		.000		.000
Distress		.000		.000		-.076*
PTSD		.000		.000		.000
Trauma		.000		.000		.000
Life Changes		.040		.027		.000
Multiple-need[a]						
ADL*Wellbe		.000		.000		.000
ADL*Distress		.000		.000		.000
ADL*PTSD		.000		.000		.000
ADL*Trauma		.000		.000		.000
ADL*Changes		.000		.032		.000
Ills*Wellbeing		.000		.000		.057*
Ills*Distress		.000		.051*		.034
Ills*PTSD		.000		.000		.000
Ills*Trauma		.000		.000		-.025
Ills*Changes		.000		.000		.000
Health*Wellbeing		.000		.034		.000
Health*Distress		.064*		.000		.032
Health*PTSD		-.023		.000		.000
Health*Trauma		-.028		.000		.000
Health*Changes		.000		.000		.000
R^2	.243		.167		.208	
Adjusted R^2	.389***		.222***		.281***	
R^2 change	.026		.024		.029	
N	559		562		562	

* p < .05. ** p < .01, *** p < .001, **** p < .0001

[a] ADL=Impaired ADLs; Ills=Chronic Illnesses; Health=Perceived Health; Changes=Life Changes

Table 5-C: Step 5 of the OLS hierarchical regressions of predisposition, enablement, physical-need, psychological-need and multiple-need on formal health-care volume by New Zealand Vietnam War veterans and their partners, showing standardised regression coefficients, R^2, adjusted R^2 and R^2 change.

Variables	Hospital	GP
Predisposition		
Sex	-.082	-.136**
Age	.076	-.016
Ethnicity	-.053	.009
Qualifications	.008	-.028
Unemployed	-.060	.095
Fulltime Work	-.037	-.019
Social Contacts	.092*	.036
GP-satisfaction	.082*	.030
Health Worry	.136*	.285****
Health Control	-.008	.002
Enablement		
Living Standard	-.031	-.024
Income Adequacy	.010	.096
Health Insurance	-.026	.102*
CS Card	.049	.005
GP-Resources	.027	.110**
GP-Fee	-.021	-.021
Physical-need		
Impaired ADLs	.030	.125*
Chronic Illnesses	.145**	.175**
Perceived Health	-.074	-.138*
Psychological-need		
Wellbeing	-.042	-.116
Distress	-.157*	-.012
PTSD	.118	-.101
Trauma	.116*	-.004
Life Changes	.104*	-.027
Multiple-need[a]		
ADL*Wellbeing	-.201*	.052
ADL*Distress	-.160	.058
ADL*PTSD	-.026	-.076
ADL*Trauma	.008	.110
ADL*Changes	.039	-.049
Ills*Wellbeing	-.044	.062
Ills*Distress	-.110	.006
Ills*PTSD	-.031	.086
Ills*Trauma	-.007	-.015
Ills*Changes	.002	.054
Health*Wellbeing	-.137	-.033
Health*Distress	-.076	.012
Health*PTSD	-.136	-.001
Health*Trauma	-.041	.041
Health*Changes	.014	-.042
R	.446	.572
R^2	.199****	.327****
Adjusted R^2	.138	.267
R^2 change	.018	.017
N	556	480

* p < .05, ** p < .01, *** p < .001, **** p < .0001

[a] ADL=Impaired ADLs; Ills=Chronic Illnesses; Health=Perceived Health; Changes=Life Changes

Table 5-D: Step 5 of the OLS hierarchical regressions of predisposition, enablement, physical-need, psychological-need and multiple-need on informal health-care volume by New Zealand Vietnam War veterans and their partners, showing standardised regression coefficients, R^2, adjusted R^2, and R^2 change.

Variables	Prescription	Cutback
Predisposition		
Sex	-.153**	-.112
Age	.020	.078
Ethnicity	-.005	.140*
Qualifications	.091*	-.083
Unemployed	.151*	.215*
Fulltime Work	.032	-.069
Social Contacts	-.034	-.022
GP-satisfaction	.042	-.028
Health Worry	.125*	.247***
Health Control	-.047	.073
Enablement		
Living Standard	-.018	-.088
Income Adequacy	-.030	.048
Health Insurance	.011	-.015
CS Card	.041	-.164*
GP-Resources	-.006	.042
GP-Fee	-.061	-.107
Physical-need		
Impaired ADLs	.049	.199*
Chronic Illnesses	.244****	-.129
Perceived Health	-.173**	-.278**
Psychological-need		
Wellbeing	-.060	-.184
Distress	-.086	-.292*
PTSD	-.001	.055
Trauma	-.023	-.008
Life Changes	-.004	-.015
Multiple-need[a]		
ADL*Wellbeing	.022	.146
ADL*Distress	-.007	.166
ADL*PTSD	-.015	.035
ADL*Trauma	.050	.024
ADL*Changes	-.031	.035
Ills*Wellbeing	-.010	-.033
Ills*Distress	-.075	.006
Ills*PTSD	-.012	.044
Ills*Trauma	-.022	.027
Ills*Changes	.012	.018
Health*Wellbeing	.001	-.069
Health*Distress	-.105	-.034
Health*PTSD	.023	-.020
Health*Trauma	.041	-.142
Health*Changes	-.057	.110
R	.547	.696
R^2	.299****	.485****
Adjusted R^2	.232	.376
R^2 change	.009	.049
N	449	225

* p < .05, ** p < .01, *** p < .001, **** p < .0001

[a] ADL=Impaired ADLs; Ills=Chronic Illnesses; Health=Perceived Health; Changes=Life Changes