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Determinants of Care Seeking for Persons with Low Back and Neck Pain Treated By Physicians, Chiropractors or Physical Therapists

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Determinants of Care Seeking for Persons with Low Back and Neck Pain Treated by Physicians, Chiropractors or Physical Therapists

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"When I look up at the full moon, I know that the full moon is there. And I want only to focus my attention, my whole attention, on the presence of the full moon. So I take an in-breath and I say, "full moon." And then full moon suddenly reveals herself to me very clearly. There's only the full moon at that moment. And when I breathe out, I smile and say, "Thank you for being there." So I and the full moon were very real in that moment. And I repeat, I do it two, three, four times, and my happiness increases all the time. I feel very alive in that moment."

----From a dharma talk by the Venerable Thich Nhat Hanh entitled "Be Like the Earth" given at Plum Village on July 23, 1996.

Thank you for being there:

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Table of Contents

List of Tables

Table Page

List of Figures

List of Abbreviations

APTA ..... American Physical Therapy Association

DC ..... Doctor of Chiropractic

HMO ..... Health Maintenance Organization

LBP ..... Low back pain

MD ..... Medical Doctor (physician)

MEPS ..... Medical Expenditure Panel Survey

NAMCS ..... National Ambulatory Medical Care Survey

NHANES II ..... National Health and Nutrition Examination Survey II

NP ..... Neck pain

PCS ..... Physical Component Summary

PT ..... Physical Therapy

U.S. ..... United States of America

Abstract

DETERMINANTS OF CARE SEEKING FOR PERSONS WITH LOW BACK AND NECK PAIN TREATED BY PHYSICIANS, CHIROPRACTORS OR PHYSICAL THERAPISTS

By Julia Chevan, Ph.D.

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

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Low back and neck pain are frequent reasons for adults to seek healthcare. Three types of practitioners are commonly used in the United States: physicians, chiropractors and physical therapists. In this study, Andersen's "Behavioral Model of Health Services Utilization" is used to examine care seeking and provider selection. Estimates of back and neck pain prevalence in the United States are presented as well as care seeking rates and care consumption estimates for patients who used the three providers of interest. Multivariate regression analyses are presented that model the variables that most influence care seeking and provider selection.

Cases with the conditions of low back pain and neck pain were drawn from the Medical Expenditure Panel Survey Panel 6 participants. Episodes of care and non-care were defined and the provider used during an episode was identified.

Determinants of care seeking for low back pain included MSA status, insurance coverage, perceived health status, number of comorbidities and number of episodes. Determinants of care seeking for neck pain included insurance coverage and number of episodes. When condition was included in the analysis, it was a determinant of care seeking. All of these variables are enabling factors or need factors in Andersen's model.

In the analysis of provider selection for low back pain, variables that determined the provider from whom care was sought included patient age, gender, race, ethnicity, marital status, MSA status, insurance coverage, perceived health status, if the condition was disabling and number of episodes. In the analysis of provider selection for neck pain, variables that determined the provider from whom care was sought included patient ethnicity, marital status, and if the condition was disabling.

Andersen's Behavioral Model adequately predicts care seeking in LBP and NP with enabling and need factors playing a predominant role. In terms of equity of access this finding indicates a problem of access to care for persons who were uninsured. In the case of provider selection, all the constructs from the model were found to have a role in prediction indicating that access may be inequitable in the case of some providers.

CHAPTER 1: INTRODUCTION

Overview of the Problem

Low back pain (LBP) and neck pain (NP) are frequent, symptomatic complaints of adults. These two conditions combined have imposed a tremendous economic burden on society and on the medical care system. In the year 1998, 25.9 million adults reported an occurrence of spine-related pain in the United States (U.S.) resulting in total health care expenditures of $91 billion, a figure that equates to 1% of the gross domestic product. Ambulatory care visits accounted for 26% of these expenditures (Luo, Pietrobon, Sun, Liu & Hey, 2003).

The figures cited above incorporate both NP and LBP however, there has been far more research conducted on the impact of LBP on the health care system than NP or incidents in which the two conditions occurred simultaneously. LBP by itself is the primary cause for activity limitation among persons under the age of 45 (Rizzo, Abbott, & Berger, 1998). According to one commonly used figure, LBP occurs in 80% of the population at some point in each person's lifetime (Andersson, 1999; Deyo, 1983). Similar figures are unavailable regarding NP.

The U.S. point prevalence for LBP is estimated to be between 5-7%. This estimate equates to 14 million persons with LBP at any given point in time (Deyo & Tsui-Wu, 1987a; Loney, & Stratford, 1999; Murt et al., 1986). The incidence and

prevalence of NP, in contrast, is not as well studied with no national estimates available. Data from Canadian studies indicate that the annual incidence for an episode of NP is 14.6% (Cote, Cassidy, Carroll, & Kristman, 2004) while the point prevalence is 22.2% (Cote, Cassidy & Carroll, 1998). Although these point prevalence figures indicate that the prevalence of NP exceeds that of LBP this concept is in dispute (Ferrari, & Russell, 2003; Leroux, Dionne, Bourbonnais, & Brisson, 2004).

In the U.S., spine-related pain is a frequent reason for adults to seek out health care services. Care seeking is the act of obtaining a service from any healthcare provider and is an indicator of the demand on the system made by persons with a given condition or disease process. Cohen and Krauss (2003) identified spine-related pain as one of the fifteen most expensive conditions in the U.S. based on service use. Furthermore, of the fifteen conditions identified, spine-related pain was the condition with the highest percent of services provided on an ambulatory basis. Care seeking has been studied in the U.S. for the condition of LBP. For LBP, it is estimated that during an episode between 39 and 85% of people will seek care from a health professional (Carey et al., 1996; Carey et al., 1995; Deyo & Tsui-Wu, 1987a). The only estimate for care seeking that incorporates NP comes from a Canadian study in which 19.1% of persons with either NP, LBP or both sought care (Cote, Cassidy, & Carroll, 2001).

Care seeking is a measure of realized or actual access representing an encounter with the healthcare system. Access is the actual use of health services and those factors that either hinder or facilitate use (Andersen & Davidson, 2001). Measures of access provide planners and policy analysts with a means to determine if the delivery of services

is equitable. Care seeking is incorporated into Andersen's "Behavioral Model of Health Services Utilization" (Aday & Awe, 1997; Andersen, 1968; Andersen & Davidson, 2001), a commonly used model of health care access. The constructs of Andersen's model include three types of factors that influence use of services: predisposing factors, enabling factors and need factors. These factors incorporate demographic variables, socioeconomic variables and the variables that describe an individual's need for care. In an analysis of research using Andersen's model, Phillips, Morrison, Andersen and Aday (1998) cited as a deficiency in most access studies the disregard for provider-related variables, such as type of provider seen.

Enabling, predisposing and need factors have been analyzed to determine their influence on care seeking for LBP (Carey et al., 1995; Carey et al., 1996; Jacob, Zeev, & Epstein, 2003; Molano, Burdorf & Elders, 2001; Mortimer et al., 2003; Szapalski et al., 1995; Waxman, Tennant & Helliwell, 1998; Wright, Barrow, Fisher, Horsley & Jayson, 1995) and for care seeking of both conditions combined (Cote et al., 2001). The role that most of these factors play lacks clarity since factors identified in one study are discounted in a subsequent study. For instance, Carey et al. (1996) found that care seeking for LBP was more common among nonwhites than whites but that there was no association between seeking care and age, gender and educational attainment. In contrast Wright et al. (1995) found an association between care seeking and both age and gender while Jacob et al. (2003) found a gender association.

In addition to a lack of agreement on factors influencing care seeking, the majority of the care seeking literature has employed samples from countries other than

the U.S. Given the social and cultural differences as well as differences in healthcare organization and financing, the findings from these other studies do not apply to care seeking for LBP in the U.S. Research documenting the profiles of care seekers and predictors of care seeking for LBP in the U.S. is limited in scope and in its analysis of care providers. Although Deyo and Tsui-Wu (1987a) used data from the National Health and Nutrition Examination Survey (NHANES II), thereby obtaining population estimates, their analysis of care seeking and care providers was mostly descriptive in nature and did not involve a comparative study by provider type. Carey et al. (1996) examined care seeking among persons with acute LBP using a random telephone survey of adults. Predictors of care seeking in this sample included variables that described the individual's pain and the presence of sciatica. While these authors did examine predictors of care seeking and conducted a comparison between physicians and chiropractors, the study used a sample of persons who resided in the state of North Carolina limiting its external validity.

The providers from whom persons with spine-related pain can seek care include allopathic physicians, chiropractic physicians, other ancillary health professionals, and an array of alternative medicine practitioners (i.e., acupuncturists, massage therapists). The majority of persons seeking care for LBP see a primary care allopathic physician (Carey et al., 1995; Deyo & Tsui-Wu, 1987a; Hart, Deyo, & Cherkin, 1995). In ambulatory care medical settings, LBP ranks fifth among all diagnoses as a reason for a physician visit, and is ranked second among symptomatic complaints for a physician visit (Hart et al., 1995). Following physicians, the other two practitioners who account for a substantial

proportion of care are chiropractors and physical therapists (Carey et al., 1995; Carey et al., 1996; Deyo & Tsui-Wu, 1987a). In chiropractic practice, 40 to 68% of all patients seen report LBP (Coulter, Hurwitz, Adams, Genovese, Hays & Shekelle, 2002; Hurwitz, Coulter, Adams, Genovese & Shekelle, 1998; Shekelle & Brook, 1991). In outpatient physical therapy practices, 25% of patients state that LBP is the primary reason for seeking care, making LBP the most likely reason for a physical therapy visit (Jette, Smith, Haley & Davis, 1994). Again, estimates for NP are not readily available for any of these professions.

Physicians, chiropractors and physical therapists are all providers of nonsurgical care for persons with spine-related pain. Medical care for spine-related pain includes drug therapy, education and referral to chiropractic or physical therapy for manipulation, modalities or exercise (Bigos et al. 1994; Hurwitz et al. 2002; van Tulder, Koes & Bouter, 1997). Chiropractic and physical therapy care for spine-related pain, though coming from different theoretical backgrounds, are similar in terms of the intervention options (Hurwitz et al. 2002). Chiropractors use more manipulation and physical therapists provide more modalities and exercise, however both have a similar set of interventions at their disposal (Skargren, Oberg, Carlsson & Gade, 1997). Among these three care providers, physicians and chiropractors are similar since both provide primary care for spine-related pain, while physical therapists and chiropractors are similar since both provide manipulative and corrective care for spine-related pain.

Studies that compare the attributes of care seekers who see different providers are limited. Most studies that incorporate any type of comparison involving physical

therapists, physicians and chiropractors are clinical studies comparing the outcomes of interventions. Interestingly, these studies indicate that the providers all appear to offer similar benefits in treating spine-related pain (Cherkin, Deyo, Battie, Street & Barlow, 1998; Hurwitz et al., 2002; Skargren, Carlsson & Oberg, 1998; Skargren et al., 1997). The few studies that have examined the characteristics of persons seeking out providers of care for spine-related pain are limited to comparisons of users of physician and chiropractor care. These studies indicate that persons seeking care from chiropractors have less comorbidity and fewer disabling conditions than those who seek care from physicians (Cote et al., 2001; Hurwitz & Morgenstern, 1997b). Freburger, Carey and Holmes (2005a) studied care seeking for physical therapy and Mielenz et al. (1997) studied the characteristics of persons with LBP who received physical therapy. However, characteristics of physical therapy service users have not been compared with the characteristics of persons receiving care from physicians or chiropractors. Use of an access model to compare the factors that determine who sees which provider or which array of providers provides information that could be used by health care planners and policy makers.

Persons with spine-related pain may receive care from more than one provider. One study was found that examined the characteristics of persons who sought out care from multiple providers for LBP using a U.S. sample. Sundararajan, Konrad, Garrett and Carey (1998) found that 21% of patients with LBP saw multiple providers for their condition. Receiving care from multiple providers was associated with longer duration of pain, sciatica, greater disability, referral and longer time to recovery. In the Sundararajan

et al. (1998) study, the multiple providers were classified from only three groups, primary care physicians, orthopedic surgeons and chiropractors. These authors specifically stated that they did not include physical therapy in the analysis since they considered it to be an "...ancillary source of care, seen in conjunction with one of the initial provider types." At this time, there are no national studies that describe and compare the profiles of persons with LBP or NP who receive care from physicians, chiropractors or physical therapists either separately or in combination.

This dissertation examines the factors that determine care seeking for LBP and for NP using the constructs derived from Andersen's model. The model developed in the care seeking analysis provides the basis for a second research model employing the factors that determine care seeking to analyze provider-related access issues. In this second stage study, the predisposing, enabling and need factors that determine care seeking are used to assess how these factors influence the specific provider or providers an individual with NP or LBP uses for care provision. This study attempts to fill the gaps in the research on access by using a broad national sample and a comprehensive model of healthcare access to examine the demographic, social and individual clinical factors that predict which persons seek care and from which array of providers care is sought.

Justification for Investigating the Problem

Studies of access can improve the healthcare system by informing providers and policymakers if services are being provided in an equitable and efficient manner. When healthcare provision is determined by social or economic characteristics then care is deemed inequitable (Andersen & Davidson, 2001). Equitable care occurs when need

factors predominate the determinants of provision. Understanding access to services and exploring the factors that determine which patients go to which types of practitioners is a component of ascertaining if patients enter the health services system in an unbiased manner. Among many types of healthcare services, social and demographic characteristics have been shown to influence use. Disparities in use and access based on social and demographic characteristics such as race, ethnicity and income have received highlighted attention in recent years (Smedley, Stith, & Nelson, 2003). Comparing the characteristics of persons with LBP or NP who use physicians, chiropractors and physical therapists would provide a clearer picture of whether these services are obtained equitably or if there is preferential access based on demographics or social status.

Currently, the factors that have most clearly been demonstrated to directly influence use of services for persons with LBP are factors specific to the individual. The factors that are specific to the individual are related to the symptoms and disability produced by LBP (Carey et al., 1995; Carey et al., 1996; Cote et al., 2001; Hurwitz & Morgenstern, 1999; IJzelenberg & Burdorf, 2004; Jacob et al., 2003; Mortimer & Ahlberg, 2003; Walker, Muller & Grant, 2004). Both of these are need factors in Andersen's model. While the literature does provide evidence of need-oriented access in the case of LBP it is a literature that is limited in its generalizability to the U.S. population and the U.S. healthcare system. For the condition of NP, this type of literature was not found.

In addition to documenting the factors that influence access, studies of access provide key information to health planners on how demands for care and service are

made on the healthcare system. For LBP there is a broad range in the estimate of the demand on the system with the low end documenting that 39% of persons with the condition will seek care while the high end documents that as many as 85% of persons with the condition will seek care. None of these estimates are current, none incorporate NP, none document the quantity of care consumed, and only one is based on a national estimate (Carey et al., 1995; Carey et al., 1996; Deyo & Tsui-Wu, 1987a). Thus the true nature of the demand on the system placed by persons with the condition of NP or LBP remains unknown limiting health planning ability for these conditions.

A person who has spine-related pain may seek care and has the option of seeking care directly from a physician or a chiropractor. Other than the case of specialty care (orthopedic surgeon or neurosurgeon), the majority of the visits to physicians and chiropractors are not visits made via referral. In most states, care from a physical therapist can also be accessed directly. However, in most cases, the process of obtaining a referral from another health provider also influences the use of services for physical therapy. Although the American Physical Therapy Association (APTA) has advocated for access to physical therapy for the public, most patients' paths to physical therapy are through another practitioner. It is imperative to understand how the sieve effect of access through a physician impacts on the characteristics of the population that uses physical therapy and whether referral acts as a barrier to care for social or demographic subgroups.

Outcomes studies of physical therapy, chiropractic and physician care for persons with LBP are underway and in many cases these studies follow the gold standard of randomization. Due to methodological and economic constraints, much research in

health sciences is observational or quasi experimental in nature. For these researchers, this study will provide a level of knowledge about the similarities and differences among the populations that access these three providers. Freburger, Carey, and Holmes (2006) demonstrated that knowledge of care seeking attributes may be used to develop propensity scores. Propensity scores incorporate care seekers attributes and are used to adjust for pre-existing between-group differences that could exist among users of differing providers in outcomes studies. (Foster, 2003).

A study of multiple provider selection will provide insight to each specific discipline about the equity of service provision and the characteristics of single and multi-service users. This type of information may also be related to the cost of services for persons with LBP and to satisfaction with the care provided. The more providers sought out by a person with LBP, the higher the cost of care (Sundararajan et al., 1998). No studies examine the reasons for seeking care from this array of multiple providers but one may hypothesize that those persons who see multiple providers may be doing so because of referral by a provider, the severity of the condition, the length of time of the episode, or because of dissatisfaction with the services of the previous provider. The first step in understanding the use of multiple providers is to ascertain who these users are; once this is better clarified then further research into the reasons as hypothesized above may be undertaken.

This study examines access by comparing the characteristics of persons who do and do not receive care and then by specifically examining who uses which provider or array of providers. Knowledge about access is important as it influences service delivery,

planning and reimbursement. A study of this nature aids in the overall understanding of the factors that predict patterns of provider use and thus can provide a tool to improve the efficiency of service delivery and to ensure that delivery occurs in a socially just and equitable manner.

Study Purpose

The purpose of this study is to describe the care seeking patterns of persons with LBP and NP in the U.S. using data from a population based survey. This study identifies the influence of social and demographic factors on care seeking and the selection of healthcare providers for LBP and NP. In addition, this study sheds light onto the demands placed on the healthcare system and on specific healthcare providers by persons experiencing an episode of NP, LBP or both by developing estimates of care consumption. Within this study, healthcare provider selection is defined as the use of a physician, chiropractor, physical therapist, or multiple provider use in any iteration of these three. The study clarifies the individual factors that determine who seeks care for LBP and NP and the predictors of single and multiple provider use. Andersen's Behavioral Model of Health Services Utilization (Aday & Awe, 1997; Andersen, 1968; Andersen & Davidson, 2001) served as the conceptual framework to analyze the influence of social and demographic factors and the utilization of one or more of these providers for LBP.

Research Questions

1. What are the rates of care seeking for LBP, NP and persons experiencing both conditions simultaneously in the U.S.?

2. What quantity of care is consumed by persons seeking care for LBP, NP and persons experiencing both conditions simultaneously in the U.S.?
3. Do demographic variables, socioeconomic variables and individual clinical variables affect care seeking for LBP, NP and persons experiencing both conditions simultaneously?
4. Among care seekers, do demographic variables, socioeconomic variables and individual clinical variables affect the use of a specific provider or multiple providers for LBP, NP and persons experiencing both conditions simultaneously?

Data and Analysis

The data source for this analysis is the Medical Expenditure Panel Survey (MEPS). The MEPS is a national probability survey conducted by the Agency for Healthcare Research and Quality (AHRQ) to study the financing and utilization of health care in the United States (S. B. Cohen, 1997). The MEPS uses the National Health Interview Survey (NHIS) as its sampling frame. This frame means that a sample produced through MEPS will be a nationally representative sample of the U.S. noninstitutionalized civilian population.

Data in the MEPS are collected in a panel design in which panel participants are visited for five interviews over the course of a two-year period. The MEPS is made up of four components that include a household survey, a survey of medical providers, a survey of health insurance providers and a periodic survey of nursing home residents.

For the purpose of the present study, data are drawn from persons who were members of Panel 6. The Panel 6 household component survey was completed during

2000-2001. The final dataset for analysis included information on patient demographics, medical conditions, insurance, and ambulatory medical event utilization. AHRQ ensured that any unique patient identifiers were eliminated before public release of the data.

Data are managed and analyzed using STATA/SE 8.2 for Windows. STATA subprograms are used to account for sample weights and the complex survey design of the MEPS. In this study, the dependent variable, provider use, is nominal with multiple categories, thus, primary analysis of the research questions was conducted using maximum-likelihood multinomial logistic regression. Independent variables that served as predictors of provider use are conceptualized by means of Andersen's Behavioral Model of Health Services Utilization (Aday & Awe, 1997; Andersen & Davidson, 2001). Using this model, variables that represent the constructs of individual context including demographics, social standing, insurance status and disability are incorporated as independent variables.

Significance of the Study

LBP and NP both have significant social consequences primarily resulting in the outcome of individual level disability and inability to be a member of the workforce. In the United States, as in many countries, back problems have substantial economic impact. They are responsible for a high volume of visits to health providers and LBP is the primary cause of disability among adults under the age of 45 (Kelsey, White, Pastides & Bisbee, 1979). Back problems are one of the most costly medical conditions in the United States (Cohen & Krauss, 2003). One estimate of the direct costs due to LBP are

$20-25 billion per year and indirect costs have been estimated to range from $50-75 billion per year (Deyo, Cherkin, Conrad & Volinn, 1991; Frymoyer & Cats-Baril, 1991).

With such widespread impact back problems have been identified as a priority condition for researchers. LBP is the condition most commonly treated by two healthcare providers that directly compete for patients: physical therapists and chiropractors, and is one of the most frequent reasons for an ambulatory care visit to a physician (Coulter et al., 2002; Cypress, 1983; Jette et al., 1994).

This study examines the issue of health services access for persons with LBP and NP in a very distinct and original manner. First, using a national sample, determinants of care seeking are examined and clarified in terms of whether care was sought. The national sample permits findings to be generalized to the U.S. noninstitutionalized adult public. Second, this is the first study to examine care seeking for the condition of NP separately from the condition of LBP for multiple providers. Third, care seekers with both conditions simultaneously are examined. Finally, this study documents the quantity of services used during an episode of the conditions of LBP or NP.

Organization of the Dissertation

The chapters that follow this introduction contain a more detailed conceptualization of this study. While the introduction delineated the context and the rationale for the current study on care seeking and provider use for LBP and NP, remaining chapters provide the substance and findings from the study itself.

In Chapter 2, a detailed literature review is presented. This literature review analyzes the antecedents to receipt of therapy services, which include an exploration of

who gets LBP and NP, who seeks care for LBP and NP, and what types of care are available. These antecedents are seen as constructs to be employed in the theoretical framework for the current research study. Andersen's Behavioral Model is more fully explored and delineated in the review of literature. The empirical evidence for factors that predict care of specific services is explored in detail using constructs from the Behavioral model. Finally, this chapter incorporates the empirical evidence and the model to develop the research hypotheses that guided the analysis of the data.

In Chapter 3, the data source and approach to analyses are described. This description includes a delineation of the variables and measures used to represent the constructs from the study's theoretical model. Chapter 4 contains the results of the data analyses. First the results are presented for each of the models developed for care seeking and provider selection, than a summary of the findings by research hypothesis is offered.

Chapter 5 completes this study with a discussion of the results. Results of this study are compared with previous research studies. Returning to the context and rationale presented in the introduction, the study results are now framed in terms of the limitations of the study as well as the significance and implications of the present findings. Chapter 5 concludes with a presentation of ideas for future research.

CHAPTER 2: LITERATURE REVIEW

Introduction

Low back pain (LBP) and neck pain (NP) are actually symptomatic complaints that both encompass a number of diagnostic entities. While neither is a true pathology or disease, both are considered common occurrences among adults in the U.S. LBP is defined as "pain localized below the line of the twelfth rib and above the inferior gluteal folds, with or without leg pain" (Woolf & Pfleger, 2003, p. 652). NP encompasses symptoms felt from the occiput to the third thoracic vertebra (Cote et al., 1998) and may include pain into the shoulder or arm. Within this chapter the literature on LBP and NP is reviewed at the population level through a review of epidemiologic studies; at the provider level through a review of care options; and, finally, at the individual level by reviewing the literature on the impact of back problems and the care seeking behaviors of persons with back problems.

First, an overview of the epidemiology of LBP and NP looking at empirical evidence regarding both the distribution of and the social determinants of both conditions is presented. The disabilities that result from spine-related pain are then examined. To introduce the provider options for spine-related pain, utilization rates of physicians, chiropractors and PTs are presented as well as details of the characteristics of each provider's care decisions. In the second section of the chapter, the theoretical framework

that will guide this study of the determinants of care seeking and provider use in LBP and NP is presented. The chapter concludes with presentation of the research hypotheses. Hypotheses are presented in a manner that integrates the theoretical model and the literature on care seeking in relation to the constructs from the model.

The Epidemiology of Spine-Related Pain

Distribution studies: The Prevalence of Low Back Pain in the United States

The high prevalence of LBP is one of the principal reasons that it is a priority area for research. Published measures of the prevalence of LBP are quite varied due to the differing definitions of LBP proffered, the different populations studied, and the range of methodologies used by investigators (Loney & Stratford, 1999; Woolf & Pfleger, 2003). Prevalence is a measure of the rate of all persons who have a condition at a specified point in time in a given population. Prevalence rates are dependent upon several factors of the condition being considered including the duration of the condition and the impact of treatment on the condition. A number of different types of prevalence rates are offered in the literature. Lifetime prevalence is a measure of the number of persons who have a condition during the course of their lifetime. Annual prevalence is a measure of the number of persons who have a condition during the course of a year. Period prevalence is a measure of the number of persons who have a condition during a specified time period. Finally, point prevalence is a measure of the number of persons who have a condition at a single specific point in time (Timmreck, 1998, p. 152).

Loney and Stratford (1999) examined the methodologies used in studying LBP prevalence in a broad based review of the quality of published prevalence studies. These

authors attributed much of the differences in prevalence statistics to methodological differences among the studies. A great deal of the variation in prevalence rates was related to the definitions for the duration of LBP used by previous researchers. These definitions ranged from LBP lasting several days in some studies to LBP lasting at least 2 weeks in others. Those studies that used a definition of LBP with shorter duration tended to report higher prevalence rates than those that used a definition incorporating greater time duration. In addition, differences in prevalence rates among studies were found based on the age range of the population studied. Younger adults (20-35 years) had lower prevalence rates, rates rose in the middle ages (40-60 years) and then rates dropped after the age of sixty.

In their research, Loney and Stratford (1999) critically examined 18 studies that dealt with the prevalence of LBP in adults. The three studies that were rated as being of the highest quality produced point prevalence rates for LBP of 13.7% (Biering-Sorensen, 1982), 28.7% (Cassidy, Carroll & Cote, 1998) and 19% (Hillman, Wright, Rajaratnam, Tennant & Chamberlain, 1996). These studies were conducted in three different European countries and may not represent LBP prevalence in the United States. Loney and Stratford did identify one study by Deyo and Tsui-Wu (1987a) with a methodologically sound approach that contained prevalence estimates for the U.S.

Deyo and Tsui-Wu (1987a) conducted a study using the NHANES II survey data and its definition of LBP to determine lifetime prevalence, point prevalence, and care seeking patterns for LBP. In the NHANES II survey, LBP was defined as "pain in your back on most days for at least 2 weeks." Accordingly, in this survey lifetime prevalence

of LBP was 13.8% and point prevalence was 6.8%. Among demographic subgroups, prevalence rates were found to be similar for males and females but to differ by race with whites (14.2%) having a higher lifetime prevalence of LBP than blacks (11.4%). When level of educational attainment was considered it was found that the less education a person reported the higher the prevalence of LBP. Individuals with less than a high school degree had the highest lifetime prevalence of LBP at 17.3%, individuals who had a high school degree had a lifetime prevalence of 14.4% and those with a college degree had a lifetime prevalence of 11.2%. In the U.S. regional differences were evident for LBP prevalence with the highest prevalence in the western states (15%) and the lowest in the northeastern states (10.9%).

Additional estimates of the prevalence of LBP in the United States come from two published studies of care seeking conducted using a random sample of residents of North Carolina (Carey, et al., 1995; Carey, et al., 1996). Telephone interviews were conducted with a random sample of 4437 adults in order to develop estimates of the prevalence of acute severe LBP and chronic LBP. Chronic LBP was defined as functionally limiting back pain that has lasted for more than 3 months or that produced 25 occurrences in one year while acute severe LBP was back pain that was functionally limiting for at least 1 day. The one-year period prevalence of acute severe LBP was 7.6%. The prevalence was higher among adults aged 35 to 39 and higher among white persons. The one-year period prevalence of chronic LBP was 3.9%.

Prevalence studies and prevalence data are useful as they identify the size and the scope of the LBP problem and help to clarify the population that may require the

provision of health services. The studies by Deyo and Tsui Wu (1987a) and Carey et al. (1995, 1996) demonstrate that LBP is a problem that is wide in its scope having an impact on a large proportion of the population in the U.S. The evidence from these studies supports the notion that this affects a broad base of the population.

Distribution studies: The Prevalence of Neck Pain

In contrast to LBP, the prevalence of NP has not been examined in the United States. Fejer, Kyvik and Hartvigsen (2004) reviewed NP prevalence studies and found that most studies have been conducted in Scandinavia or other European countries. In these studies, there were regional differences in the prevalence of NP. Based on these studies, it would appear that the prevalence of NP is equal to the prevalence of LBP in European countries. This finding would explain the attention paid to NP in the European literature, but not the lack thereof in the U.S.

Two studies were identified in North America that examined prevalence of NP among adults, both were conducted in Canada (Cote et al., 1998; Cote et al., 2004) Cote et al. (1998) used data from the Saskatchewan Health and Back Pain Survey to estimate the prevalence of NP among adults. The age-standardized lifetime prevalence rate for NP was found to be 66.7% while the point prevalence was 22.2%. The prevalence of NP was shown to decrease with age. Higher prevalence rates were found among women compared to men. The estimates from these authors seem to indicate that in North America, similar to the European countries, the rates of NP are as high as those of LBP.

An examination of NP prevalence rates according to the nature of the pain and disability produced, indicates that most NP may in fact be more mild in nature and not as

disabling as LBP (Cassidy et al., 1998; Cote et al., 1998). It may be this finding that is key in explaining the small number of studies investigating the impact of NP on the healthcare system as a separate entity in the U.S. Still the evidence does point to NP being a condition that impacts a significant number of persons.

Social and Demographic Determinants

In most prevalence studies the analysis of demographic subgroups does not extend beyond bivariate descriptions of prevalence. The development of multivariate models makes possible identification of subgroups at risk for back pain or back pain care. The introduction of control variables allows multivariate models to identify more clearly associated risk factors.

Reisbord and Greenland (1985) studied LBP prevalence in relation to demographic characteristics using multivariate techniques. The authors' intent was to develop a model for the prediction of LBP. The study used data from the RAND Health Insurance Experiment and the survey definition of LBP, which was "frequent back pain during the 12 months prior to the interview." The demographic variables investigated included age, gender, race, education, occupation, physical demand of the occupation, income and marital status. In the univariate analysis the authors found that all of the variables except race had a significant association with back pain. The prevalence of LBP was 4% higher among women than men. The multivariate modeling produced three identifiable subgroups for demographic profiles and prevalence. The high prevalence group comprised persons 50-64 years old and no longer married. The intermediate prevalence group was made up of persons 35-49 years old and no longer married and

married persons with high school education or less regardless of age. Finally, the low prevalence group consisted of persons who were married with greater than a high school education and 18 to 34 year old persons who were no longer married regardless of level of education. The most important predictors for LBP prevalence in this analysis were education, gender and marital status.

Studies of risk factors for LBP have shown that a key factor in risk is occupation and physical load/demand placed on the body. In Reisbord and Greenland's (1985) model, income, occupation and demand were factors shown to be intermediate to education, gender and marital status. This study was not only unique in the use of multivariate analysis but also in the finding that demographics may play a more important predictive role than physical attributes.

Heistaro, Vartiainen, Heliovaara, and Puska (1998) examined 20 years of data from a series of surveys conducted in Finland. The 20 years enabled these researchers to examine the stability of prevalence rates in relation to demographic and social characteristics and behavioral risk factors for LBP. The authors used logistic regression models to analyze the change in prevalence rates over time for subgroups divided by age and gender. In this study, back pain was most prevalent among persons with lower levels of education, with lower levels of income, with blue-collar occupations and with jobs that required heavier physical workloads. These prevalence rates were relatively stable over the 20 years of the study though the strongest and most time stable determinant of LBP in this study was determined to be level of education. Again, the strength of this study was the development of a model based on multiple predictors.

Educational level is a demographic factor that plays an important role as a determinant not only of back pain prevalence, but it has also been found to be a predictor of the outcomes of back pain episodes and the outcomes of care for episodes of back pain (Dionne et al., 2001). A review of the evidence of the relationship between level of education and measures of back pain prevalence found that low educational status was associated with increased back pain prevalence in at least sixteen separate studies. Educational level, according to the authors' analysis, had a stronger effect on the duration and recurrence of back pain than it did with the actual onset of back pain. Five hypotheses were postulated to explain the relationship between educational level and LBP. The hypotheses were based on the premise that education level may also be linked to socioeconomic status or other risk factors that occur in the presence of lower educational levels. The hypotheses incorporated a profile of persons with lower educational levels that included more toxic and hazardous living environments, more life stressors, more physically demanding occupations, compromised "health stock," and differential access to and use of health services. The authors urged for more rigorous methodology in future studies to adjust for confounding factors such as level of education and to develop a model accounting for multiple factors.

The strongest demographic predictor for NP appears to be gender. Makela at al., (1991) examined determinants of chronic NP using data from the Finland Health Survey. These authors found that the age and gender adjusted determinants for chronic NP included lower levels of education and higher rates of comorbidity. Chronic NP was more prevalent among women than men. This particular study, however, did not

examine other social or demographic characteristics that may be related to painful conditions.

Vogt et al., (2003) studied the determinants of NP among older U.S. adults finding that among older adults the prevalence of NP was 11%. Based on models developed using logistic regression, these authors found that race and gender were both determinants of NP with white women having the highest prevalence of NP at 14%. While this study sheds some light on the potential social determinants of NP, its implications are limited due to the narrow age range (70-79) of subjects used to develop prevalence rates.

It seems evident that social determinants play a crucial role in the occurrence of LBP. LBP prevalence has an inverse relationship with measures of higher socioeconomic status. In contrast, the role of social determinants is less clear with NP though there is evidence that gender consistently plays a role as a determinant with women having higher NP rates than men.

The Course of Low Back and Neck Pain

Pengel, Hebert, Maher and Refshauge (2003) conducted a systematic review of published studies in order to describe the course of LBP. The 15 studies included in this review were prospective, had a cohort of subjects who had LBP for less than three weeks and had a follow up period of at least three months. Outcomes of interest were pain, disability, return to work and recurrence. Accordingly, LBP can be described as a condition in which pain and accompanying disability typically decrease rapidly within one month. Most individuals who are off of work due to LBP are able to return within a

month. Improvement from the condition continues for three months. After the three month point, levels of pain, disability and return to work remain constant with pain and disability both at low levels for up to twelve months following onset. Finally, the risk of at least one recurrence of LBP within a year was estimated as a range from 66% to 84%. From this analysis, LBP could be characterized as a condition that for most people has a good prognosis since its impact is time-limited and improvement is imminent. However, the analysis also shows that LBP is a condition that likely will recur.

Von Korff, Deyo, Cherkin and Barlow (1993) examined the outcomes of back pain among patients enrolled in a Health Maintenance Organization (HMO) who sought care from primary care physicians. In this study 1128 patients participated in an interview one year after initially seeing a physician for back pain. Outcomes measured by the researchers included pain, disability and depression. Patients were divided into two groups based on previous occurrences of back pain. At the one-year follow up, both groups reported high levels of back pain in the month prior to the phone interview (69% and 82%). The authors used a multinomial logistic regression to examine the influence of pain and demographic factors on outcomes. Poor outcomes in terms of persistence of pain and disability were associated with being female and having a lower level of education. This study suggests that the good prognosis of LBP may only be apparent if analysis is undertaken within a short timeframe after the initial onset.

Carey, Garrett, Jackman and Hadler (1999) also examined the likelihood of recurrence after an episode of acute LBP. Subjects in the study were enrolled through a care provider and interviewed at six and 22 months after initial visit to the provider.

Over one-half of the 921 subjects identified as being at risk had a recurrence of LBP. The level of recurrence rose from the six month to the 22 month interviews. At the three month interview the lowest level of recurrence was 35% among those who sought care from private practice primary care doctors. The highest level of recurrence at the 22 month interview was 59% among those whose care was provided by an HMO. Levels of functionally disabling recurrence were lower than the levels of any recurrence. The highest level of functionally disabling recurrence was found among persons whose care was provided by an HMO at 35%. Predictors for recurrence included a history of more episodes of back pain and a higher level of disability.

Most studies that examine recurrence are restricted to follow up periods of one year's time or shorter. Enthoven, Skargren and Oberg (2004) extended the time period of follow up to five years to understand the long term clinical course of persons with both LBP and NP. These authors surveyed a cohort of subjects who had participated in a prospective study on treatment by chiropractors and physical therapists. In this study, the researchers found that overall, 63% of the subjects reported two or more recurrences or a continuous episode of daily pain at the five year point. In addition, they found that 32% of their subjects reported seeking care during the six months prior to the survey. While this study may seem to point to the magnitude of recurrence as a problem and to its implications in terms of care seeking for LBP and NP, the information is limited since the authors did not distinguish patients with NP from those with LBP and the information on "health care consumption" was not specific to either condition.

In summary, there is evidence that recurrence is a common occurrence with both LBP and NP and that it may impact on patterns of seeking care. As with the other epidemiological information presented earlier, the data on NP is quite limited.

Disability as a Consequence of Low Back and Neck Pain

LBP and NP result in a significant burden on society and to the individual due to the disability that is often a consequence of these conditions. Among chronic conditions reported in the U.S. National Health Survey, back pain is the most frequent cause of limitation for persons less than 45 years old (Kelsey et al., 1979). In order to examine the impact of spine disorders and comorbidities on physical function, Fanuele, Birkmeyer, Abdu, Tosteson & Weinstein (2000) used data from 17,774 subjects who sought care from one of 15 centers that comprise the National Spine Network. Functional status was measured using the Physical Component Summary (PCS) derived from the SF-36 Questionnaire. The mean PCS score for subjects in this study was 30.4 (+/- 9.95), which is lower than 50.0, the mean for the general U.S. population. Persons with greater numbers of comorbidities tended to have lower PCS scores; in this sample, 46% of the patients had at least one comorbidity. When subjects who had only a spine condition and no comorbidity were analyzed, the mean PCS was 31.6.

Using the same data source, Daffner et al., (2003) examined data from the SF-36 questionnaire for persons with NP. These authors found that NP associated with arm symptoms produced the lowest PCS scores (33.64) and that persons younger than 60 were more disabled by their NP then older persons. These two studies demonstrate the

substantial physical and functional impact produced by spinal disorders and the potential that these disorders have to produce disabling conditions.

As with the prevalence of spine-related pain, demographic variables play a role as determinants of disability for persons with LBP. Deyo and Tsui-Wu (1987b) examined the NHANES-II data and found that disability due to LBP was most strongly correlated with educational level. Hurwitz and Morgenstern (1997a) examined the correlates of disability due to back pain using data from the 1989 NHIS. Correlates of back-related disability included age, gender, race, education, marital status, employment status, presence of co-morbidities, weight and traumatic onset of back problem. Men, unemployed individuals and persons with other disabling conditions were most likely to report a disabling back problem. Disabling back conditions were most common in the 35-54 year old groups and among those with less than a high school degree.

Disability is an important outcome of LBP since, it potentially results in a reduction of people available for the workforce. Recognizing the impact of disability, Rizzo et al. (1998) used data from the National Medical Care Expenditure Survey (NMCES) to examine the labor productivity losses associated with back pain. The authors used regression models to examine the probabilities of being employed and of missing workdays. Having back pain among older age cohorts resulted in a lower probability of being employed and increased the risk of incurring a disability day. When the models were translated into lost earnings the results for loss of employment were an average of $1,106 annually for men and $725 annually for women. The results for disability days were an average of $124 annually for men and $48 annually for women.

At an aggregated level these figures result in annual productivity losses due to back pain of $28.17 billion in 1996 dollars.

Physician, Chiropractic and Physical Therapy Care for Low Back and Neck Pain

Utilization Rates

Rates of provider utilization for spine-related pain vary by provider type. Table 1 summarizes the literature that provides estimates of utilization rates for physicians, chiropractors and physical therapists. The utilization rate for persons with LBP ranges from 39% to 85% for care sought from any category of healthcare provider. Utilization rate estimates cannot be made from this literature for NP as in the one case in which this condition was studied it was combined with LBP (Cote et al., 2001). LBP and NP combined had a utilization rate estimate of 25% for any provider. Rates of physician utilization are the highest of the three categories of providers under study followed by rates of chiropractic utilization and rates of PT utilization.

Utilization rates do vary by the country in which a study was conducted and by the nature of the sample. By country, rates reflect healthcare patterns that are specific to the health services systems in place. The U.S. utilization rate of 85% of all persons with LBP having seen any provider, calculated from the NHANES II data by Deyo and Tsui-Wu (1987a) is the rate most often used to represent a national standard. However, in two separate studies based on a population in North Carolina a utilization rate of 40% from all persons with LBP was reported (Carey,et al., 1996; Carey et al., 1999).

Feuerstein, Marcus & Huang (2004) demonstrated that trends in overall utilization rates in the U.S. are stable by using data from the 1987 National Medical Expenditure

Table 1

Provider Utilization Rates for Persons with Low Back and Neck Pain

Principal Author	Year	Sample used to develop rates	Any provider rate	MD rate	DC rate	PT rate	Multiple Providers
Carey	1995	269 subjects with chronic LBP in North Carolina	73%	90.9%	24.6%	29.1%	
Carey	1996	485 subjects with acute LBP in North Carolina	39%	24%	13%		
Cote	2001	907 subjects with either NP or LBP or both	25%	32%	29%	2%	8% MD and chiropractor 5% MD and PT 3% MD, PT and DC
Deyo	1987	NHANES II survey 1516 subjects with LBP	85%	59%	31%	16%	
Feuerstein	2004	Subjects from 1987 NMES & 1997 MEPS with LBP	4.5/100 population in 1987 and 1997	64% in 1987 73% in 1997	40% in 1987 30% in 1997	5% in 1987 9% in 1997	
Jacob	2003	555 subjects with LBP in city in Israel	79%	58%	4.9%	37%	

Table 1 (cont.)

Provider Utilization Rates for Persons with Low Back and Neck Pain

Principal Author	Year	Sample used to develop rates	Any provider rate	MD rate	DC rate	PT rate	Multiple Providers
Molano	2001	193 scaffolders with LBP in Netherlands		44%		22%	
Mortimer	2003	1448 subjects with LBP in Sweden	50%	31%		32%	
Sundararajan	1998	1580 subjects in North Carolina with LBP					21% MD and DC
Szpalski	1995	2783 subjects in Belgium with a history of LBP	63%				

Survey and the 1997 Medical Expenditure Panel Survey. The rate of utilization for outpatient treatment for LBP was 4.5 per 100 population. Among those who received care, the proportion of physician care increased from 64% to 74% and the proportion of PT care increased from 5% to 9% in the ten year period.

Only two studies have examined rates of multiple provider utilization and the factors that influence multiple provider use. Sundararajan et al. (1998) examined the combination of using a physician and a chiropractor. Twenty-one percent of subjects saw more than one provider and this was associated with being referred by the initial provider seen, disease severity and type of provider first seen. Cote et al. (2001) provided data on many provider types but only conducted a detailed analysis of the physician and chiropractor combination. These authors found that utilization of this combination of providers was associated with increasing age, lower levels of educational attainment, lower income levels and worse general health and health related quality of life scores.

Physician Care

Physicians account for the largest proportion of healthcare utilization due to LBP. Based on the NHANES II data 59% of all persons with LBP will seek out care from a physician (Deyo & Tsui-Wu, 1987a). At least 2% of all ambulatory care visits to physicians are related to LBP accounting for 13 million visits on an annual basis (Cherry, Burt & Woodwell, 2003). Encounters with physicians have been analyzed by two studies each using data from the National Ambulatory Medical Care Survey (NAMCS) (Cypress, 1983; Hart et al., 1995).

Cypress (1983) published a study examining patient encounters with physicians among persons whose principal complaint was back symptoms. Data from the 1977 and 1978 NAMCS were used. Among persons with back symptoms, 61% were treated by primary care physicians while the remainder were seen by specialty physicians. Most persons visiting physicians due to LBP were aged 25-64 (70%) and the highest visit rate was found among males aged 45-64 years. Services ordered or provided by the physicians were both diagnostic and therapeutic in nature. Among diagnostic services physicians offer a physical exam, x-ray, blood pressure check and clinical lab tests most often. Among the therapeutic interventions physicians most often prescribed drugs, provided medical counseling and referred to physical therapy. Study results were representative of a national snapshot of ambulatory care offered in physician offices for LBP.

Hart et al. (1995) followed Cypress' lead by conducting a follow-up study on physician office visits for LBP using NAMCS data from 1989 and 1990. Persons aged 25-44 made the largest number of visits. Women made more visits than men. Among the racial and ethnic groups identified by NAMCS blacks and Hispanics had the highest rates of visits per thousand persons. The most common source of payment for visits was commercial insurance. In an analysis of the content of care provided, these authors concurred with Cypress in finding that the therapeutic intervention of choice for physicians was prescribed drugs followed by medical counseling. Again, physicians conducted physical examinations and used x-ray in diagnosis.

Physician care for LBP is quite varied and is greatly dependent upon physician specialty (Cherkin, Deyo, Wheeler & Ciol, 1995). Orthopedists are more likely to order x-rays; physiatrists are more likely to order exercise; osteopathic physicians use more spinal manipulation. Nonetheless, guidelines on the management of acute LBP have clarified the medical nonsurgical approach to mechanical conditions affecting the spine (Bigos et al., 1994). The guidelines and more recently published review articles (Atlas & Deyo , 2001; Deyo & Weinstein, 2001) both have reiterated that medical care should revolve around conservative care, counseling and education. These interventions may be seen as similar to the intervention options of chiropractors and physical therapists.

Chiropractic Care

Chiropractors are a major source of care for persons with LBP in the U.S. Chiropractic is a unique profession as its history is rooted in a model long considered "unconventional" by the medical community (Cooper & McKee, 2003; Meeker & Haldeman, 2002). The profession is categorized as "complementary and alternative" medical care because it exists outside of standard allopathic medicine (Eisenberg et al., 1998). Public and professional views of chiropractic have altered so that it has moved from being a fringe profession to being the complementary and alternative care provider most frequently sought out in the U.S. (Coulter et al., 2002; Eisenberg et al., 1998; Meeker & Haldeman, 2002). The ranks of the profession have grown to be so large that chiropractors rank third in numbers of providers in the United States after physicians and dentists (Hurwitz et al., 1998; Shekelle, 1998).

Spinal manipulative therapy forms the basis of chiropractic care for LBP and many other diagnostic categories (Cooper & McKee, 2003). Shekelle and Brook (1991) found that while manipulation occurred in the majority of chiropractic encounters there were also high rates of "physical medicine" and x-ray services provided as well. Though the authors did not define physical medicine, the interventions that are incorporated in chiropractic care include "physical therapies such as heat, cold, electrical methods and rehabilitation methods" (Meeker & Haldeman, 2002, p. 219) and perhaps these interventions are referred to physical medicine services. In addition, chiropractors make recommendations on therapeutic exercise, provide education about posture and may provide other health and preventive counseling services (Hawk & Dusio, 1995). These descriptions of the services provided demonstrate that there is substantial overlap between chiropractic services, physician services and physical therapy services for LBP.

Most patients who seek chiropractic care do so because of LBP. As a percentage of all patients seen by chiropractors, LBP is a diagnosis in 40-68% of cases and NP in approximately 27% of all cases (Cherkin et al., 2002; Coulter et al., 2002; Hurwitz, Coulter, Adams, Genovese, & Shekelle, 1998; Meeker & Haldeman, 2002). In comparisons with non-chiropractic users, the demographics of persons who seek care from chiropractors indicate that these patients are typically white, aged 18-50, married and have at least a high school degree (Coulter et al., 2002; Hurwitz et al.,1998; Shekelle & Brook, 1991). It is not clear if there is a gender differential in chiropractic use as there are studies that demonstrated no difference (Hurwitz et al., 1998; Shekelle & Brook,

1991) and one study that showed a slightly higher level of use among women (Coulter et al., 2002).

Shekelle, Markovich and Louie (1995b) examined the demographics of chiropractic users specifically among persons with LBP. Using data from the RAND Health Insurance Experiment these researchers identified 686 people who incurred 1020 episodes of LBP. Subjects were all enrolled in insurance plans that had equivalent levels of coverage for services and each plan included chiropractic care as an option. When comparing the choice of a chiropractor to that of a medical doctor, the researchers found that there were differences evident by both race and gender. Being male, white and having at least a high school level of education were all predictive of selecting a chiropractor for care. Data for the RAND study were collected at six sites and it was found that site was predictive of seeking care from a chiropractor. The site-related finding may indicate that there is geographic variation in the selection of a chiropractor for care in the case of LBP but that issue was not addressed by the authors nor has it been studied by other researchers.

In addition to demographic variables, there are patient-level variables related to health and disability level that may be used to describe chiropractic users. As expected of any person with LBP, those who seek chiropractic care demonstrate SF-36 scores that indicate higher levels of physical disability and pain than found in normative U.S. data (Coulter et al., 2002).

Patient-level health and disability variables have been examined in comparative analyses between physician and chiropractic users. In comparison with persons who seek

care from physicians, patients seeking chiropractic care tend to have better physical and social functioning (Cote et al., 2001). Hurwitz and Morgenstern (1997) used NHIS data to specifically compare the effects of comorbidity and health status on provider choice. This study is unique in its use of a large nationally-based data set. The findings indicated that persons who used chiropractic care were less likely to have disabling comorbidities and back-related activity limitations. Interestingly mental health status as measured by the SF-36 has been found to be worse among those who seek chiropractic care in comparison to patients who seek care from physicians (Coulter et al., 2002).

Physical Therapy Care

LBP is a disorder that has tremendous impact on service provision in physical therapy. Given this impact it is surprising that only three studies have examined physical therapy utilization among persons with LBP (Freburger et al., 2005a; Jette et al., 1994; Mielenz et al., 1997). Only the study by Freburger et al (2005a) incorporated persons with NP in their analysis . These three studies examined the patterns of utilization, the nature of therapy provided and its cost.

Physicians play a key role in access to physical therapy since the vast majority of physical therapy visits occur as a result of a physician referral. Although most states have direct access or practice without referral regulations for physical therapy, few patients are seen in clinics without first seeing a physician. Dumohldt and Durchholz (1992) surveyed therapists practicing in direct access states and found that only 10% of therapists' caseload was seen through direct access. Crout, Tweedie and Miller (1998) sampled therapists in only one direct access state finding that approximately 9% of

patients were treated without a physician's referral. The small number of patients seen by direct access is a reflection of the fact that most third party payers will not reimburse for physical therapy visits that occur without a physician referral or prescription for physical therapy (Jette & Davis, 1991). Referral is an important step in enabling patients with LBP to see a physical therapist with physicians determining its occurrence.

Studies of physician referral patterns to physical therapy have shown that the majority of patients referred to physical therapy are referred due to musculoskeletal complaints with back pain being the most frequent diagnosis generating a referral (Jorgensen, Fink & Olesen, 2001; Kerssens & Groenewegen, 1990). Nelson (1986) used 1980-81 NAMCS data to analyze referral patterns to physical therapy. An average of 48 referrals to physical therapy were generated from every 1,000 physician office visits with the majority of the referrals generated due to LBP. Nelson reported that there was variation in referral patterns with the referral rates highest among persons aged 15-64. Though not analyzed by inferential methods, Nelson's report inferred that disparities in referral existed based on gender and ethnicity with referrals higher among males aged 15-44 and higher among Hispanic persons. Nelson's analysis was severely limited as it was purely descriptive in nature and did not control for confounders related to acuity or severity of diagnosis.

Freburger, Holmes and Carey (2003) used four years of data from the NAMCS to analyze which physician and patient characteristics were associated with referral to physical therapy. After controlling for diagnosis, illness severity and PT supply, these authors found that insurance status and seeing an osteopathic primary care physician or

an orthopedic surgeon were associated with referral to physical therapy. In addition, a diagnosis of mechanical LBP was more likely to result in a PT referral.

Using the National Spine Network database, Freburger, Carey and Holmes (2005b) studied physician referrals to physical therapy specifically among persons with spine disorders. Thirty-eight percent of the sample was referred to PT. Need based characteristics of the patient, specifically, physician diagnosis, were positively associated with PT referral as was education level with more educated patients more likely to be referred. Older persons and men were less likely to be referred to PT. This study does point to a possible disparity in service access of PT by socioeconomic level as measured by educational status.

In terms of utilization, LBP is the most frequent primary reason a person seeks care from PT (Jette et al., 1994). PTs tend to use a combination of interventions in treating LBP rather than relying on any single approach (Jette et al.,1994). Interventions most commonly employed by PTs include therapeutic exercise, education, spinal mobilization and physical modalities (Jette et al., 1994; Li & Bombardier, 2001; Mielenz et al., 1997).

Freburger et al. (2005a) conducted a study to identify determinants of PT use or care seeking for persons with spine disorders. Using the data from the National Spine Network they found that education level and health care payment attributes explained the greatest amount of variation in PT use. The demographic characteristics associated with PT use included being female and being over 50 years of age. Persons who had PT were also more likely to be receiving workers compensation and be in litigation. The results of

their study are key in identifying that there are issues of disparities in access to physical therapy.

Mielenz et al. (1997) examined utilization of PT among persons with acute LBP in North Carolina. The likelihood of being treated by a PT was influenced by a person having a greater level of disability and by the provider first seen for an episode of LBP. Persons who saw orthopedic surgeons were most likely to be treated by a PT while persons who saw chiropractors were least likely. Demographic characteristics associated with utilization were similar to Freburger et al. (2005a).

Summary of Care Comparisons Among Providers

The three categories of providers under comparison differ in the rates of utilization among persons with LBP. Similar information is not available regarding NP. While there are also differences in the types and frequency of interventions provided, it is the similarities that are most striking. All three types of providers incorporate counseling or education as a component of intervention. Both chiropractors and PTs use spinal manipulation or mobilization, therapeutic exercise and physical modalities. Finally, only physicians provide a significant amount of drug therapy as an intervention. Interestingly in a number of outcomes studies that have compared the effectiveness of these interventions they are seen as having similar effects (Carey et al., 1995; Cherkin et al., 1998; Hurwitz et al., 2002; Skargren et al., 1998; Skargren, et al., 1997).

Theoretical Framework

In this section the theoretical framework for the process of care seeking that leads to use of one of the healthcare providers for spine-related pain is presented. The process

is framed with Andersen's Behavioral Model of Health Services Utilization (Aday & Awe, 1997; Andersen & Davidson, 2001). Andersen's model is presented to define use, to examine the antecedents to use and to place use in the context of the medical care system.

Andersen's "Behavioral Model of Health Services Utilization" (Figure 1) has been used as a framework for defining the antecedents of utilization of a variety of healthcare services (Aday & Awe, 1997; Andersen & Davidson, 2001). Andersen first presented the model in a study that examined family use of health care services (Andersen, 1968). In that model, Andersen proposed a framework encompassing predisposing, enabling and need factors as variables that were explanatory of utilization of health services. Predisposing variables described the family structure, social structure and health beliefs of the family; all variables that related to the tendency to use health care services. Enabling factors were the variables that described a family's economic resources and the community resources. Variables describing need referred to the health status and illness status of family members. Andersen's model became popular in utilization studies because of his inclusion of social context and social structure as determinants in families' use of healthcare (Aday & Awe, 1997; Andersen 1968).

Since the 1968 monograph by Andersen, the model has been revised multiple times in response to research findings and in order to make it more generalizable to a variety of populations including cross-national comparative utilization studies, studies on the elderly and studies of homeless persons' health utilization (Aday & Awe, 1997; Andersen, 1995; Gelberg, Andersen & Leake, 2000).

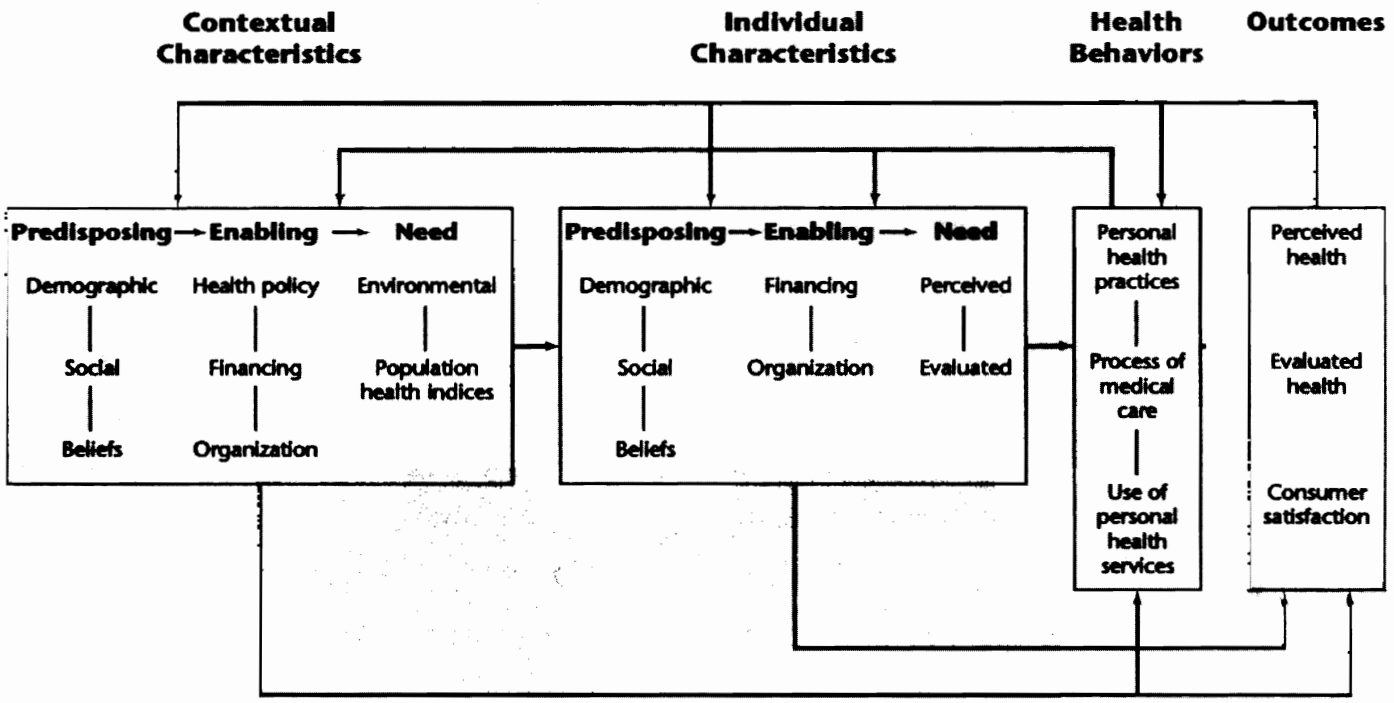

Figure 1. Behavioral Model of Health Services Utilization

Source: Andersen, R.M., & Davidson, P. L. (2001). Reprinted with permission of John Wiley & Sons, Inc.

In the current iteration of the model, use is seen in the context of access. Access is defined as "actual use of personal health services and everything that facilitates or impedes their use" (Andersen & Davidson, 2001, p. 3). The Behavioral Model was developed as a tool to aide in the measurement of access. The most recent version of the model provides a succinct conceptualization of how an individual or group of individuals gains entry to the healthcare system. The foundation underlying the Behavioral Model is that it is a model that facilitates an understanding of health services use. As a model it may also assist in examining system equity in access and can serve as an instrument for policy development.

There are four dimensions that provide a framework for the model: contextual characteristics, individual characteristics, health behaviors, and outcomes. As depicted in Figure 1, these dimensions are recursive in nature with each dimension influencing multiple elements of the model. For example, individual characteristics influence health behaviors and in turn, health behaviors can influence the individual characteristics. For a person with LBP or NP this may be demonstrated as the person perceiving a need for services (individual characteristic) and seeking out a physician (health behavior). The use of services and interaction with the physician (health behavior) may result in a change of the person's perception about the severity or nature of the low back disorder (individual characteristic).

Contextual characteristics are the circumstances and the environment in which access occurs. Contextual characteristics include healthcare organization, provider related and community characteristics. These characteristics are measured on the

aggregate level. This level of measure contrasts with the individual characteristics which are the factors that define the person and thus are measured at the person level.

Health behaviors incorporate both the behaviors of the individual and the behaviors of health providers in the process of delivering care. For the individual these behaviors may include factors such as exercise, tobacco use and compliance with medical advice. For the provider the measure is the process of care delivery.

Finally the model incorporates outcomes including perceived and evaluated health and satisfaction. In this model outcomes are not only the result of access to healthcare but also serve as a feedback mechanism ensuring adequacy of access and equity of access.

Andersen's model is holistic in its approach, incorporating behavioral and environmental features that influence use and ultimately health outcomes. The model has been used in many previous studies of health services utilization. Phillips et al. (1998) conducted an analysis of published literature on healthcare utilization in order to determine if these studies were including environmental and provider-related variables. Examining articles published from 1975-1995, the authors found 139 articles that referenced or used the Andersen model. While 51% of the articles incorporated provider-related variables only two studies actually examined the specific characteristics of the provider in relation to health services utilization.

Many studies of utilization using the Andersen model do not differentiate the type of provider from whom care was received. In most of the studies cited by Phillips et al. (1998), provider-related variables were used to predict a singular form of service

utilization. On many occasions in healthcare there are viable possibilities of substitution for provider sources. The Andersen model can serve to aid in an understanding of choice of provider. For instance, individuals with mental impairments who receive VA benefits can choose to have a provider through the VA or through the community. Choice of provider has been modeled using enabling factors, illness factors and predisposing factors from Andersen's model (Gamache, Rosencheck & Tessler, 2000).

The focus of the present study is to understand the factors that determine care seeking, and from among the care seekers group, to examine provider-related access issues. This study specifically examines how predisposing, enabling and need factors determine which providers an individual with LBP and NP uses for care provision.

In a system in which access is equitable, need factors should prevail as determinants of care seeking. When need factors predominate then access to services is considered equitable (Andersen & Davidson, 1999). Equitable access describes a fair distribution of health services across all social and demographic groups in a population. Inequitable access to services happens when care provision is determined by social characteristics or enabling factors. For example, inequitable access would occur if there were preferential selection of persons with higher income to chiropractic care.

The analysis in this study is conducted at the person level with a focus on determinants from the individual context or dimension. Factors that are considered include predisposing factors (e.g., demographics), enabling factors (e.g., insurance status) and need factors (e.g., disability and health status).

It is estimated that of 39% to 85% of all persons with LBP will seek care from a healthcare professional (Carey et al., 1995; Carey et al., 1996; Deyo & Tsui-Wu, 1987a; Jacob et al., 2003). In the case of NP, estimates for males are 18% while for females it is 29% (Grooten et al., 2004). When care seeking behaviors have been examined there is variation in these behaviors that is associated with the constructs from Andersen's model. Table 2 provides a summary of the factors that have been shown to influence care-seeking behavior. The constructs that best describe care seeking are contained within the individual context of the Andersen model and include predisposing, enabling and need constructs.

Predisposing Factors and Care Seeking

It is not clear to what extent demographic characteristics influence care seeking for LBP and NP. While some researchers have found an association between care seeking and race, age and gender, others have developed models in which these factors provide no explanation of the variation in care seeking behaviors. The variation in findings may be explained by differences in the samples under study or in the definitions used for the study variables.

In the U.S., care seeking has been examined among persons with both acute LBP (Carey et al., 1996) and chronic LBP (Carey et al., 1995) with differing findings. Demographics were only associated with the acute population. In the acute LBP population, it was found that care seeking was more common among nonwhites than whites but there was no association between seeking care and age, gender and education.

Table 2

Summary of the Literature on Care Seeking Among Persons with Low Back and Neck Pain

Principal Author	Sample	% Seeking care	Factors influencing care seeking	Factors studied that did not influence care seeking
Carey (1995)	269 subjects with chronic LBP in North Carolina	73%	Severity of back pain Number days in bed in previous year	Demographics Health status Insurance Employment
Carey (1996)	485 subjects with acute LBP in North Carolina	39%	Race Pain >2 weeks duration Pain in leg Pain occurring at work	Age Gender Education Income Geography
Cote (2001)	907 subjects with either neck or LBP or both in Canada	25%	Health status Pain Disability	
Grooten (2004)	1496 working aged adults in Sweden with neck/shoulder pain	18% men 29% women	Gender Biomechanical work factors Psychosocial work factors	
Hurwitz (1999)	4790 adults from 1987 NHIS with LBP	20%	Disability with nondisabling comorbidity	Disability associated with comorbidity Seeking care for comorbid condition
Jacob (2003)	555 subjects with LBP in city in Israel	79%	Gender Disability Pain	
Molano (2001)	193 scaffolders with LBP in Netherlands	Overall rate not reported	Sickness absence from work	Demographics Job seniority Job characteristics

Table 2 (cont.)

Summary of the Literature on Care Seeking among persons with Low Back and Neck Pain

Principal Author	Sample	% Seeking care	Factors influencing care seeking	Factors studied that did not influence care seeking
Mortimer (2003)	1448 subjects with LBP in Sweden	50%	Pain intensity Disability	Previous pain Working conditions Physical factors and Lifestyle
Tornqvist (2001)	392 cases who sought care for neck or shoulder disorders 1,511 controls	All cases	Work conditions	
Vingard (2000)	695 cases with LBP who sought care 1423 referents all in Sweden	All cases	Previous LBP Occupational factors	Lifestyle
Walker (2004)	1228 Australian adults with LBP in past 6 months	44.5%	Disabling LBP Gender Marital status Accident at home as cause of LBP	
Waxman (1998)	782 subjects with LBP in the UK	48%	Having a diagnosis Employment status First episode Pain Chronicity Externalized locus of control for pain management	Age Gender

Table 2 (cont.)

Summary of the Literature on Care Seeking among persons with Low Back and Neck Pain

Principal Author	Sample	% Seeking care	Factors influencing care seeking	Factors studied that did not influence care seeking
Wright (1995)	8316 persons with LBP in the UK	53%	Age Height Gender Mental health status	BMI Activity Diet Living alone
Szpalski (1995)	2783 subjects in Belgium with a history of LBP	63%	Age Habitat Social class Belief LBP is an ongoing problem	Language Gender Health status

Other care seeking studies finding demographic associations were conducted in countries other than the U.S. Wright et al. (1995) found an association between both gender and age and consultation with a physician. In this study based in the United Kingdom, women consulted with physicians more frequently and the rate of consultation increased with increasing age. In a study based in a demographically homogenous city in Israel, Jacob et al. (2003) found that persons who sought care for LBP were also more likely to be female.

In contrast, multiple studies have found no association between care seeking and patient demographic characteristics for LBP (Molano et al., 2001; Szpalski et al., 1995; Waxman et al., 1998). In the case of NP there seems to be a clear association between gender and care seeking with females seeking care more frequently than males (Grooten et al., 2004). Other demographic characteristics have not been clarified in the NP literature. Given the discrepancies in the literature, it is, in the least, important to control for predisposing factors in examining care seeking for spine pain.

Enabling Factors and Care Seeking

Enabling factors that have been studied in relation to care seeking for LBP include insurance status, income, employment status, geographic location and social class. Again the role that these factors play is unclear as the literature on LBP provides a mixed message and much of the literature is focused on countries other than the U.S. For NP, these factors remain unstudied.

In the U.S., insurance, employment status and income were all shown to have no association with care seeking in persons with both acute and chronic LBP (Carey et al.,

1995; Carey et al., 1996). In contrast, Szapalski et al. (1995) did find that social class and geography were both associated with care seeking. In this study based in Sweden, persons who lived in urban locations were less likely to have seen a care provider; and the highest social class and the blue collar social class were both more likely to have seen a care provider. Mortimer et al. (2003) found that women in Sweden who had a strained economic situation were less likely to seek care. As with predisposing factors, the role for enabling factors in terms of care seeking remains unclear.

Need Factors and Care Seeking

Of all the constructs in Andersen's model, need factors of the individual seem to play the clearest role in terms of care seeking. Most studies are in agreement that both pain and disability influence care seeking activities of persons with LBP. Numerous studies have found that greater severity of pain, greater duration of pain and location of pain all induce a person to seek out care (Carey et al., 1995; Carey et al., 1996; Cote, et al., 2001; Mortimer et al., 2003; Waxman et al., 1998). Higher levels of disability are also related to care seeking (Cote et al., 2001; Hurwitz & Morgenstern, 1999; Jacob et al., 2003). Aside from being indicators of care seeking, measures of pain and disability have also been shown to be appropriate and responsive measures to document treatment outcomes in LBP (Pengel, Refshauge & Maher, 2004). While pain and disability are not clearly correlated in other musculoskeletal disorders, they may be related in LBP and NP.

Models for the Present Investigation

The present investigation uses two separate though inter-related conceptual models that draw upon Andersen's Behavioral Model and the specific factors shown to

influence care seeking and provider selection. The models were developed in order to examine and compare how care seeking occurs and how care seekers access any of the three types of providers under study and whether that access occurs in an equitable manner. The models as seen in Figure 2 and Figure 3 draw upon the individual characteristics constructs of Andersen's model and use the predisposing, enabling and need factors as determinants of care seeking, of provider type and of the sequence of provider selection in the case of multiple providers.

The use of two models demonstrates that there are two levels of analysis of the population of persons with LBP and NP. In the first analysis the dependent variable is care seeking and it is examined in relation to the factors identified in Anderson's model. In the second analysis, only those persons who have sought care are included and provider selection is examined. The relationship of the first model to the second is seen in the modification of the factors from Anderson's model as each one is derived from the care seeking model. This relationship implies that there is a process from the point of seeking care to the point of going to a specific provider and that the determinants of the second component of the process is dependent upon the first. Thus knowledge of the predisposing, enabling and need factors that are analyzed in the mode of provider selection are determined by the outcome of the analysis of care seeking.

Rationale and Hypotheses for the Present Investigation

There is a lack of clarity on the role that predisposing and enabling factors play in care seeking for persons with LBP and NP. In contrast, need factors show great importance in the decision to seek care. Once the decision to seek care is made, a

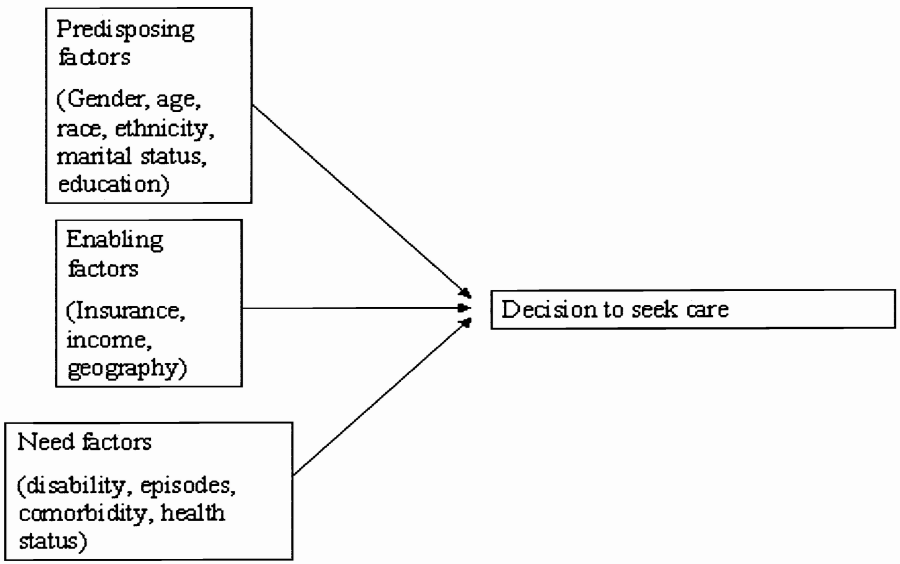

Figure 2. Model of Care Seeking in Low Back and Neck Pain

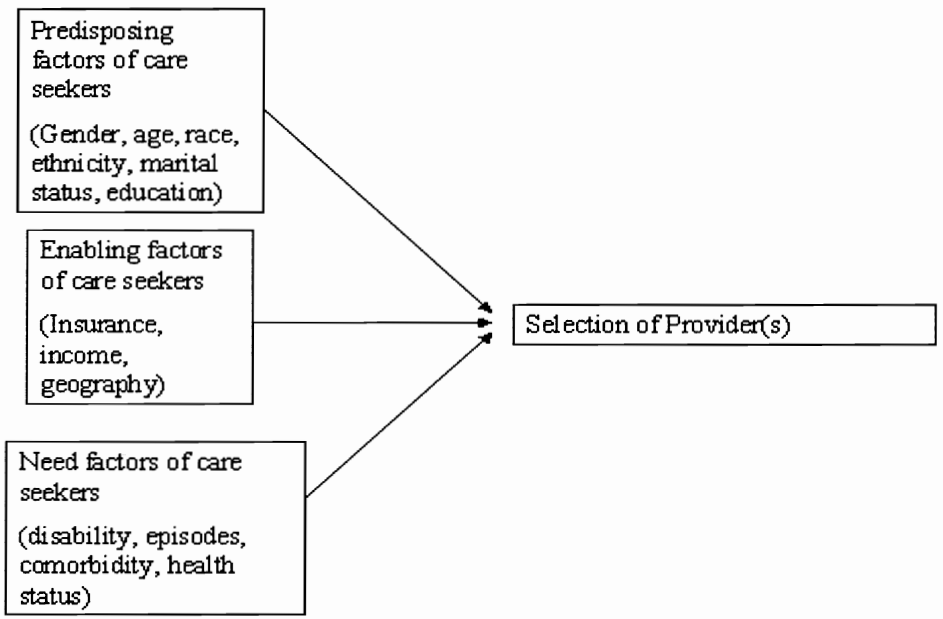

Figure 3. Model of Provider Selection in Low Back and Neck Pain

person with LBP or NP has a choice from among an array of providers. This choice is affected by two known factors that are insurance coverage and referral patterns. There is a gap in the literature in terms of clarifying how the determinants of care seeking relate to provider selection. This gap is particularly evident in terms of a comparison of the three providers under question in this study. Previous studies have compared persons using chiropractic and physician services (Hurwitz & Morgenstern, 1997b; Shekelle et al., 1995b) but no study has examined and compared the determinants of selecting physician, chiropractic and physical therapy services or multiple providers.

Care Seeking Hypotheses

As discussed previously in the literature review, the clearest determinants of care seeking for LBP are need factors including disability and recurrence of LBP symptoms (Carey et al, 1995; Hurwitz & Morgenstern, 1999; Jacob et al., 2003; Vingard et al., 2002). Carey et al. (1995) concluded that care seeking for LBP is not discretionary from the standpoint of the patient, since care seeking seems to be strongly symptom driven.

Need factors, however, may not be the only determinants of care seeking. Racial differences in care seeking have been demonstrated in one U.S. population with blacks more likely to seek care than whites (Carey et al, 1996). In other studies, predisposing factors such as gender and age and enabling factors including geography have been shown to be related to care seeking (Szapalski et al., 1995; Wright et al., 1995). Based on this literature, hypotheses are explored to examine the influence of predisposing, enabling and need factors.

Predisposing Factors

Hypotheses to study the impact of predisposing factors on care seeking among persons with LBP are:

H1A: No statistically significant difference exists in care seeking for LBP and for NP between men and women controlling for other predisposing, enabling and need factors.

Although the LBP prevalence rate is similar for men and women, an interaction has been demonstrated between gender and race in prevalence rates implicating the importance of including gender in the present model (Deyo & Tsui-Wu, 1987a). Furthermore men appear to have more disabling back problems than do women (Hurwitz & Morgenstern, 1997a). In terms of care seeking, most studies show no difference between men and women in the rates of seeking care for LBP but rates do differ for NP. Wright et al. (1995) and Walker et al. (2004) found that women were more likely than men to seek out care for LBP in studies based in Great Britain and Australia respectively. McGeary et al. (2003) found that women were more likely than men to seek care from new providers during a one-year follow up period. Grooten et al. (2004) found that women were more likely to seek care for neck/shoulder pain than men. The hypothesis using men and women is thus based in the knowledge that there may be gender differences in care seeking for LBP and NP.

H1B: No statistically significant difference exists in care seeking for LBP and for NP by race and ethnicity controlling for other predisposing, enabling and need factors.

The inclusion of a hypothesis examining racial differences is based on the finding by Carey et al. (1996) that race was a strong predictor of care seeking in acute back pain. In that study, nonwhites were found to be less likely to experience LBP but more likely than whites to seek care. Sixty percent of nonwhites sought out care as opposed to 36% of whites with LBP. In a follow-up study, Carey and Garrett (2003) found that black persons with LBP presented to medical providers with worse functional status and that there were differences in outcomes and treatment received by racial category. No studies have been identified that have included ethnicity or Hispanic status though the study by Carey et al. (1996) may have incorporated Hispanic persons into the nonwhite category.

H1C: No statistically significant difference exists in care seeking for LBP and for NP by age controlling for other predisposing, enabling and need factors.

Increasing age has been shown to be associated with an increased likelihood of care seeking among persons with LBP (Szpalski et al., 1995; Wright et al., 1995). This increase is complicated by an interaction between age and gender as demonstrated by Wright et al (1995). Accordingly, as age increased, men's rates of consultation reduced while women's rates of consultation increased. Although other studies have shown no association between age and care seeking for LBP, increasing age has been associated with greater use of care for other medical problems (Murphy & Hepworth, 1996) and thus warrants examination in the current study.

H1D: No statistically significant difference exists in care seeking for LBP and for NP by marital status controlling for other predisposing, enabling and need factors.

Walker et al. (2004) found that being never married was associated with lower rates of care seeking. These authors hypothesized that these individuals may have greater self-reliance and thus are less likely to seek care. This variable has not often been addressed in studies on care seeking and LBP or NP but does warrant attention given its possible impact.

H1E: No statistically significant difference exists in care seeking for LBP and for NP by level of educational achievement controlling for other predisposing, enabling and need factors.

Level of educational attainment has been shown to play a significant role in predicting persons who will have LBP and persons who will be disabled by LBP (Dionne et al., 2001). While educational attainment has not been demonstrated to impact care seeking, its influence on the prevalence of LBP warrants the inclusion of a hypothesis incorporating this variable.

Enabling Factors

Hypotheses to study the impact of enabling factors on care seeking among persons with LBP are:

H1F: No statistically significant difference exists in care seeking for LBP and for NP by insurance status controlling for other enabling, predisposing and need factors.

As seen in the review of literature, many of the studies on care seeking for LBP are based in countries other than the U.S. The variable of insurance status is clearly country specific since insurance types differ so dramatically internationally. Carey et al. (1996) did not observe an association between care seeking and insurance. However, in that study, insurance was a dichotomized variable only examining those who were insured and those who were underinsured which was defined as having no insurance, Medicare or Medicaid. The hypothesis on insurance status is included because previous studies have demonstrated a relationship between use of health services and insurance status (Kubrin, 1995).

H1G: No statistically significant difference exists in care seeking for LBP and for NP by income level controlling for other enabling, predisposing and need factors.

Income is a variable that indicates a person's social class status. Szpalski et al. (1995) found that higher social class was associated with care seeking though not linearly with the greater rates of care seeking among persons of the highest and the lowest social classes. Typical of measures of social class, the measure that was used in the study by Szapalski et al, incorporated both occupation and income. In the present study hypotheses related to income will be used to ascertain information about class and care seeking.

H1H: No statistically significant difference exists in care seeking for LBP and for NP by geographic location controlling for other enabling, predisposing and need factors.

The few studies based in the U.S. have not fully explored the relationship of geographic location to care seeking for LBP. Subjects in the study by Carey et al. (1996) were only from North Carolina and in that study region of the state and population density were not related to care seeking. Hurwitz and Morgenstern (1999) used a nationally based sample but their focus was on the impact of comorbidities on care seeking. Using data from the 1989 NHIS the authors presented descriptive statistics on subjects with back conditions by census geographic region and size of residence but did not statistically analyze this relationship. The inclusion in the present study of a hypothesis on geography and the inclusion of census region and urban status of location may thus provide information previously not clarified by other researchers.

Need Factors

Hypotheses to study the impact of need factors on care seeking among persons with LBP are:

H1J: No statistically significant difference exists in care seeking for LBP and for NP by disability controlling for other need, predisposing and enabling factors.

Disability is the one factor that appears to have the most clear relationship in the literature to care seeking among persons with LBP. Persons with back-related disability are more likely to be care seekers (Cote et al., 2001; Hurwitz & Morgenstern, 1999; IJzelenberg & Burdorf, 2004; Jacob et al., 2003; Mortimer & Ahlberg, 2003; Walker, et al., 2004). Consequently, inclusion of this measure of need incorporates an important variable in care seeking for LBP and NP.

H1K: No statistically significant difference exists in care seeking for LBP and for NP by recurrence of an episode of care or symptoms controlling for other need, predisposing and enabling factors.

Back pain is often a recurrent condition (Carey et al., 1999). Waxman et al., 1998) found that care seekers were more likely to be persons who were having a first episode of LBP. In contrast Vingard et al., (2000) described a previous occurrence of LBP as a factor that influenced care seeking. The influence of a single or multiple episodes of LBP or NP on care seeking is not clear and this hypothesis will explore the influence of recurrence on care seeking.

H1L: No statistically significant difference exists in care seeking for LBP and for NP by the number of comorbid conditions controlling for other need, predisposing and enabling factors.

Hurwitz and Morgenstern (1999) examined the effect of comorbidities on care seeking for LBP. Subjects in this study were drawn from the 1989 NHIS. Most subjects (63%) had at least one comorbidity with 37% having multiple comorbidities. Having comorbidity alone or a comorbidity with an associated disability did impact on care seeking for LBP. Subjects who sought care for their comorbidity were less likely to seek care for their LBP during the period under study. The authors of the study feel that this finding may suggest a possible prioritization of conditions by the subject however, it may also be related to the brief period under study and the fact that the data are cross sectional. Subjects were only asked about care seeking for the two weeks prior to the survey and thus the information on care seeking for LBP could have been censored.

H1M: No statistically significant difference exists in care seeking for LBP and for NP by perceived health status controlling for other need, predisposing and enabling factors.

Studies have not incorporated variables representing a person's general health status and care seeking for NP or LBP. The variable perceived health status takes into account not only LBP or NP related disability but also disability and health due to other conditions. This study is unique in incorporating this measure of health into its care seeking hypotheses.

Provider of Care Hypothesis

The literature on the type of provider that affords care for LBP and NP is limited primarily to comparisons of persons who gain care from physicians and chiropractors. In this literature, it has been demonstrated that determinants of provider type include predisposing, enabling and need factors.

Carey et al. (1995) and Shekelle et al. (1995b) both found that black persons were less likely than whites to seek care from a chiropractor as compared to a physician. In addition to race, Shekelle et al. (1995b) found that gender and educational attainment influenced care seeking from chiropractors. Chiropractic users tend to be white, aged 18-50, married and educated (Cote et al., 2001). Carey et al. (1995) found that individuals who sought care from chiropractors were in better health, in less pain and were more likely to have good insurance coverage.

Though the research is limited in the comparisons made, it is evident that multiple factors do influence the type of provider seen for LBP. In the present study, factors that

previously determined care seeking are analyzed in terms of their contribution to provider type. This study is unique in its additional consideration of physical therapy as a provider choice and its analysis of multiple providers as a selection.

H2: The type of provider is not associated with significant differences in predisposing, enabling and need factors of care seekers for LBP or for NP.

Summary of the Literature Review

This review of the literature has attempted to provide a picture of who has spine-related pain, the consequences of the conditions of NP and LBP, the care provided and the factors that influence whether or not a person will seek care. LBP and NP are both highly prevalent conditions. While the course of LBP and NP indicates that these conditions often resolve, they both do tend to recur and to result in disability. The impact of LBP at the individual and the societal level has been studied more than NP.

Care seeking among persons with LBP is related to the occurrence of both pain and disability. Demographic and social factors play a less clear role in care seeking. Persons with LBP have a wide range of provider options. The most commonly accessed providers are physicians, chiropractors and physical therapists. The option of care provision from a physician or a chiropractor appears to be related to factors that include level of education, race and disability. The option of a physical therapist may be more restricted due to the intervening factor of physician referral. The three types of providers offer interventions that may be seen as similar in nature. No studies have been conducted as yet, however, that have compared the determinants of single and multiple provider use

in these three provider types among persons with LBP. In the chapter that follows, the methods that were used in this study to examine this issue are presented.

CHAPTER 3: METHODS

This chapter provides details of the research methods and the approach used in the data analysis. The data source and development of the sample are described followed by a discussion of the research design. The unit of analysis in this study was an episode thus a clear description of episode definition and development is provided. Finally all study variables and an outline of the approach taken in the data analysis are delineated.

Data Source

The source of data for this study was the Medical Expenditure Panel Survey (MEPS). MEPS is the third survey in a series conducted by the Agency for Healthcare Research and Quality (AHRQ) in conjunction with the National Center for Health Statistics (NCHS) to study the financing and utilization of medical care in the United States. The first two surveys, the National Medical Care Expenditure Survey (NMCES) and the National Medical Expenditure Survey (NMES) were conducted in 1977 and 1987 respectively. The MEPS was initiated in 1996 to provide updates necessary to analyze changes that may have occurred since 1986 (S. B. Cohen, 1997). As of November 2005, MEPS data files were available for public use and analysis for the years from 1996 through 2002. These years incorporated files that contained data for a total of six panels of survey participants.

MEPS encompasses four surveys: a household survey (MEPS-HC), a survey of medical providers (MEPS-MPC), a survey of health insurance providers (MEPS-IC) and a periodic survey of nursing home residents (MEPS-NHC). The MEPS-HC and MEPS-MPC can be linked to provide a highly detailed level of analysis of utilization and expenditures.

MEPS-HC is that portion of the MEPS survey that is used to collect data on a sample of families and individuals in the United States. The MEPS-HC uses the National Health Interview Survey (NHIS) as its sampling frame drawing on a subsample of households that participated in the previous year's NHIS.

The MEPS sample like its parent, the NHIS, is representative of the U.S. noninstitutionalized, civilian population. The NHIS uses a multistage sample involving stratification and clustering. The MEPS uses the NHIS as its sampling frame. Both the MEPS and the NHIS are considered complex sample surveys. In a complex sample survey using a multistage sampling approach, independence of observations cannot be assumed. The lack of independence of the observations is fundamentally different from a random sample. This difference requires adjustment in statistical analysis, since most statistical estimates generated are based on random sampling. To develop and analyze a sample from the MEPS, variables that account for the sampling approach such as person-level sample weights must be incorporated. Use of unweighted data results in biased estimators (S. B. Cohen, 1997). To obtain estimates of variability from MEPS data, variance estimation variables for both strata and primary sampling units (PSUs) within the strata must be specified (Korn & Graubard, 1999 p. 16). The incorporation of strata

and PSUs into the data ensures proper methods of variance estimation - specifically that when standard errors are calculated they are not minimized. Weighting variables, strata and PSUs are critical components of the MEPS datasets made available through the AHRQ.

The MEPS-HC survey incorporates an overlapping panel design with several rounds of interviewing. In a panel design, the participants take part in a repeated survey process during a set time period. Two years of information are collected from each household over the course of five in-person interviews. MEPS-HC is conducted using a computer assisted personal interview for data collection during the five rounds of interviews. The five interviews are spaced to be four months apart with a single family respondent reporting for all household members. Over the course of the five interviews a dependent methodology is used. In a dependent methods interview process respondents have the opportunity to confirm and revise, if necessary, data collected in previous interviews at each subsequent interview.

At any point in time, two MEPS panels are being interviewed. This approach to data collection affords researchers the opportunity to combine panels for point-in-time estimates or examine in detail the two-year experience of a single panel. The panel approach also makes possible tracking of changes in health status, use and expenditures over a two-year period.

MEPS-HC collects a core set of data on subject demographic characteristics, health status and conditions, charges, payment and utilization of healthcare, prescribed and over the counter medications purchased, employment and health insurance. Periodic

supplements to the core data collection instrument are used to examine other aspects of the healthcare system experience including satisfaction with care provided and use of alternative healthcare approaches (S. B. Cohen, 1997).

In conducting the MEPS-HC, mail and phone contacts are first used to recruit a respondent into the MEPS and to inform the household of the record keeping requirements for the survey. The observation period commences on January 1st of the initial survey year. Prior to the round one interview, materials are sent to the household including a study calendar and record file. Respondents are compensated with $5 for the time required to keep the records. An interviewer telephones to ensure arrival of the materials and to arrange a time for conducting the round one interview. If a household is not available by telephone, mail contact is attempted. A unique facet of MEPS-HC is that the surveyors obtain permission from survey participants to collect information directly from healthcare providers, employers and health insurance plans. This permission is requested during the round one interview for events taking place in hospitals and during the round two interview for all other types of medical providers.

The MEPS-MPC sample incorporates data from hospitals, pharmacies and home health care providers reported in the MEPS-HC. A sample of office-based physicians and other medical providers under the supervision of physicians is also included in the MEPS-MPC. The office-based physician sample incorporates information based on MEPS-HC respondents who are Medicaid recipients, a sample of respondents who are receiving care via an HMO and a sample of all other respondents. MEPS-MPC serves as a supplement to, and source of validation of, the expenditure and utilization data

collected in the MEPS-HC. Data are collected documenting the medical and financial aspects of events reported by MEPS-HC respondents. MEPS-MPC data are collected by telephone interviews in which the persons who are responsible for billing are queried on details of the care provided. Different versions of the MEPS-MPC interview are used with different providers and in some cases medical records personnel are interviewed as well. Data collected via questionnaire include diagnoses, procedure codes, charges and sources of payment (Machlin & Taylor, 2000).

Study Sample Development

MEPS Panel 6

The MEPS-HC survey uses a complex sampling design in order to produce estimates at the national level for the civilian, noninstitutionalized population of the United States. Data from sample surveys have three key characteristics that account for the complexity of sampling: sampling weights, a variable to denote the sample clusters and a variable that denotes sample strata. The MEPS-HC data files incorporate these variables in a manner that allows analysis of data both cross-sectionally and longitudinally by panel.

Panel 6 from the MEPS-HC represents the most recently completed panel of data publicly available for analysis through AHRQ; this panel is derived as a subsample from the 2000 NHIS sample. Panel 6 data were collected during the two-year period from January 2001 to December 2002. The 2000 NHIS consisted of 38,633 households. For MEPS Panel 6, 10,651 households were fielded. These MEPS Panel 6 households reflected an overall response rate calculated by AHRQ to be 64%. From the Panel 6

responding households, 20,758 persons contributed data for longitudinal analysis over the two-year period of the panel.

In order to develop the Panel 6 sample for the present analysis, data from eleven MEPS files were merged. A listing of the publicly available MEPS files that were used to create the sample is found in Appendix A. To create the single file that contained sample characteristics, identified persons with the conditions of low back pain (LBP) and neck pain (NP) and delineated all health care events associated with the conditions of LBP and NP, a program was written for data management using STATA/SE 8.2 for Windows (Appendix B).

Although public use files provide a large amount of information on MEPS participants, it was necessary to access data for this study through the AHRQ Center for Financing, Access and Cost Trends Data Center (CFACT-DC). The CFACT-DC houses data that cannot be made publicly available due to the constraints of federal confidentiality guidelines. For this study, the four digit ICD-9-CM codes necessary to establish the conditions of LBP and NP formulated the basis for data use at the CFACT-DC. This study's methods and plan for data use and analysis were reviewed and approved by the Virginia Commonwealth University Instititutional Review Board. The researcher then submitted an application and obtained permission to use data at the CFACT-DC from AHRQ.

Research Design

This study used a retrospective nonexperimental research design to examine the social and demographic predictors of care seeking and provider selection for LBP and

NP. The study used two years of data from one panel of MEPS respondents. The data were from 2001 and 2002, thus the design was retrospective since data were collected to examine events that have already occurred. The study employed a nonexperimental design since the researcher did not randomize subjects or apply an intervention. Finally, though the MEPS panel was followed over time, the study was actually a hybrid model incorporating the two years of data, as in a panel design, but examining these data in the method of a cross- sectional design through the use of episodes of care or non-care. The final episode of care or non-care over the two year period of study for persons with LBP and NP was used as the unit for analysis.

Typical of studies of healthcare access this study employed a correlational design. In this type of study, the researcher examines the independent variables that contribute to variance in the outcome measures related to access. In the present study, the statistical analysis employed examined the independent variables or predictors in relation to the dependent variables, which were, firstly care seeking and then selection of providers from whom care was sought.

In the first analysis, that of care seeking, the dependent variable was nominal and dichotomous, assuming the values of care sought, or care not sought for an episode of LBP or NP. To determine the role of the independent variables for this analysis a logistic regression was employed. In this analysis, one regression model was developed for care seeking for LBP, while a second regression model was developed for care seeking for NP. Since the final number of cases was so small (n=40), no model was analyzed for persons with both conditions simultaneously.

In the second analysis, that of provider selection, the dependent variable was polytymous with four possible values: MD only, chiropractor only, PT and any other provider, MD and chiropractor. As each of these values represent the nominal level variable, this was analyzed by a multinomial logistic regression as the primary form of analysis to determine the probabilities of provider use associated with the independent variables. Again, in this second analysis provider selection for LBP was modeled separately from provider selection for NP.

Study Sample

Using the sample person identifier (DUPERSID) as the link, 2001 and 2002 full year consolidated data files were merged and 15,068 Panel 6 respondents aged 18 and over were identified. Panel 6 longitudinal weights, and the variables necessary for variance estimation all provided in a separate data file were merged to each person using the person identifier (DUPERSID). The longitudinal weights were used to account for unequal probabilities of responder selection and nonresponse over the course of the two-year period of data collection. The merge procedures resulted in a sample of 14,614 persons. These persons represented the base population from which individuals with the conditions of LBP and NP were identified and only included persons who participated in two full years of panel data collection.

Persons with the conditions of LBP and NP from Panel 6 were identified using the 2001 and 2002 medical conditions data files. The medical conditions files contain data on 85,692 conditions reported by persons in Panel 6. During the course of MEPS interviews, respondents were asked to report on all existing health conditions. Condition

information is solicited regardless of whether or not the condition is associated with a healthcare event via open-ended questions in which the condition information is recorded verbatim. Professional coders use this verbatim information to map the conditions to International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) diagnostic codes.

Persons with NP or LBP were identified using the 4 digit ICD-9-CM codes that represented the conditions reported by household members during any of the five panel interviews. A full listing of the four digit ICD-9-CM codes incorporated in this study is found in Appendix C. The approach used by Cherkin, Deyo, Volinn and Loeser (1992) and a screening of all relevant ICD-9-CM codes was used to identify codes representing mechanical low back problems. Cherkin et al (1992) defined mechanical low back problems as "conditions originating in the lumbar spine and sacrum that could be associated with pain, as well as conditions causing radicular pain from compression or irritation of lumbar nerve roots." The definition from Cherkin et al (1992) was adopted by the current study to classify persons as having LBP.

Codes representing mechanical neck problems were identified by screening all relevant ICD-9-CM codes. Mechanical neck problems were defined similar to back problems as conditions originating in the cervical spine that could be associated with pain, as well as conditions causing radicular pain from compression or irritation of cervical nerve roots.

Cases were also identified in which both the condition of LBP and the condition of NP were present simultaneously. The process used to identify persons with both

conditions simultaneously involved obtaining a count of each condition by person and by MEPS round. When a person was identified as having than one condition in an interview round and the two conditions identified were NP and LBP the case was marked as having both conditions simultaneously and analyzed separately from either cases with NP or LBP.

In order to link each condition of LBP and NP with all associated ambulatory healthcare events from the visits files, the condition-event link data file was merged to attach the unique event identifier (CONDIDX). Subsequently, the 2001 and 2002 office-based medical provider visit data files and outpatient visit data files were merged to the conditions files using the event identifier (CONDIDX). Only events that were identified as visits made to physicians, chiropractors or physical therapists were included in the final analysis file.

Episode Creation

In this study care seeking and provider selection were examined during episodes of care. An episode of care consists of a "series of health related events with a beginning, an end, and a course, all related to a particular health problem that exists continuously for a delimited period of time" (Hornbrook, Hurtado & Johnson, 1985, p. 164). The start point of an episode of care occurs when a person makes contact with a provider for a healthcare appointment, the end point occurs when formal care is terminated, signaled by a last contact with a healthcare provider. While conceptually simple, the start and end points can potentially be problematic as these contact points must be determined within the context of existing data. Within MEPS data, limits include the censoring of start and

end dates of episodes, and difficulty in determining if the last visit documented was actually the last of an episode. The two year period of the panel is a snapshot of information, conditions and the events associated with the conditions may precede and antecede the time of participant empanelment.

In spite of these limits, analysis at the level of an episode best describes all potential health inputs and services provided when an individual chooses to seek care or not. In addition, LPB and NP are episodic diagnostic problems with recurrence quite common (de Vet et al., 2002). De Vet et al., (2002) examined the literature that incorporated definitions of LBP and proposed standardized definitions for episodes of LBP and for episodes of LBP care. These authors defined an episode of back pain as "a period of pain in the lower back lasting for more than 24 hours, preceded and followed by a period of at least one month without low back pain." The definition for an episode of care was described as a period of care in which consultations for LBP occurred and were "preceded and followed by at least three months without consultation for low back pain."

De Vet et al. (2002) found that the clearest definition provided in the literature for conceptualizing an episode of care for LBP or NP comes from the work of Shekelle, Markovich & Louie (1995a). Shekelle et al. (1995a) used data from the RAND Health Insurance Experiment to describe the epidemiology of back pain episodes of care. Within their study, these authors defined an episode of care as incorporating only visits related to back pain that did not contain a gap of three months or greater.

In the current research project, episodes were examined over the two-year period of MEPS Panel 6. Within the MEPS database, subjects identified the condition of LBP

or NP during any one of the five interviews that occur in the two-year period of the panel. In the MEPS condition data file, CONDIDX uniquely identified each condition, while CONDRN identifies the round in which a condition is first reported. For persons who did not seek care but did identify either the condition of LBP or NP, the MEPS unique identifier CONDIDX served to identify the episode of noncare, as for these persons, this variable did not link to any care from the events files. For the analysis file, a new variable was generated, HAVEVENT that was coded "1" if the condition was associated with healthcare events and "0" if it was not associated with any events.

For persons who did seek care, ambulatory health care events were considered an episode according to the definitions provided by de Vet el al. (2002) and the rules associated with the work of Shekelle et al. (1995a). Thus, an episode included all LBP or NP related health practitioner visits that occurred sequentially without a three-month break between practitioner visits.

In the MEPS data files, visits were termed events. Only events associated with physician, chiropractic or physical therapist care were included in the analysis file. In the MEPS data file dates were identified for each event by the variables DATEDD, DATEMM and DATEYR. These dates enabled the identification of an episode of care, however, prior to episode creation, the procedures detailed below were used to manage the missing data from the date values. The procedures used to replace missing data from the date values enabled events from a single episode to remain in their episodic pattern.

First, all events with missing day, month or year data were identified. Of the 14,481 events associated with LBP and NP, four were missing year data, 97 were missing

month data and 1,874 were missing day data. One case was found that had an event missing all three values. Since there was only one condition identified by that participant, the event was assigned to the year associated with the interview round of condition identification. Month was arbitrarily assigned as June and the day was randomly assigned.

For the events missing month data, replacement of month data occurred by examining each missing value within the context of all events that occurred for each person. When the month data was missing from a person with a single CONDIDX then the months were coded to fit in with the existing episodic data. For events missing the value for the day, if there was only a single day value missing for an episode with only one event then the day was replaced by the mid-point of the month with the value 15. If there was more than one day missing or there were multiple events in a month or an episode then the day value was randomly generated to replace the missing value.

The steps involved in creating an episode of LBP or NP care were:

1. Identification of all LBP or NP related visits by identifying all events associated with the unique identifier CONDIDX. The variable CARE was generated to identify if an episode of a condition was or was not associated with events.
2. Identification of event dates and calculation of periods of time with no events. Any period of time that was three months or longer between events signaled the start of a new episode of LBP or NP care.
3. All events that were contained within a time period that did not have a gap of three months or longer were part of the same episode of LBP or NP care.

Once episodes were created for the conditions, each episode was placed in order of occurrence and a data file of first episodes and a data file of last episodes was created for analysis.

For the majority of the cases (79%), the first episode was also the last episode. For the cases with multiple episodes, demographics and condition coding (LBP, NP or both) did not change from first to last episode. An analysis of the model for care seeking developed using the first episode data was analyzed and shown, with the exception of the episode variable, to be no different from the model developed for the fina episode. Thus, for data analysis, and statistical model building, only the last episode data file was used as this file encompassed all possible care and non-care events during the two year period under study.

Analysis Approach

This study used both logistic regression and a form of logistic regression called multinomial or polytymous regression in examining the relationship between the independent variables that relate to the probability of seeking care and to provider selection. In this section, details of the study variables are provided and an explanation of the statistical analysis is discussed.

Study Variables

In the present study, the events under study were care seeking and provider selection. The variables used in this study were defined within the concepts of the theoretical framework provided by Andersen's Behavioral Model. The dependent variables are listed in Table 3. The independent variables are found in Tables 4, 5 and 6.

Table 3

Study Variables: Dependent Variables for Care Seeking and Provider Selection

Construct	Variable Name	Level of Measurement	Measurement Definition
Care seeking	HAVEVENT	Nominal	0=No care sought for this episode 1=care sought for this episode
Provider selection	WHOSAW	Nominal	1=MD only 2=Chiropractor only 3=PT only 4=MD and chiropractor 5=MD and PT 6=Chiropractor and PT 7=MD, PT and Chiropractor
Provider selection (recoded)	WHOREC	Nominal	1=MD only 2=Chiropractor only 3=PT alone and with any other provider 4=MD and Chiropractor

Table 4

Study Variables: Independent Variables – Predisposing Factors

Construct	Variable Name	Level of Measurement	Measurement Definition
Predisposing Factors	AGE01x	Interval	Age as of 12/31 of the first year of the MEPS panel
	GENDER	Dichotomous	1=Male 2=Female
	RACE	Nominal	1=White 2=Black 3=Other and Multiple Race
	HISPANX	Dichotomous	1=Hispanic 2=Not Hispanic
	MARSTAT	Nominal	Marital status as of 12/31 of the first year of the MEPS panel 1=Married 2=Previously Married 3=Never married
	EDUC	Nominal	Highest earned educational degree as of 12/31 of the first year of the MEPS panel 1= No degree 2=High school or GED 3=College or University degree 4=Other degree

Table 5

Study Variables: Independent Variables – Enabling Factors

Construct	Variable Name	Level of Measurement	Measurement Definition
Enabling Factors	MSA01	Dichotomous	0=Non-MSA
			1=MSA
	REGION01	Nominal	Census region as of 12/31 of the first year of the MEPS panel
			1=Northeast
			2=Midwest
			3=South
			4=West
	TTLP01X	Continuous	Person's total income in the first year of the MEPS panel
	INSCOV01	Nominal	Health insurance coverage indicator
			1=Any private
			2=Public only
			3=Uninsured

Table 6

Study Variables: Independent Variables – Need Factors

Construct	Variable Name	Level of Measurement	Measurement Definition
Need Factors	RTHLTH	Ordinal	Perceived health status in the round in which the condition of NP or LBP is identified 1=Very good - excellent 2=Good 3=Poor – Fair
	DISABIL	Nominal	Identifies if the condition of LBP or NP is associated with a disability day (missed work day, missed school day or bed day)
	EPISODE	Nominal	Identifies the total number of episodes of care or of pain during the 2 year period 1=1 episode 2=2 or more
	COMORBIDS	Interval	Number of comorbid conditions identified when LBP or NP is identified 0=none 1= 1 comorbid condition 2= 2 or more comorbid conditions

The variables of interest in this study are described by a series of mathematical functions that demonstrate their relationship as follows:

Care seeking = f(predisposing factors, enabling factors, need factors)

Provider selection = f(predisposing enabling and need factors of care seekers)

Dependent Variables

The dependent variables of this study each represent and define patterns of care seeking and the use of either a single or multiple providers for persons with LBP or NP. The first outcome of interest was defined by the variable HAVEVENT and was based on an analysis of whether there were provider events associated with an episode of LBP or NP. When the MEPS condition data file was merged with the MEPS event files, the variable HAVEVENT was created identifying conditions that have no events from the providers of interest associated with them.

The second outcome of interest was provider selection. The variable WHOSAW that defined provider selection was derived from data provided in the MEPS office-based and outpatient events files. For each event, the MEPS provided a variable SEEDOC that determined if an event was a physician visit. If the variable SEEDOC was coded "no" then the variable MEDPTYPE was used to determine those persons who had a chiropractic and those who had a PT visit. Chiropractors were coded "1" while PTs were coded "8" in this variable. The variables SEEDOC and MEDPTYPE were examined over episodes of care to create the variables WHOSAW for each episode under analysis. Additional variables that summed the number of visits by provider types during each episode of care were also calculated to describe healthcare consumption by

provider. Analysis of the number of visits was conducted only using descriptive statistics as it was not a component of the inferential analysis in the present study.

The variable WHOSAW was recoded into WHOREC because of the small numbers of persons in some categories of providers. In the new variable WHOREC, persons who saw a physician only, chiropractor only or a physician and chiropractor during an episode of care remained in these categories respectively. Persons who saw a physical therapist either alone or with a physician or chiropractor during an episode of care were recoded into the category PT and any other provider. Persons who saw all three providers were dropped from the provider selection analysis, resulting in ten cases dropped from the LBP care seekers and two cases dropped from the NP care seekers. Figure 4 summarizes the recoding results for care seekers with LBP and Figure 5 summarizes the recoding results for care seekers with NP.

Independent Variables

The independent variables that were used in the analyses were associated with the constructs from Andersen's model. To ascertain the impact of predisposing factors, variables that defined age, gender, race, ethnicity, marital status and level of educational attainment were used. The impact of enabling factors was examined using variables that defined geographic location, income and insurance status. Finally the need factor was analyzed by variables that defined the individual's perceived health status, disability associated with LBP or NP and variables that enumerated both recurrent episodes of care and comorbid conditions.

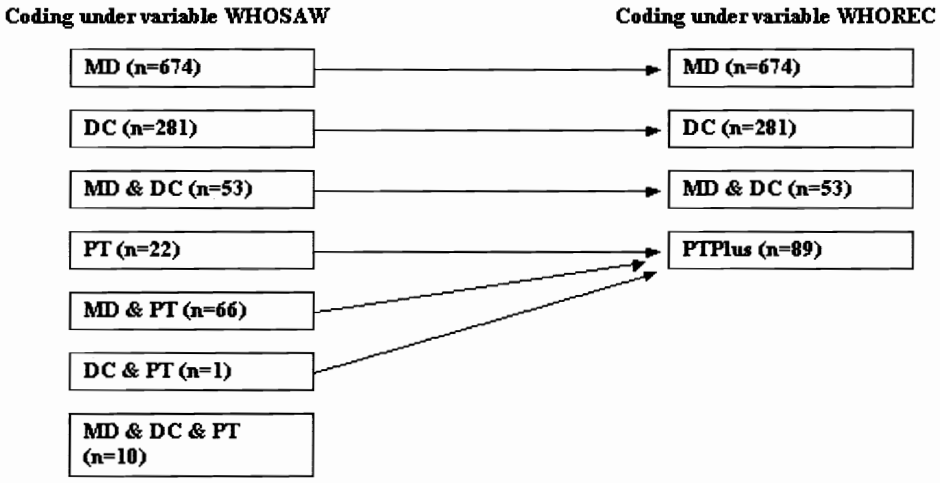

Figure 4. Recoding of WHOSAW to WHOREC for care seekers with Low Back Pain

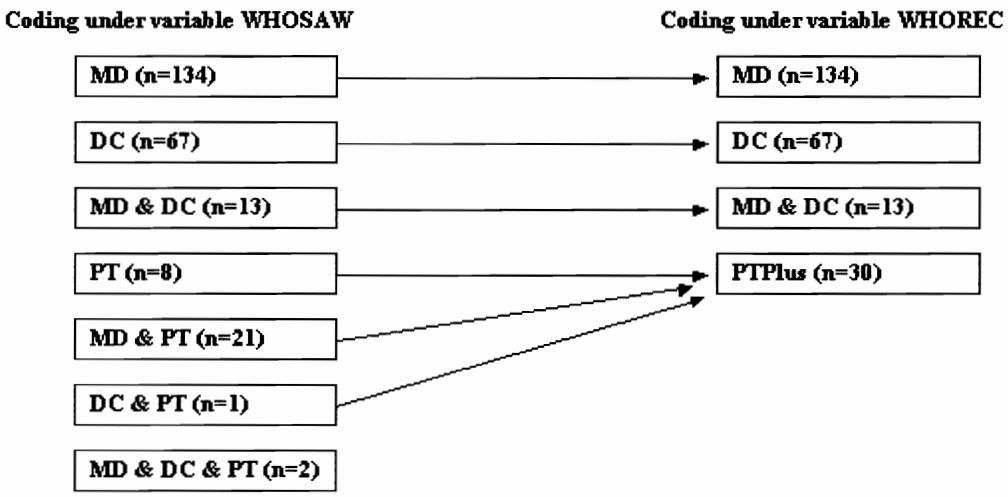

Figure 5. Recoding of WHOSAW to WHOREC for care seekers with Neck Pain

The variables AGE, GENDER, RACE, HISPAN, MARRY, HIDEG, MSA, CENSUS, TTLPX and INSCOV01 were used directly from the MEPS datasets, thus MEPS definitions for these variables all apply. Each of these variables was found in the 2001 and/or the 2002 full year consolidated data files (H60 and H70).

The variable RTHLTH was taken from the MEPS dataset and then collapsed due to small cell sizes that resulted for some analyses. The five categories of self perceived health status were collapsed into three so that persons who were in very good to excellent health were one category, persons in good health were the second category and persons in poor to fair health were the third category.

The variable DISABIL was derived from three variables on the condition file that identified if a condition was associated with a missed day of work, a missed day of school or a day in bed. DISABIL summarized these variables identifying simply if the condition of LBP or NP was associated with any type of disability day.

The variable EPISODE identified if a person had only a single episode or more than one episode of LBP or NP care or non care during the period of analysis. This variable was derived by examining the total number of episodes that occurred for each person with the condition of LBP or NP over the two year period under study.

The variable COMORBID was constructed by summing the number of comorbid conditions that were identified in rounds prior or concurrent with the round in which the condition of LBP or NP was identified. Prior and concurrent rounds were included to account for chronic conditions. In constructing this variable, conditions associated with ICD-9-CM "V" codes were eliminated as these are not specific conditions. In addition,

each case was checked for possible double coding of conditions to ensure that each condition was only identified once on the file for each case. When double coding was identified, one of the conditions was eliminated from the count of comorbid conditions.

Statistical Analysis

All data analyses were conducted using Stata/SE 8.2 for Windows.[1] In the first phase of the statistical analysis, descriptive statistics were used to examine frequency distributions of each of the study variables. Associations between variables were examined through an analysis of bivariate statistics with contingency tables constructed to clarify these relationships.

Logistic regression was used to analyze care seeking. Multinomial logistic regression was used to analyze provider selection. In both cases the analysis used the Stata survey commands employing the variables LONGWTP6 for weighting, VARSUP6 for the identification of psu and VARSTRP6 for the identification of stratum.

Logistic regression is an analysis used to examine the probabilities associated with event occurrence (Hosmer & Lemeshow, 2000). Logistic regression analyzes the relationships that exist between multiple independent variables and a categorical dependent variable. Though typically used to model relationships when the dependent variable is dichotomous, logistic regression is also employed in the case of a polytymous outcome. In this case, it is called multinomial or polytymous regression. Logistic

[1] Stata Corp, 4905 Lakeway Drive, College Station TX 77845.

regression produces the odds of the occurrence of the dependent variable or event within a specific set of circumstances as proscribed by the independent variables.

Hosmer and Lemeshow (2000) identified limitations to the analysis of data from complex surveys. The statistical software Stata, has the capability through its survey package of computing a logistic regression using the complex survey variables and weighting. However, the additional tests and diagnostics used in logistic model building are not available in the survey package. Hosmer and Lemeshow (2000) proposed that the researcher run two analyses: a "model-based" analysis and a "design-based" analysis. In the model based analysis the complex survey variables are not used, so that logistic regression diagnostic statistics are calculated to assess the model fit. Changes incorporated to the regression from the model-based analysis are then carried into the design-based analysis to produce the actual estimates that are used in the presentation of final regression results and tables. A model-based analysis followed by a design-based approach was employed in the regression model building analyses for both the care seeking provider selection regressions conducted for the current study.

The model building strategy and model-based analysis used for the study of care seeking followed the approach proposed by Hosmer and Lemeshow (2000). A univariate analysis of each variable in the model was undertaken using a contingency table and the likelihood ratio chi-square test statistic for nominal variables, and a univariate logistic regression for continuous variables. Odds ratios were also calculated for all variables in the univariate analysis.

The first multivariate model analyzed was the full model with all study variables included. Based on recommendations from Hosmer and Lemeshow (2000), any variable whose univariate test had a p-value <.25 was included in the subsequent multivariate model. Other variables were also included based on the results of previous studies of care seeking or clinical relevance. For example, the variable age was used in the multivariate modeling in spite of the fact that it did not reach the significance criteria to enter the multivariate model for care seeking among persons with NP. The decision of the relevance of the variable age was based on the fact that age has been shown to be a predictor of care seeking in LBP (Szpalski et al., 1995; Wright et al., 1995) and that the variable age did enter the multivariate model for LBP in the current study.

The relative importance of variables in the multivariable model was confirmed by examination of the Wald statistic. Subsequent models with and without each variable were compared to the first, full multivariate model using the likelihood ratio test. To determine if continuous covariates were linear in the logit the Stata fractional polynomial regression package was used. To examine for multicollinearity, the "collin" package developed by Philip B. Ender and available through the Stata findit command was used. Model assessment included an examination of case-wise diagnostics to identify poorly fit variables or covariate patterns and determination of significant interactions among the independent variables in the model. Results of the model-based analysis were implemented into the final design-based analysis.

The multinomial regression for the provider selection analysis used the independent variables from the final design-based model developed in the care seeking

analysis. This approach was consistent with the theoretical model proposed in Chapter 2. As with the care seeking analysis both a model-based analysis and a design-based analysis were carried out. Assessment of goodness of fit and diagnostics for the multinomial model were carried out by examining each of the outcome possibilities as individual logistic regressions in the manner recommended by Hosmer and Lemeshow (2000).

Summary of Methods

Within this methods section the MEPS data source was described and a rationale was presented that defends this data source as a viable approach to obtaining a national level sample to analyze care seeking for back and neck pain. The dependent and independent variables selected from the data source were operationalized and used to define the constructs of the research model. The approach to analysis was presented. This approach was used in order to clarify the phenomenon of care seeking for back and neck pain in the U.S.

CHAPTER 4: RESULTS

This chapter describes the final sample that was used in this study and presents the results of the data analysis. First the univariate analysis is examined, and then the multivariate analysis of care seeking is presented. Following the analysis of care seeking, the multinomial analysis of provider selection is presented. Statistical results are organized in tables with prominent and relevant points described within the text. The chapter concludes with an overview of the study hypotheses indicating whether the results offer support of these hypotheses.

Sample Characteristics

There were a total of 20,578 subjects in Panel 6 who participated in the full two years of data collection. With weights applied this number equates to an estimate of the U.S. population of 284 million persons. This estimate is equal to the United States Census Bureau population estimate of July, 2001 (U.S. Census Bureau, 2001). Subjects in Panel 6, who met the inclusion criteria of being aged 18 or over, totaled 15,160. Among adults 18 or over who had two full years of data and positive sample weights, the condition of low back pain (LBP) was identified in 2,201 subjects, the condition of neck pain (NP) was identified in 407 subjects and both conditions occurred simultaneously in 70 subjects. The numbers reported for conditions include duplicate observations for

some subjects during the two year period under study. In the statistical analysis, only the last episode of a condition was used eliminating the duplicate observations.

There were 1,713 unique last episodes of LBP and therefore unique person observations of LBP, 330 unique last episodes of neck pain and 40 unique episodes in which both conditions were simultaneously identified. Prevalence rates were calculated in order to compare the sample's rates to those presented in the literature. The highest prevalence rate estimate was for persons with LBP with an estimate of this condition occurring in 9% of the population. Prevalence estimates and weighted population sizes for persons with each condition are presented in Table 7.

Table 7

Population Estimates for Low Back Pain, Neck pain and Both Conditions Simultaneously

	Weighted Population Estimate (S.E.)	Weighted Prevalence Estimate
Low Back Pain	26,053,956 (1,043,788)	8.9%
Neck Pain	5,072,470 (372,066)	1.7%
Both Conditions	632,116 (112,717)	0.2%

Among persons with LBP, the most common diagnostic category was ICD-9-CM code 722, "other and unspecified disorders of back" while for persons with NP the most common category was 723, "other disorders of the cervical region." The determination of condition for each observation was made using four digit ICD-9-CM codes. However,

the CFACT data center agreement precluded obtaining any output from the analyses containing frequency data using the four digit codes. Accordingly, presentation of condition information is limited to the 3 digit codes. Table 8 provides details of the three digit ICD-9-CM codes associated with the sample for the conditions of LBP and NP.

Table 8

ICD-9-CM Codes Associated with Persons with Low Back Pain and Neck Pain at the Last Episode

Code	Low Back Pain	Neck Pain
353: Nerve root and plexus disorders	--	3
720: Ankylosing spondylitis and other inflammatory spondylopathies	2	--
721: Spondylosis and allied disorders	6	9
722: Intervertebral disc disorders	161	26
723: Other disorders of the cervical region	--	204
724: Other and unspecified disorders of the back	1,294	--
846: Sprains and strains of the sacroiliac region	42	--
847: Sprains and strains of other and unspecified parts of the back	208	88
Total	1,713	330

Proxy responses were identified by the PROXY01 variable from the MEPS survey. The MEPS survey defines a proxy respondent as a person who was not a part of the reporting unit (household) at the time of the survey. There were in total nine proxy respondents from the 2,201 cases. Proxy respondents provided information for seven cases with LBP, one case with NP and one case with both conditions simultaneously.

Descriptive statistics for each of the three condition groups were generated using the independent variables for the care seeking analysis, and are presented in Table 9. Values in Table 9 reflect population estimates and are weighted accordingly. From this table, it is evident that the three groups share many similarities in terms of their demographic characteristics. For each group, average age was in the 40's though there is a range of age from 42 to 47 with the oldest group being those with LBP. Most participants were white, female, not Hispanic and married with an education level of a high school degree. In terms of enabling and need factors, again the three groups appear comparable. The majority of the participants had health insurance with private insurance being most common. Most participants rated their health status as good or better. For persons with LBP or NP the condition typically did not produce a disability day; this was not true for persons with both conditions simultaneously. Similarly, persons with LBP or NP typically had only one episode of care or pain while persons with both conditions simultaneously more often experienced two or more episodes.

Healthcare Consumption Estimates

Care seeking occurred in 1,107 (64.9%) observations among persons with LBP, 246 (75.0%) observations among persons with NP and 30 (68.3%) observations among

Table 9

Descriptive Statistics for the Independent Variables by Condition (n=2,201)

	Persons with low back pain n=1,713 n (weighted %) or $\bar{X}$ (S.E.)	Persons with neck pain n=330 n (weighted %) or $\bar{X}$ (S.E.)	Persons with both conditions simultaneously n=40 n (weighted %) or $\bar{X}$ (S.E.)
Age (years)	47.6 (.47)	45.11 (.92)	41.99 (2.86)
Gender			
Male	777 (46.4)	129 (41.0)	13 (31.4)
Female	936 (53.6)	201 (59.0)	27 (68.6)
Race			
White	1,457 (86.5)	274 (85.4)	26 (65.6)
Black	177 (8.7)	38 (9.3)	3 (5.6)
Other and multiple races	79 (4.7)	18 (5.2)	11 (28.8)
Ethnicity			
Hispanic	256 (9.0)	47 (8.9)	4 (5.8)
Not Hispanic	1,457 (91.0)	283 (91.1)	36 (94.2)
Marital Status			
Married	1,016 (57.9)	193 (56.0)	22 (52.0)
Previously married	409 (24.1)	84 (24.0)	10 (21.5)
Never married	288 (18.0)	53 (20.0)	8 (26.5)
Education			
No degree	350 (16.6)	61 (16.3)	8 (17.5)
HS or GED	882 (52.0)	167 (50.9)	21 (45.5)
College or University	339 (22.7)	64 (20.7)	9 (32.9)
Other degree	142 (8.7)	38 (12.1)	2 (4.1)
MSA			
Non-MSA	417 (20.9)	67 (16.9)	6 (10.2)
MSA	1,296 (79.1)	263 (83.1)	34 (89.8)
Census Region			
Northeast	311 (21.1)	48 (16.4)	7 (19.9)
Midwest	429 (26.5)	81 (27.8)	12 (26.9)
South	587 (31.9)	118 (33.6)	9 (24.2)
West	386 (20.5)	83 (22.2)	12 (29.0)
Total Income (dollars)	30,086.82 (857.11)	33,386.41 (2,253.34)	29,616.70 (5,996.41)

Table 9 (cont.)

Descriptive Statistics for the Independent Variables by Condition (n=2,201)

	Persons with low back pain n=1,713 n (weighted %) or $\bar{X}$ (S.E.)	Persons with neck pain n=330 n (weighted %) or $\bar{X}$ (S.E.)	Persons with both conditions simultaneously n=40 n (weighted %) or $\bar{X}$ (S.E.)
Insurance Coverage			
Any private	1,224 (74.6)	247 (76.9)	26 (71.9)
Public only	302 (15.5)	45 (12.1)	6 (11.2)
Uninsured	187 (9.9)	38 (11.0)	8 (16.9)
Perceived Health Status			
Very good -Excellent	729 (45.6)	155 (49.3)	11 (33.4)
Good	539 (31.8)	108 (32.7)	18 (44.1)
Poor - Fair	445 (22.6)	67 (18.0)	11 (22.6)
Disabling Condition			
No	1,091 (64.4)	235 (71.0)	21 (48.8)
Yes	622 (35.6)	95 (29.0)	19 (51.2)
Comorbidities			
0	396 (23.1)	52 (16.2)	14 (31.3)
1	372 (22.0)	69 (20.3)	8 (17.2)
2+	945 (54.9)	209 (63.5)	18 (51.5)
Number episodes			
1	1,337 (78.6)	271 (81.2)	18 (41.0)
2+	376 (21.4)	59 (18.8)	22 (59.0)

persons with both conditions simultaneously. Care seeking rates by provider type and condition are found in Table 10.

When all episodes were considered, on average, persons with LBP had 6.26 +/- .431 visits to any healthcare provider; persons with NP had 7.58 +/- .886 visits to any healthcare provider; while persons with both conditions simultaneously had 24.42 +/-8.73 visits to any healthcare provider. No further consumption estimates were calculated for

Table 10

Care Seeking Rates by Provider Type and Condition

	Low Back Pain (n=1,713) Estimated proportion (S.E.)	Neck Pain (n=330) Estimated proportion (S.E.)	Both Conditions (n=40) Estimated proportion (S.E.)
MD Only	39.24 (.015)	39.16 (.028)	17.35 (.059)
DC Only	16.82 (.011)	20.61 (.025)	25.70 (.095)
PT Plus	5.27 (.006)	10.06 (.019)	7.02 (.036)
MD & DC	3.55 (.006)	5.16 (.015)	18.22 (.069)
No care sought	35.12 (.014)	25.01 (.028)	31.71 (.100)

care seekers with both conditions simultaneously due to the small sample size (n=40) and the resultant instability of the variance estimates when consumption was considered by provider type.

The average number of visits by provider type for care seekers with LPB and NP were calculated as one analysis of consumption and use. These averages represent visits that occurred over all episodes of care. The average number of visits to a physician per episode was 2.52 +/- .179 for LBP and 3.34 +/- .684 for NP. The average number of visits to a chiropractor was 2.86 +/-.312 for LBP and 3.17 +/-.645 for NP. The average number of visits to a physical therapist was .876 +/-.213 for LBP and 1.07 +/-.219 for NP.

The consumption estimates in Table 11 show calculations of visits for only those persons who used a given provider or array of providers during an episode of care seeking. Thus, if a person's care for the condition of LBP was provided by a PT and any other provider the average number of visits per episode was 11, whereas when all persons

Table 11

Average Number of Visits Per Episode by Provider Type From Whom Care Was Sought

	Persons with LBP Number of visits (S.E.)	Persons with NP Number of visits (S.E.)
MD Only	3.13 (.208)	5.67 (1.25)
DC Only	8.07 (.962)	7.69 (1.68)
PT Plus	10.94 (2.06)	8.72 (.970)
MD & DC	16.73 (2.45)	19.41 (5.68)

with LBP are considered the average number of visits per episode to a PT was less than one. These two estimates demonstrate the difference in examining the impact of consumption to the total sample, in which PT had a small impact versus those whose care was provided by PT where consumption estimates are much higher.

Univariate Analyses of Care Seeking

Among persons with LBP, 1,107 (64.9%) observations were associated with care seeking at the last episode. Table 12 contains the results of the univariate analysis comparing care seekers to non-care seekers for the last episode of LBP. Among predisposing factors, differences were found among the variables age, ethnicity and

Table 12

Care Seeking in the Last Episode for Persons with Low Back Pain

	Care Seekers n=1,107 n (weighted %) or $\bar{X}$ (S.E.)	Non-Care Seekers n=606 n (weighted %) or $\bar{X}$ (S.E.)	t or χ^2	P
Predisposing Factors				
Age (years)	48.8 (.62)	45.5 (.70)	3.41	.001
Gender				
Male	494 (48.8)	283 (45.1)		
Female	613 (51.2)	323 (54.9)	27.14	.149
Race				
White	950 (87.1)	507 (85.5)		
Black	103 (8.1)	74 (9.9)		
Other and multiple races	54 (4.8)	25 (4.6)	20.68	.581
Ethnicity				
Hispanic	145 (7.9)	111 (11.0)		
Not Hispanic	962 (92.1)	495 (89.0)	56.21	.020
Marital Status				
Married	667 (59.0)	349 (55.8)		
Previously married	275 (25.2)	134 (22.0)		
Never married	165 (15.8)	123 (22.2)	137.02	.014
Education				
No degree	218 (17.0)	132 (15.8)		
HS or GED	584 (53.0)	298 (50.3)		
College or University	219 (22.1)	120 (23.7)		
Other degree	86 (7.8)	56 (10.2)	47.33	.355
Enabling Factors				
MSA				
MSA	809 (76.7)	487 (83.5)		
Non-MSA	298 (23.3)	119 (16.5)	131.34	.003
Census Region				
Northeast	208 (21.5)	103 (20.3)		
Midwest	294 (28.1)	135 (23.7)		
South	369 (30.9)	218 (33.8)		
West	236 (19.5)	150 (22.2)	67.45	.270
Total Income (dollars)	29,691.43 (1,180.08)	30,817.05 (1,115.15)	-.69	.491

Table 12 (cont.)

Care Seeking in the Last Episode for Persons with Low Back Pain

	Care Seekers n=1,107 n (weighted %) or $\bar{X}$ (S.E.)	Non-Care Seekers n=606 n (weighted %) or $\bar{X}$ (S.E.)	t or χ^2	P
Insurance Coverage				
Any private	797 (74.7)	427 (74.3)		
Public only	220 (17.3)	82 (12.2)		
Uninsured	90 (7.9)	97 (13.5)	229.19	.000
Need Factors				
Perceived Health Status				
Very good - Excellent	439 (42.0)	290 (52.2)		
Good	363 (33.8)	176 (28.1)		
Poor - Fair	305 (24.2)	140 (19.7)	202.48	.001
Disabling Condition				
Yes	412 (36.6)	210 (33.9)		
No	695 (63.4)	396 (66.1)	14.55	.397
Comorbidities				
0	223 (19.9)	173 (29.0)		
1	236 (22.1)	136 (21.9)		
2+	648 (58.0)	297 (49.1)	241.58	.000
Episodes				
1	789 (72.3)	548 (90.4)		
2+	318 (27.7)	58 (9.6)	941.86	.000

marital status. A higher proportion of care seekers were persons who identified as not Hispanic, and a higher proportion of care seekers were persons who were married or previously married. Among enabling factors, differences in proportions were found among the variables MSA status and insurance coverage. In the analysis of MSA status, a higher proportion of care seekers did not reside in an MSA. The analysis of insurance coverage revealed that there was a higher proportion of persons with public insurance

among care seekers, and a lower proportion of persons who were uninsured. Among need factors, differences in proportions were found in perceived health status, number of comorbid conditions and whether a person had more than one episode. For perceived health status a higher proportion of care seekers had identified health status as good or poor to fair. In the analysis of comorbid conditions, a higher proportion of care seekers had one or more comorbid conditions. Finally, when episodes were analyzed, a higher proportion of those with two or more episodes of LBP or LBP care were care seekers.

Among persons with NP, 246 (75.0%) observations were associated with care seeking. Table 13 compares care seekers to non-care seekers for the last episode of neck pain on the independent variables of the analysis. Among predisposing factors,

Table 13

Care Seeking in the Last Episode for Persons with Neck Pain

	Care Seekers n=246 n (weighted %) or $\bar{X}$ (S.E.)	Non-Care Seekers n=84 n (weighted %) or $\bar{X}$ (S.E.)	t or χ^2	P
Predisposing Factors				
Age (years)	45.4 (1.22)	44.2 (1.70)	.50	.619
Gender				
Male	88 (37.4)	41 (51.6)		
Female	158 (62.6)	43 (48.4)	293.26	.066
Race				
White	207 (85.8)	67 (84.5)		
Black	26 (8.9)	12 (10.6)		
Other and multiple races	13 (5.3)	5 (4.9)	12.92	.884
Ethnicity				
Hispanic	33 (8.7)	14 (9.6)		
Not Hispanic	213 (91.3)	70 (90.4)	3.33	.772

Table 13 (cont.)

Care Seeking in the Last Episode for Persons with Neck Pain

	Care Seekers n=246 n (weighted %) or $\bar{X}$ (S.E.)	Non-Care Seekers n=84 n (weighted %) or $\bar{X}$ (S.E.)	t or χ^2	P
Marital Status				
Married	144 (55.1)	49 (58.5)		
Previously married	63 (23.7)	21 (25.0)		
Never married	39 (21.1)	14 (16.5)	47.40	.671
Education				
No degree	42 (82.0)	19 (16.3)		
HS or GED	122 (71.9)	45 (55.8)		
College or University	51 (52.1)	13 (18.7)		
Other degree	31 (100.0)	7 (9.2)	86.92	.715
Enabling Factors				
MSA				
MSA	194 (82.3)	69 (85.6)		
Non-MSA	52 (17.7)	15 (14.4)	25.71	.479
Census Region				
Northeast	38 (17.4)	10 (13.3)		
Midwest	57 (25.3)	24 (35.2)		
South	82 (33.3)	36 (34.5)		
West	69 (24.0)	14 (17.0)	234.22	.468
Total Income (dollars)	31,747.10 (1,986.39)	38,302.17 (6,416.96)	-.99	.325
Insurance Coverage				
Any private	190 (77.9)	57 (74.0)		
Public only	35 (13.4)	10 (8.2)		
Uninsured	21 (8.7)	17 (17.8)	347.21	.034
Need Factors				
Perceived Health Status				
Very good - Excellent	116 (49.7)	39 (48.1)		
Good	73 (30.8)	35 (38.1)		
Poor - Fair	57 (19.5)	10 (13.8)	121.13	.426
Disabling Condition				
Yes	72 (29.4)	23 (27.6)		

Table 13 (cont.)

Care Seeking in the Last Episode for Persons with Neck Pain

	Care Seekers n=246 n (weighted %) or $\bar{X}$ (S.E.)	Non-Care Seekers n=84 n (weighted %) or $\bar{X}$ (S.E.)	t or χ^2	P
No Comorbidities	174 (70.6)	61 (72.4)	5.89	.779
0	40 (17.2)	12 (13.3)		
1	52 (21.1)	17 (17.7)		
2+	154 (61.7)	55 (69.0)	82.96	.519
Episodes				
1	206 (84.2)	65 (72.2)		
2+	40 (15.8)	19 (27.8)	333.18	.028

differences in were not found among any of the variables in the analysis. Among enabling factors, a difference in the proportions for the variable insurance coverage was found. Similar to the LBP analysis, among care seekers there was a higher proportion of persons with public insurance and among non-care seekers there was a higher proportion of persons who were uninsured. Finally, among the need factors, differences in proportions were only found for the variable episodes. A higher proportion of care seekers had only one episode.

Among persons with both conditions simultaneously, 30 (68.3%) observations were associated with care seeking. Table 14 describes persons with both conditions comparing care seekers to non-care seekers for the last episode. Univariate statistics were not analyzed and no further analysis of this subgroup was completed due to the small size of the sample, small cell numbers and instability in the variance estimates.

Table 14

Care Seeking in the Last Episode for Persons with Both Conditions

	Care Seekers n=30 n (weighted %) or $\bar{X}$ (S.E.)	Non-Care Seekers n=10 n (weighted %) or $\bar{X}$ (S.E.)
Predisposing Factors		
Age (years)	44.9 (3.48)	35.5 (3.33)
Gender		
Male	11 (36.7)	2 (20.0)
Female	19 (63.3)	8 (80.0)
Race		
White	20 (62.5)	6 (72.2)
Black	1 (2.1)	2 (13.0)
Other and multiple races	9 (35.4)	2 (14.8)
Ethnicity		
Hispanic	4 (8.4)	0 (0.0)
Not Hispanic	26 (91.6)	10 (100.0)
Marital Status		
Married	19 (64.7)	3(24.4)
Previously married	7 (20.5)	3(23.8)
Never married	4 (14.7)	4 (51.7)
Enabling Factors		
Education		
No degree	7 (21.0)	1 (9.7)
HS or GED	15 (47.9)	6 (17.8)
College or University	6 (25.1)	3 (20.1)
Other degree	2 (6.0)	0 (0.0)
MSA		
MSA	25 (87.7)	9 (94.4)
Non-MSA	5 (12.3)	1 (5.6)
Census Region		
Northeast	6 (26.0)	1 (6.7)
Midwest	8 (23.7)	4 (33.9)
South	7 (18.3)	2 (36.9)
West	9 (32.0)	3 (22.5)
Total Income (dollars)	23,260.10 (3,760.28)	43,306.11 (13,227.94)

Table 14 (cont.)

Care Seeking in the Last Episode for Persons with Both Conditions

	Care Seekers n=30 n (weighted %) or $\bar{X}$ (S.E.)	Non-Care Seekers n=10 n (weighted %) or $\bar{X}$ (S.E.)
Insurance Coverage		
Any private	19 (68.2)	7 (79.7)
Public only	5 (13.9)	1 (5.6)
Uninsured	6 (17.9)	2 (14.7)
Need Factors		
Perceived Health Status		
Very good - Excellent	7 (24.7)	4 (52.1)
Good	13 (47.0)	5 (37.9)
Poor - Fair	10 (28.3)	1 (10.0)
Disabling Condition		
Yes	14 (45.6)	5 (36.6)
No	16 (54.4)	5 (63.4)
Comorbidities		
0	10 (33.4)	4 (26.8)
1	6 (18.2)	2 (14.9)
2+	14 (48.4)	4 (58.3)
Episodes		
1	18 (60.0)	0 (0.0)
2+	12 (40.0)	10 (100.0)

Multivariate Modeling of Care Seeking for LBP

Logistic regression was used to build a model that represents the variables that determine care seeking for LBP. Independent variables were examined for problems of collinearity using the Stata collin module and by an examination of the standard errors and coefficient estimates. Coefficient analysis was accomplished by adding in each variable to the model one at a time to investigate if the addition of a variable caused a

substantial change to a coefficient. Through this analysis, no problems were identified with collinearity; therefore all variables were included in the model.

The first analysis in the multivariate logistic regression for care seeking for LBP was model-based and incorporated all 14 variables of the study. This analysis is represented by the equation:

$$\textit{Care Seeking for LBP} = f(\beta 0 + \beta 1 \textit{Age} + \beta 2 \textit{Gender} + \beta 3 \textit{Race} + \beta 4 \textit{Ethnicity} + \beta 5 \textit{MaritalStatus} + \beta 6 \textit{Education} + \beta 7 \textit{MSA} + \beta 8 \textit{CensusRegion} + \beta 9 \textit{Income} + \beta 10 \textit{Insurance} + \beta 11 \textit{HealthStatus} + \beta 12 \textit{DisablingCondition} + \beta 13 \textit{Comorbidities} + \beta 14 \textit{Episodes}).$$

The model-based regression does not account for weighting, PSU or strata, but is used for regression diagnostics and testing. Diagnostic statistics examined included standardized residuals and leverage statistics to examine for influential observations, and the DBeta statistic to examine for covariate patterns (Hosmer and Lemeshow, 2000). Based on the diagnostics analysis, five cases were removed from the analysis. The fourteen variable model that was fitted produced a likelihood ratio of 157.17 (df=23, p=0.00) indicating that the model did fit the data. The McFadden's R^2 measure calculated for this analysis was 0.07. The model was able to correctly classify cases 66.2% of the time with a sensitivity of 90.24% and a specificity of 22.28%.

Results of the model with all 14 variables are seen in Table 15. These results reflect a design-based analysis with survey weights, PSU and strata applied. This design-based or survey logistic regression produced an F(23, 210) of 5.45 (p=0.00). Variables with significant coefficients in this model included MSA, perceived health status, number

Table 15

Summary of Logistic Regression Results for Care seeking for Low Back Pain

	β	SE	*P*	OR (95% CI)
Predisposing Factors				
Age (years)	.001	.005	.844	1.00 (.991, 1.01)
Gender				
Male[a]				
Female	.070	.118	.555	1.07 (.849, 1.35)
Race				
White[a]				
Black	-.134	.215	.534	.875 (.572, 1.34)
Other and multiple races	.026	.352	.940	1.03 (.514, 2.05)
Ethnicity				
Hispanic[a]				
Not Hispanic	.200	.185	.280	1.22 (.849, 1.76)
Marital Status				
Married[a]				
Previously married	-.084	.150	.578	.920 (.684, 1.24)
Never married	-.270	.180	.137	.764 (.535, 1.09)
Education				
No Degree[a]				
HS or GED	.011	.175	.949	1.01 (.717, 1.43)
College or University	-.054	.231	.816	.947 (.601, 1.49)
Other degree	-.222	.242	.360	.801 (.497, 1.29)
Enabling Factors				
MSA				
Non-MSA[a]				
MSA	-.356	.154	.022	.700 (.505, .914)
Census Region				
Northeast[a]				
Midwest	.043	.188	.818	1.04 (.723, 1.53)
South	-.171	.186	.360	.843 (.596, 1.25)
West	-.123	.200	.539	.884 (.619, 1.36)
Total Income (dollars)	.000	.000	.601	1.00 (.999, 1.00)
Insurance Coverage				
Any private[a]				
Public only	.144	.181	.428	1.15 (.808, 1.65)
Uninsured	-.372	.197	.060	.689 (.468, 1.01)

Table 15 (cont.)

Summary of Logistic Regression Results for Care Seeking for Low Back Pain

	β	SE	P	OR (95% CI)
Need Factors				
Perceived Health Status				
Very good - Excellent[a]				
Good	.299	.148	.044	1.34 (1.01, 1.81)
Poor – Fair	.254	.177	.153	1.29 (.910, 1.83)
Disabling Condition				
No[a]				
Yes	.102	.146	.484	1.11 (.831, 1.48)
Comorbidities				
0[a]				
1	.405	.187	.032	1.50 (1.04, 2.17)
2+	.419	.177	.019	1.52 (1.07, 2.16)
Episodes				
1[a]				
2+	1.25	.187	0.00	3.48 (2.41, 5.02)

[a]Reference category.

of comorbid conditions and number of episodes. Persons in an MSA were 30% less likely to seek care than those not in an MSA. Persons who rated their perceived health status as good, who had more comorbid conditions and who had more than one episode of LBP were more likely to be care seekers. The odds of care seeking for those who rated their health as good were 34% greater than for those who rated it very good to excellent. The odds of care seeking for persons with comorbid conditions were 50% greater than for those who had no comorbid conditions. The odds of care seeking increased 3.5 times for those who had more than one episode.

The second regression analysis for care seeking for LBP included all variables significant in the univariate analysis and those variables that had a univariate test outcome with a p-value <.25. This model was represented by the equation:

$$Care\ Seeking\ for\ LBP = f(\beta 0 + \beta 1 Age + \beta 2 Gender + \beta 3 Ethnicity + \beta 4 MaritalStatus + \beta 5 MSA + \beta 6 Insurance + \beta 7 HealthStatus + \beta 8 Comorbidities + \beta 9 Episodes).$$

The statistical analysis of this second model produced a likelihood ratio of 149.10 (df=13, p=0.00) indicating that the model did fit the data. The McFadden's R^2 measure calculated for this analysis was 0.07. The model was able to correctly classify cases 66.8% of the time with a sensitivity of 91.60% and a specificity of 21.45%. To determine if the second model was a better fit the Hosmer-Lemeshow goodness of fit test was used which produced a χ^2 of 4.19 (p=.839) indicating the second model is well supported and not reliably different from the first model. The difference in the Bayesian Information Criteria (BIC') statistic from the first to the second model was calculated to be 66.39 also indicating that the second model was a good fit, and as a smaller model, provided a more parsimonious fit. Results of this second fitted model with the design-based analysis are seen in Table 16. The design-based analysis produced an F(13, 220) of 9.52 (p=0.00).

Tests for two way interactions between age and gender and each of the other IV's in the analysis were run. None of the tested interactions were significant. Variables with significant coefficients in the reduced model included MSA, insurance coverage, perceived health status, number of comorbid conditions and number of episodes. Persons in an MSA were 32% less likely to seek care than those not in an MSA. Uninsured

Table 16

Logistic Regression Results for Care Seeking for Low Back Pain Reduced Model

	β	SE	*P*	OR (95% CI)
Predisposing Factors				
Age (years)	.001	.005	.870	1.00 (.991, 1.01)
Gender				
Male[a]				
Female	.077	.116	.510	1.08 (.858, 1.36)
Ethnicity				
Hispanic[a]				
Not Hispanic	.184	.178	.304	1.20 (.846, 1.70)
Marital Status				
Married[a]				
Previously married	-.065	.149	.662	.937 (.699, 1.26)
Never married	-.239	.176	.175	.787 (.556, 1.11)
Enabling Factors				
MSA				
Non-MSA[a]				
MSA	-.384	.146	.009	.681 (.510, .908)
Insurance Coverage				
Any private[a]				
Public only	.162	.175	.353	1.18 (.834, 1.66)
Uninsured	-.374	.186	.045	.688 (.477, .992)
Need Factors				
Perceived Health Status				
Very good - Excellent[a]				
Good	.330	.143	.022	1.39 (1.05, 1.84)
Poor - Fair	.285	.171	.098	1.33 (.948, 1.86)
Comorbidities				
0[a]				
1	.412	.187	.028	1.51 (1.05, 2.18)
2+	.422	.175	.016	1.53 (1.08, 2.15)
Episodes				
1[a]				
2+	1.26	.182	.000	3.52 (2.46, 5.04)

[a]Reference category

persons were 31% less likely to seek care than those with private insurance. The odds of care seeking for those who rated their health as good were 39% greater than for those who rated it very good to excellent. The odds of care seeking for persons with comorbid conditions were 51-53% greater than for those who had no comorbid conditions. The odds of care seeking increased 3.5 times for those who had more than one episode of LBP. These results, reflecting a more parsimonious model are similar to those of the analysis incorporating all the 14 variables from the theoretical model.

Multivariate Modeling of Care Seeking for NP

The first analysis in the multivariate modeling for care seeking for NP was the full theoretical model with all the 14 variables of the study. This model is represented by the equation:

$$\textit{Care Seeking for NP} = f(\beta 0 + \beta 1 \textit{Age} + \beta 2 \textit{Gender} + \beta 3 \textit{Race} + \beta 4 \textit{Ethnicity} + \beta 5 \textit{MaritalStatus} + \beta 6 \textit{Education} + \beta 7 \textit{MSA} + \beta 8 \textit{CensusRegion} + \beta 9 \textit{Income} + \beta 10 \textit{Insurance} + \beta 11 \textit{HealthStatus} + \beta 12 \textit{DisablingCondition} + \beta 13 \textit{Comorbidities} + \beta 14 \textit{Episodes}).$$

A model-based regression, not accounting for weighting, PSU or strata was analyzed for the 14 variable model. Again as with the LBP model, diagnostic statistics examined included standardized residuals, leverage statistics, and the DBeta statistic. Based on the diagnostics analysis, it was not necessary to remove any cases from the analysis. This model produced a likelihood ratio of 41.15 (df=23, p=0.011) indicating that the model does fit the data. The McFadden's R^2 measure calculated for this analysis

was 0.11. The model was able to correctly classify cases 77.58% of the time with a sensitivity of 96.34% and a specificity of 22.62%.

Results of the model with all 14 variables are seen in Table 17. These results reflect a design-based analysis with survey weights, PSU and strata applied. This design-based or survey logistic regression produced an F(23, 177) of 2.02 (p=0.006). Variables with significant coefficients in this analysis included insurance coverage, and number of episodes of neck pain or neck pain care. The odds that uninsured persons were care seekers were 58% less than those of persons with private insurance. The odds that persons with two or more episodes were care seekers were 60% less than those of persons with only one episode.

Table 17

Summary of Logistic Regression Results for Care Seeking for Neck Pain

	β	SE	*P*	OR (95% CI)
Predisposing Factors				
Age (years)	.019	.013	.124	1.02 (.995, 1.05)
Gender				
Male[a]				
Female	.647	.336	.055	1.91 (.985, 3.71)
Race				
White[a]				
Black	-.487	.483	.315	.614 (.237, 1.59)
Other and multiple races	.076	.682	.912	1.08 (.281, 4.14)
Ethnicity				
Hispanic[a]				
Not Hispanic	.402	.500	.423	1.50 (.557, 4.01)
Marital Status				
Married[a]				
Previously married	-.080	.363	.825	.923 (.452, 1.89)
Never married	.614	.484	.206	1.85 (.712, 4.80)

Table 17 (cont.)

Summary of Logistic Regression Results for Care Seeking for Neck Pain

	β	SE	P	OR (95% CI)
Education				
No Degree[a]				
HS or GED	.075	.533	.888	1.08 (.377, 3.09)
College or University	.566	.526	.283	1.76 (.624, 4.97)
Other degree	.762	.520	.145	2.14 (.768, 5.98)
Enabling Factors				
MSA				
Non-MSA[a]				
MSA	-.256	.394	.517	.774 (.356, 1.68)
Census Region				
Northeast[a]				
Midwest	-.935	.539	.085	.393 (.136, 1.14)
South	-.389	.538	.470	.678 (.235, 1.96)
West	.028	.627	.965	1.03 (.299, 3.54)
Total Income (dollars)	.000	.000	.156	1.00 (.999, 1.00)
Insurance Coverage				
Any private[a]				
Public only	.032	.603	.958	1.03 (.314, 3.91)
Uninsured	-.868	.391	.028	.420 (.194, .907)
Need Factors				
Perceived Health Status				
Very good - Excellent[a]				
Good	-.148	.309	.633	.863 (.469, 1.59)
Poor – Fair	.492	.481	.308	1.64 (.633, 4.23)
Disabling Condition				
No[a]				
Yes	.178	.362	.624	1.20 (.585, 2.44)
Comorbidities				
0[a]				
1	-.205	.501	.683	.815 (.304, 2.19)
2+	-.809	.461	.081	.445 (.179, 1.11)
Episodes				
1[a]				
2+	-.878	.324	.007	.415 (.219, .787)

[a]Reference category.

The second regression analysis for care seeking for NP included all variables significant in the univariate analysis and those variables that had a univariate test outcome with a p-value <.25. Although the variables age and comorbid conditions did not meet either of these criteria, it was decided to include both variables in the analysis because of their relevance both clinically and in the LBP analysis. This model is represented by the equation:

$$Care\ Seeking\ for\ NP = f(\beta 0 + \beta 1 Age + \beta 2 Gender + \beta 10 Insurance + \beta 13 Comorbidities + \beta 14 Episodes).$$

The model-based analysis of this second model produced a likelihood ratio of 16.88 (df=7, p=0.045) indicating that the model did fit the data. The McFadden's R^2 measure calculated for this analysis was 0.05. The model was able to correctly classify cases 75.15% of the time with a sensitivity of 98.37% and a specificity of 7.14%. To determine if the second model was a better fit the Hosmer-Lemeshow goodness of fit test was used which produced a χ^2 of 6.16 (p=.630) indicating the second model was well supported and not reliably different from the first model. The difference in the BIC` statistic from the first to the second model was calculated to be 68.52 also indicating that the second model was a good fit and as a smaller model a more parsimonious fit. Results of this second fitted model with the design-based analysis are seen in Table 18. The design-based analysis produced an F(7, 193) of 2.89 (p=0.007). Variables with significant coefficients included insurance coverage, and number of episodes. The odds that uninsured persons were care seekers were 54% less than those of persons with private insurance. The odds that persons with two or more episodes were care seekers

Table 18

Logistic Regression Results for Care Seeking for Neck Pain Reduced Model

	β	SE	*P*	OR (95% CI)
Predisposing Factors				
Age (years)	.008	.009	.396	1.01 (.989, 1.03)
Gender				
Male[a]				
Female	.629	.324	.054	1.88 (.990, 3.55)
Enabling Factors				
Insurance Coverage				
Any private[a]				
Public only	.473	.485	.331	1.60 (.617, 4.14)
Uninsured	-.781	.364	.033	.458 (.223, .939)
Need Factors				
Comorbidities				
0[a]				
1	-.271	.523	.604	.762 (.272, 2.14)
2+	-.780	.471	.100	.458 (.181, 1.16)
Episodes				
1[a]				
2+	-.776	.326	.018	.460 (.242, .875)

[a]Reference category.

were 54% less than those of persons with only one episode. These results reflecting a more parsimonious model are similar to those of the analysis incorporating all the 14 variables from the theoretical model.

Provider of Care Analysis for LBP

Analysis of provider selection was conducted using the 1,107 cases who sought care for LBP. Characteristics of care seekers and the provider from whom care was received are detailed in Table 19 using all the independent variables from the full theoretical model of care seeking.

Table 19

Provider Selection for Care Seekers with Low Back Pain

	MD n=674 n (weighted %) or $\bar{X}$ (S.E.)	DC n=281 n (weighted %) or $\bar{X}$ (S.E.)	PT Plus n=89 n (weighted %) or $\bar{X}$ (S.E.)	MD&DC n=53 n (weighted %) or $\bar{X}$ (S.E.)
Age (years)	50.31 (.71)	45.89 (1.10)	45.00 (1.91)	52.80 (2.68)
Gender				
Male	291 (44.4)	146 (52.2)	29 (29.7)	25 (45.5)
Female	383 (55.6)	135 (47.8)	60 (70.3)	28 (54.5)
Race				
White	557 (84.1)	256 (91.3)	75 (87.6)	52 (97.5)
Black	78 (10.4)	11 (3.4)	13 (11.2)	1 (2.5)
Other and multiple races	39 (5.5)	14 (5.3)	1 (1.2)	0 (0.0)
Ethnicity				
Hispanic	122 (10.5)	15 (4.1)	5 (5.2)	2 (2.3)
Not Hispanic	552 (89.5)	266 (95.9)	84 (94.8)	51 (97.7)
Marital Status				
Married	396 (58.8)	189 (63.5)	44 (48.9)	32 (56.5)
Previously married	182 (27.3)	54 (20.5)	20 (19.4)	16 (34.0)
Never married	96 (13.9)	38 (16.0)	25 (31.7)	5 (9.5)
Education				
No degree	172 (22.0)	27 (8.9)	13 (12.2)	6 (11.2)
HS or GED	329 (48.6)	169 (59.6)	50 (58.3)	28 (56.2)
College or University	121 (21.5)	60 (22.7)	22 (25.3)	15 (24.9)
Other degree	52 (7.9)	25 (8.8)	4 (4.2)	4 (7.7)
MSA				
Non-MSA	161 (20.6)	102 (31.0)	15 (14.6)	18 (29.6)
MSA	513 (79.4)	179 (69.0)	74 (85.4)	35 (70.4)
Census Region				
Northeast	128 (21.6)	51 (21.3)	21 (27.6)	8 (16.1)
Midwest	139 (23.3)	111 (38.4)	25 (30.3)	15 (27.0)
South	255 (34.5)	66 (23.4)	30 (29.8)	13 (24.6)
West	152 (20.6)	53 (16.9)	13 (12.3)	17 (32.3)
Total Income (dollars)	27,526.06 (1,545.60)	33,047.07 (1939.91)	32,399.51 (2848.06)	35,567.42 (5670.93)

Table 19 (cont.)

Provider Selection for Care Seekers with Low Back Pain

	MD n=674 n (weighted %) or $\bar{X}$ (S.E.)	DC n=281 n (weighted %) or $\bar{X}$ (S.E.)	PT Plus n=89 n (weighted %) or $\bar{X}$ (S.E.)	MD&DC n=53 n (weighted %) or $\bar{X}$ (S.E.)
Insurance Coverage				
Any private	437 (68.9)	243 (86.5)	71 (81.3)	36 (67.8)
Public only	182 (23.1)	20 (7.4)	10 (12.1)	8 (12.6)
Uninsured	55 (8.0)	18 (6.1)	8 (6.6)	9 (19.6)
Perceived Health Status				
Very Good - Excellent	212 (33.0)	156 (58.0)	38 (46.2)	28 (55.3)
Good	229 (36.6)	87 (30.0)	32 (36.7)	13 (20.8)
Poor - Fair	233 (30.4)	38 (12.0)	19 (17.1)	12 (23.9)
Disabling Condition				
No	388 (58.9)	221 (78.7)	46 (51.9)	37 (65.7)
Yes	286 (41.1)	60 (21.3)	43 (48.1)	16 (34.3)
Comorbidities				
0	123 (17.6)	73 (25.8)	14 (15.5)	11 (20.3)
1	139 (21.3)	64 (22.9)	21 (27.0)	10 (21.1)
2+	412 (61.1)	144 (51.3)	54 (57.5)	32 (58.6)
Episodes				
1	496 (74.4)	185 (67.1)	61 (70.9)	39 (76.9)
2+	178 (25.6)	96 (32.9)	28 (29.1)	14 (23.1)

Multinomial regression was conducted using the four categories of provider possibilities and the nine independent variables from the final reduced care seeking model for LBP. Physician care alone was the reference category for provider selection and the remaining three categories were chiropractic care alone, physical therapy care

(alone or with any other provider) and the combination of chiropractic care and physician care. The independent variables entered in the model were age, gender, ethnicity, marital status, MSA, insurance coverage, perceived health status, comorbid conditions and number of episodes.

The analysis was completed in two parts. In the first part, model-based statistics were analyzed ignoring survey weighting, PSU and strata. This analysis produced a multinomial regression with a χ^2=199.57 (df=39, p=.000). The McFadden's R^2 measure calculated for this analysis was 0.09. To assess the significance of variables across all outcome categories, likelihood ratio tests were conducted for the independent variables. The outcome of these tests is presented in Table 20 and it indicates that the variables ethnicity, marital status, MSA, insurance coverage, perceived health status and number of episodes are all significant within the model.

Likelihood ratio tests were conducted to assess if any of the outcome categories should be combined and are presented in Table 21. The design-based multinomial regression produced an F(39, 192) of 4.78 (p=0.000). Table 22 presents the results of the design-based analysis. From among the variables with significant likelihood ratios, those associated with selecting a DC alone over an MD alone included ethnicity, MSA, insurance coverage, perceived health status and number of episodes. Those associated with selecting physical therapy care over an MD alone included only marital status. Those associated with selecting an MD and DC in combination over an MD alone included insurance coverage and perceived health status.

Table 20

Results of the Likelihood Ratio Tests of Independent Variables in the Multinomial Regression for Provider Selection Among Persons with Low Back Pain

	χ^2	*P*
Age	5.33	.149
Gender		
Female	6.80	.079
Ethnicity		
Not Hispanic	25.39	.000
Marital Status		
Previously married	.139	.988
Never married	9.47	.024
MSA		
MSA	15.78	.001
Insurance Coverage		
Public only	28.01	.000
Uninsured	8.79	.032
Perceived Health Status		
Good	14.32	.002
Poor - Fair	30.35	.000
Comorbidities		
1	2.12	.548
2+	2.17	.539
Episodes		
2+	11.10	.011

Table 21

Results of the Likelihood Ratio Tests to Assess Categories of the Multinomial Regression for Provider Selection Among Persons with Low Back Pain

	χ^2	*P*
DC – PTPlus	39.348	.000
DC – MDDC	22.623	.046
DC – MD	137.930	.000
PTPlus – MDDC	26.398	.015
PTPlus – MD	47.329	.000
MDDC – MD	30.311	.004

Table 22

Multinomial Regression Results for Provider Selection Among Persons with Low Back Pain

	DC (n=281) vs. MD				PT Plus (n=89) vs. MD				MD & DC (n=53) vs. MD			
Independent Variables	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI
Age	-.011	.006	.081	.989 .976, 1.00	-.005	.008	.518	.995 .980, 1.01	.016	.010	.117	1.02 .996, 1.04
Gender												
Male[a]												
Female	-.183	.172	.287	.832 .593, 1.17	.699	.254	.006	2.01 1.22, 3.32	.010	.389	.979	1.01 .470, 2.17
Ethnicity												
Hispanic[a]												
Not Hispanic	.815	.363	.025	2.26 1.11, 4.62	.807	.557	.149	2.24 .748, 6.72	1.49	.813	.068	4.43 .892, 21.96
Marital Status												
Married[a]												
Previously married	.067	.240	.780	1.07 .666, 1.72	-.119	.342	.728	.888 .452, 1.74	.217	.355	.541	1.24 .618, 2.50
Never married	.067	.252	.789	1.07 .651, 1.76	1.00	.318	.002	2.72 1.46, 5.09	-.266	.550	.629	.766 .259, 2.26
MSA												
Non-MSA[a]												
MSA	-.591	.200	.004	.554 .373, .822	.284	.368	.440	1.33 .644, 2.74	-.426	.346	.218	.653 .331, 1.29

Table 22 (cont.)

Multinomial Regression Results for Provider Selection Among Persons with Low Back Pain

	DC (n=281) vs. MD				PT Plus (n=89) vs. MD				MD & DC (n=53) vs. MD			
Independent Variables	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI
Insurance Coverage												
Any private[a]												
Public only	-.926	.305	.003	.396 .217, .722	-.646	.389	.098	.524 .244, 1.13	-.621	.445	.165	.537 .223, 1.29
Uninsured	-.525	.322	.104	.592 .314, 1.12	-.543	.469	.248	.581 .230, 1.46	1.17	.457	.011	3.23 1.31, 7.96
Perceived Health Status												
Very good - Excellent[a]												
Good	-.696	.181	.000	.499 .349, .712	-.232	.300	.440	.793 .439, 1.43	-1.12	.329	.001	.325 .170, .623
Poor - Fair	-1.25	.246	.000	.286 .176, .464	-.639	.335	.058	.528 .273, 1.02	-.635	.485	.192	.530 .204, 1.38
Comorbidities												
0[a]												
1	-.294	.237	.216	.745 .467, 1.19	.313	.364	.392	1.37 .667, 2.80	-.300	.501	.549	.740 .276, 1.99
2+	-.141	.240	.557	.868 .541, 1.39	.231	.343	.502	1.26 .640, 2.48	-.194	.415	.641	.824 .364, 1.87

Table 22 (cont.)

Multinomial Regression Results for Provider Selection Among Persons with Low Back Pain

	DC (n=281) vs. MD				PT Plus (n=89) vs. MD				MD & DC (n=53) vs. MD			
Independent Variables	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI
Episodes												
1[a]												
2+	.536	.187	.005	1.71 1.18, 2.47	.407	.260	.118	1.50 .901, 2.51	-.071	.394	.858	.932 .429, 2.02

[a]Reference category.

Risk ratios calculated indicated a greater likelihood of seeing a DC over an MD alone for persons who were not Not Hispanic and for persons who had more than one episode. A lower likelihood of seeing a DC over an MD alone was found for persons living in an MSA, having a public form of insurance, and having a health status of good or poor to fair. Risk ratios indicated that persons who were never married had a higher likelihood of seeing a PT over an MD alone. Finally uninsured persons were more likely to see an MD and DC as opposed to an MD alone. Persons with perceived health status rated good were less likely to see an MD and DC as opposed to an MD alone.

Provider of Care Analysis for NP

Analysis of provider selection was initially conducted using the 246 cases who sought care for NP. Characteristics of care seekers and the provider from whom care was received are detailed in Table 23 using all the independent variables from the full theoretical model of care seeking.

Table 23

Provider Selection for Care Seekers with Neck Pain

	MD n=136 n (weighted %) or $\bar{X}$ (S.E.)	DC n=67 n (weighted %) or $\bar{X}$ (S.E.)	PT Plus n=30 n (weighted %) or $\bar{X}$ (S.E.)	MD&DC n=13 n (weighted %) or $\bar{X}$ (S.E.)
Age (years)	46.26 (1.70)	43.52 (2.20)	45.71 (2.59)	45.68 (4.76)
Gender				
Male	47 (35.2)	28 (43.4)	8 (25.9)	5 (53.0)
Female	89 (64.8)	39 (56.6)	22 (74.1)	8 (47.0)
Race				
White	108 (80.3)	60 (89.7)	27 (94.2)	12 (95.0)
Black	20 (12.4)	3 (5.9)	2 (3.5)	1 (5.0)
Other and multiple races	8 (7.3)	4 (4.4)	1 (2.3)	0 (0.0)

Table 23 (cont.)

Provider Selection for Care Seekers with Neck Pain

	MD n=136 n (weighted %) or $\bar{X}$ (S.E.)	DC n=67 n (weighted %) or $\bar{X}$ (S.E.)	PT Plus n=30 n (weighted %) or $\bar{X}$ (S.E.)	MD&DC n=13 n (weighted %) or $\bar{X}$ (S.E.)
Ethnicity				
Hispanic	27 (13.0)	4 (5.0)	2 (4.1)	0 (0.0)
Not Hispanic	109 (87.0)	63 (95.0)	28 (95.9)	13 (100.0)
Marital Status				
Married	72 (50.5)	41 (54.7)	23 (76.8)	8 (49.9)
Previously married	45 (31.9)	11 (15.3)	4 (10.5)	3 (21.3)
Never married	19 (17.6)	15 (30.0)	3 (12.7)	2 (28.8)
Education				
No degree	31 (22.4)	10 (15.2)	1 (2.8)	0 (0.0)
HS or GED	72 (53.3)	31 (45.3)	14 (47.6)	5 (37.6)
College or University	18 (14.0)	16 (22.1)	12 (40.6)	5 (37.4)
Other degree	15 (10.3)	10 (17.4)	3 (9.0)	3 (25.0.)
MSA				
Non-MSA	24 (13.9)	21 (28.9)	6 (15.3)	1 (5.9)
MSA	112 (86.1)	46 (71.1)	24 (84.7)	12 (94.1)
Census Region				
Northeast	19 (15.8)	8 (12.9)	10 (36.4)	1 (9.9)
Midwest	32 (26.4)	18 (31.7)	4 (11.4)	3 (19.0)
South	48 (35.0)	22 (29.7)	6 (24.2)	6 (53.2)
West	37 (22.8)	19 (25.7)	10 (28.0)	3 (17.9)
Total Income (dollars)	28,709.72 (2586.43)	34,179.60 (3436.20)	38,376.62 (5919.62)	32,148.55 (5290.16)
Insurance Coverage				
Any private	100 (73.5)	53 (80.4)	26 (86.5)	11 (84.8)
Public only	26 (18.2)	4 (4.9)	3 (11.2)	2 (15.2)
Uninsured	10 (8.3)	10 (14.7)	1 (2.3)	0 (0.0)
Perceived Health Status				
Very Good - Excellent	53 (42.2)	41 (61.8)	17 (58.1)	5 (42.2)
Good	43 (31.7)	12 (21.8)	12 (39.3)	6 (44.0)
Poor - Fair	40 (26.1)	14 (19.4)	1 (2.6)	2 (13.8)

Table 23 (cont.)

Provider Selection for Care Seekers with Neck Pain

	MD n=136 n (weighted %) or $\bar{X}$ (S.E.)	DC n=67 n (weighted %) or $\bar{X}$ (S.E.)	PT Plus n=30 n (weighted %) or $\bar{X}$ (S.E.)	MD&DC n=13 n (weighted %) or $\bar{X}$ (S.E.)
Disabling Condition				
No	88 (62.2)	55 (80.0)	21 (79.0)	10 (79.7)
Yes	48 (37.8)	12 (20.0)	9 (21.0)	3 (20.3)
Comorbidities				
0	19 (15.2)	12 (20.7)	9 (26.3)	0 (0.0)
1	26 (17.7)	17 (26.1)	5 (14.7)	4 (40.3)
2+	91 (67.1)	38 (53.2)	16 (59.0)	9 (59.7)
Episodes				
1	112 (81.6)	55 (84.3)	26 (86.2)	13 (100.0)
2+	24 (18.4)	12 (15.7)	4 (13.8)	0 (0.0)

Analysis of frequencies across the four categories of provider possibilities and the five independent variables from the final care seeking model for NP revealed problems with cells containing no observations primarily in the category of physician and chiropractic care combined which only had 13 cases. Thus, this provider category was dropped from the multinomial regression of provider selection for NP.

The multinomial regression of provider selection for care seekers with neck pain was analyzed using 233 cases that sought care for NP. Physician care alone was used as the reference category for provider selection. The remaining two categories were chiropractic care alone and physical therapy care (alone or with any other provider). The independent variables entered into the model were age, gender, insurance coverage, comorbid conditions and whether or not more than one episode of neck pain care

occurred. Both model-based and design-based analyses were conducted. The model-based regression produced a result of χ^2=19.22 (df=12, p=.083). The design-based multinomial regression produced an F(12, 176) of 1.33 (p=.204). Table 24 presents the results of the design-based analysis. These values indicate that the independent variables from the care seeking model of NP do not differentiate the provider selected for care.

Relationship of the Results to the Study Hypotheses

This section will present the results of the statistical analyses in light of the study hypotheses on care seeking for both LBP and NP presented in Chapter 2. Hypotheses are presented using the constructs of the original model of the study.

Predisposing Factors and Care Seeking

H1A: No statistically significant difference exists in care seeking for LBP and for NP between men and women controlling for other predisposing, enabling and need factors.

More than half of the LBP (53.6%) and NP (59%) populations were comprised of women. Among women with LBP, 51% sought care while 63% of the women with NP sought care. In the univariate analyses of care seeking the difference was not significant for the variable gender in the LBP analysis (p=.149) or the NP analysis (p=.066) but it did meet the criteria to enter the multivariate analysis. In the multivariate analysis of care seeking among persons with LBP and the analysis for those with NP, when controlling for all other factors in the model, the effect of gender was not significant. Based on these results, the null hypothesis H1A for gender is supported.

Table 24

Multinomial Regression Results for Provider Selection Among Persons with Neck Pain

	DC (n=67) vs. MD				PT Plus (n=30) vs. MD			
Independent Variables	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI
Age	-.002	.013	.850	.998 .972, 1.02	.006	.014	.682	1.01 .979, 1.03
Sex								
Male[a]								
Female	-.317	.346	.361	.728 .368, 1.44	.533	.484	.272	1.70 .656, 4.42
Insurance Coverage								
Any private[a]								
Public only	-1.28	.598	.033	.278 .085, .900	-.645	.749	.390	.525 .119, 2.30
Uninsured	.426	.552	.442	1.53 .515, 4.55	-1.54	1.16	.185	.214 .022, 2.10
Comorbidities								
0[a]								
1	.011	.588	.986	1.01 .317, 3.22	-.942	.651	.150	.390 .108, 1.41
2+	-.349	.532	.512	.705 .247, 2.02	-.898	.543	.100	.407 .140, 1.19
Episodes								
1[a]								
2+	-.187	.388	.631	.829 .385, 1.78	-.432	.603	.475	.649 .198, 2.13

[a]Reference category

H1B: No statistically significant difference exists in care seeking for LBP and for NP by race and ethnicity controlling for other predisposing, enabling and need factors.

The majority of persons in the samples with LBP and NP were white (86.5% and 85.4% respectively) and not of Hispanic background (91% and 91.1% respectively). Among persons with LBP and NP, the distribution of care seeking followed a similar pattern to the racial distribution of the populations with these disorders. Thus race was not associated with care seeking. In the univariate analyses of care seeking the differences were not significant for the variable race in either the LBP analysis (p=.581) or the NP analysis (p=.884). When controlling for all other factors in the model, the effect of race was not significant.

Among persons with LBP, a higher proportion of persons who were not of Hispanic background sought care in the univariate analysis (p=.02) whereas among persons with NP the univariate analysis was not significant. (p=.772). When controlling for all other factors in the model, the effect of ethnicity was not significant for care seeking in LBP or in NP. Based on these results, the null hypothesis H1B for race and ethnicity is supported.

H1C: No statistically significant difference exists in care seeking for LBP and for NP by age controlling for other predisposing, enabling and need factors.

The mean age of persons with LBP was 48 while for persons with neck pain the mean age was 45. Among persons with LBP, care seekers were older than non-

careseekers by three years. In the univariate analysis this difference was statistically significant (t=2.41, p=.001). Yet, when controlling for all other factors in the model, the effect of age was not significant in the analysis of care seeking for LBP. The univariate analysis of care seeking was not significant for the variable age in the NP analysis (p=.619). When controlling for all other factors in the model, the effect of age was not significant in the analysis of care seeking for NP. Based on these results, the null hypothesis H1C for age is supported.

H1D: No statistically significant difference exists in care seeking for LBP and for NP by marital status controlling for other predisposing, enabling and need factors.

The modal category for marital status for both persons with LBP and NP was being married (57.9% and 56% respectively). Among persons with LBP, a lower proportion of care seekers were never married. In the univariate analysis there was an association between marital status and care seeking for LBP (p=.014). When controlling for all other factors in the model, the effect of marital status was not significant in the analysis of care seeking for LBP. The univariate analysis of care seeking was not significant for the variable marital status in the NP analysis (p=.671). When controlling for all other factors in the model, the effect of marital status was not significant in the analysis of care seeking for NP. Based on these results, the null hypothesis H1D for marital status is supported.

H1E: No statistically significant difference exists in care seeking for LBP and for NP by level of educational achievement controlling for other predisposing, enabling and need factors.

Most persons with LBP and NP had at a minimum a high school degree or equivalent. The modal category for level of educational achievement was the attainment of a high school degree or GED for both LBP (52%) and NP (50.9%). The univariate analyses of care seeking were not significant for the variable education in either the LBP analysis (p=.355) or the NP analysis (p=.715). When controlling for all other factors in the model, the effect of education was not significant in either the analysis of LBP or NP. Based on these results, the null hypothesis H1D for level of educational achievement is supported.

Enabling Factors and Care Seeking

H1F: No statistically significant difference exists in care seeking for LBP and for NP by insurance status controlling for other enabling, predisposing and need factors.

Having insurance coverage through a private carrier was the norm for both persons with LBP (74.6%) and NP (76.9%). The univariate analyses of differences in insurance coverage for care seeking for LBP (p=.000) and NP (p=.034) were both significant. In the multivariate analysis of care seeking for LBP and for NP the effect of insurance coverage also had a significant effect. The odds of an uninsured person seeking care for LBP were reduced by 31% as compared to persons with private insurance. In the multivariate analysis of care seeking for NP, the odds of a person

seeking care were reduced by 58% if the person was uninsured as compared to persons with private insurance. Based on these results, the null hypothesis H1F for insurance coverage is not supported for LBP and for NP.

H1G: No statistically significant difference exists in care seeking for LBP and for NP by income level controlling for other enabling, predisposing and need factors.

The average income for persons with LBP was $30,086 and for persons with NP $33,386. In the univariate analyses of care seeking the differences were not significant for the variable income in either the LBP analysis (p=.491) or the NP analysis (p=.325). When controlling for all other factors in the model, the effect of income was not significant in either the analysis of LBP or NP. Based on these results, the null hypothesis H1G for income level is supported.

H1H: No statistically significant difference exists in care seeking for LBP and for NP by geographic location controlling for other enabling, predisposing and need factors.

Geographic variables considered in this analysis included the census region of the country in which the person resided and whether the person lived in a MSA. The distribution of persons geographically by census region was fairly even ranging from 20.5% in the West to 31.9% in the South for persons with LBP and from 16.4% in the Northeast to 33.6% in the South for persons with NP. In the univariate analyses of care seeking, the variable of census region was not significant in either the LBP analysis

(p=.270) or the NP analysis (p=.468). When controlling for all other factors in the model, the effect of census region was not significant in either the analysis of LBP or NP.

For persons with LBP and NP, most resided in an MSA (79.1% and 83.1% respectively). The univariate analysis of care seeking for NP was not significant for the variable MSA status (p=.479). The univariate analysis of care seeking for LBP (p=.003) was significant for the variable MSA status. Based on the univariate analysis, a higher proportion of non-care seekers resided within an MSA. When controlling for all other factors in the model, the effect of MSA was significant in the analysis of LBP but not in the analysis of care seeking for NP. Based on these results, the null hypothesis H1H for geographic location is supported for NP but not supported for LBP.

Need Factors and Care Seeking

H1J: No statistically significant difference exists in care seeking for LBP and for NP by disability controlling for other need, predisposing and enabling factors.

Most persons with LBP and NP did not experience it as a condition that resulted in a disability day (64.4% and 71% respectively). The univariate analyses of care seeking were not significant for the variable disabling condition in either the LBP analysis (p=.397) or the NP analysis (p=.779). When controlling for all other factors in the model, the effect of the variable disabling condition was not significant in either the analysis of LBP or NP. Based on these results, the null hypothesis H1J for disability is supported.

H1K: No statistically significant difference exists in care seeking for LBP and for NP by recurrence of an episode of care or symptoms controlling for other need, predisposing and enabling factors.

The range of episodes of care or episodes of symptoms for persons with LBP and NP was from 1-5. Most persons experienced only a single episode in the two year period under study with 78.6% of persons with LBP only experiencing one episode and 81.2% of persons with NP only experiencing one episode. As a person experienced more than a single episode, the odds of care seeking increased. In the univariate analysis of care seeking for both LBP (p=.000) and NP (p=.028) having more than one episode was significant. When controlling for all other factors in the model, episodes was a significant predictor of care seeking for both LBP and NP. In the case of LBP having more than one episode increased the odds of care seeking by over threefold whereas in the case of NP having more than one episode decreased the odds of care seeking by 59%. Based on these results, the null hypothesis H1K for episodic recurrence is not supported.

H1L: No statistically significant difference exists in care seeking for LBP and for NP by the number of comorbid conditions controlling for other need, predisposing and enabling factors.

The mean number of comorbid conditions for persons with LBP was 2.47 (+/-.08) and for persons with NP it was 2.90 (+/-.31). Most persons with either LBP or NP had at least one comorbid condition. In the univariate analysis of care seeking for LBP (p=.000) the number of comorbid conditions was significant. In the analysis for NP number of comorbid conditions was not significant (p=.519). When controlling for all other factors

in the model, number of comorbid conditions was a significant predictor of care seeking only in the case of LBP. The variable number of comorbid conditions was employed in the multivariate analysis of care seeking for NP but in this case, when controlling for all other factors in the model it was not a significant predictor of care seeking. In the LBP analysis among persons with one or more comorbid conditions, the odds of care seeking increased by approximately 50%. Based on these results, the null hypothesis H1K for number of comorbid conditions is supported for NP but not supported for LBP.

H1M: No statistically significant difference exists in care seeking for LBP and for NP by perceived health status controlling for other need, predisposing and enabling factors.

Most persons with either LBP or NP classified their perceived health status as at least good if not better. The univariate analysis of care seeking for NP was not significant for the variable perceived health status (p=.426). When controlling for all other factors in the model it was also not significant in the multivariate analysis of care seeking for NP. The univariate analysis of care seeking for LBP (p=.001) was significant for the variable perceived health status. When controlling for all other factors in the model, the effect of perceived health status was significant in the analysis of LBP. Persons who rated their perceived health status in the category good were more likely to be care seekers. For persons in these categories, the odds of care seeking increased by 33-39% over persons who rated their perceived health status as very good to excellent. Based on these results, the null hypothesis H1M for perceived health status is supported for NP but not supported for LBP.

Synopsis of Care Seeking Hypotheses

In the analysis of persons with LBP, data and analyses from this study were shown to support MSA status, insurance coverage status, perceived health status, having comorbid conditions and having more than one episode as determinants of care seeking. In the analysis of persons with NP, determinants included insurance coverage status and having more than one episode of care or neck pain. Table 25 summarizes the statistical findings for each variable in the study.

Provider of Care

H2: The type of provider is not associated with significant differences in predisposing, enabling and need factors of care seekers for LBP or for NP.

The investigation of selection of care provider was conducted using only those persons who sought care for LBP or NP. The independent variables used in this analysis were selected because they were significant in the univariate analysis of care seeking, were part of the reduced model of care seeking generated in the logistic regression analyses or were identified as clinically important variables based on previous studies. For LBP, variables examined were age, gender, ethnicity, marital status, MSA, insurance coverage, perceived health status, comorbid conditions and whether a person had more than one episode. For NP, variables examined were age, gender, insurance coverage, comorbid conditions and whether a person had more than one episode.

The multinomial regression for the analysis of provider selection for care seekers with LBP was found to be a good fit in testing the model. Variables that were statistically significant in the analysis included ethnicity, marital status, MSA, insurance

Table 25

Care Seeking Analyses Summary

	Univariate Analysis of Care Seeking for LBP	Multivariate Analysis of Care Seeking for LBP	Univariate Analysis of Care Seeking for NP	Multivariate Analysis of Care Seeking for NP
Predisposing Factors				
Age (years)	*	NS	NS	NS
Gender	NS	NS	NS	NS
Race	NS	NS	NS	NS
Ethnicity	*	NS	NS	NS
Marital Status	*	NS	NS	NS
Education	NS	NS	NS	NS
Enabling Factors				
MSA	*	*	NS	NS
Census Region	NS	NS	NS	NS
Total Income (dollars)	NS	NS	NS	NS
Insurance Coverage	*	*	*	*
Need Factors				
Perceived Health Status	*	*	NS	NS
Disabling Condition	NS	NS	NS	NS
Comorbidities	*	*	NS	NS
Episodes	*	*	*	*

Note. NS = Not significant.
*$p<.05$.

coverage, perceived health status and number of episodes. Not being of Hispanic origin was associated with a greater odds of seeing a DC over a MD. Living in an MSA, having

insurance that is identified as public only, and having a perceived health status that is identified as being less than very good to excellent all reduced the odds of seeing a DC over a MD. The variable that identified if a person had more than one episode was associated with a greater odds of seeing a DC over an MD. A person with two or more episodes was almost twice as likely to see a DC than an MD. Never being married was associated with a greater odds of seeing a PT over a MD. The only variable that was associated with a greater odds of seeing an MD over the combination of an MD and a DC was the variable of self perceived health being identified as good. Being uninsured increased the odds of seeing the combination of MD and DC over MD by 3 times. Table 26 summarizes the statistical findings for each variable that entered into the provider selection analysis for LBP.

Table 26

Provider of Care Analysis Summary for Low Back Pain

	DC vs. MD	PT Plus vs. MD	MD & DC vs. MD
Predisposing Factors			
Age (years)	NS	NS	NS
Gender	NS	NS	NS
Ethnicity	*	NS	NS
Marital Status	NS	*	NS
Enabling Factors			
MSA	*	NS	NS
Insurance Coverage	*	NS	*
Need Factors			
Perceived Health Status	*	NS	*
Comorbidities	NS	NS	NS
Episodes	*	NS	NS

Note. NS = Not significant.
*$p<.05$.

In contrast to the findings on LBP, the multinomial regression for the analysis of provider selection for care seekers with NP was found not to be significant. Based on these results, the null hypothesis for H2 is not supported in the case of care seeking for LBP but is supported in the case of care seeking for NP.

Summary of Results

The study examined care seeking for LBP and NP testing 13 hypotheses from an access based model of care seeking. The results indicated that the determinants of care seeking that were consistent for LBP and NP were need and enabling factors, specifically insurance coverage status and having more than one episode. In addition, a similar outcome occurred with predisposing factors as none of the variables that represented this construct were found to be determinants for either condition.

There were some differences in the two models developed. In the case of LBP, care seeking did appear to relate to MSA status, a variable from the enabling factors construct. This variable was not significant in the NP model In addition, two additional need factors, perceived health status and comorbid conditions were found to fit the model of care seeking in LBP but not the model for NP.

When the variables from the care seeking analysis were carried forward into the analysis of provider selection, it was found that a mix of predisposing factors, enabling factors and need factors were determinants of provider selection for LBP. In a markedly dissimilar finding, provider selection for NP had no relationship to the care seeking variables. In the next chapter, further discussion of these findings and possible

explanations are explored as well as a summary of the limitations of this study and its implications.

CHAPTER 5: DISCUSSION

This study investigated the determinants of care seeking and provider selection in persons with low back pain (LBP) or neck pain (NP). For persons with LBP the analysis revealed that the determinants of care seeking included MSA status, insurance coverage status, perceived health status, number of comorbid conditions and recurrence of an episode. For persons with NP determinants of care seeking included insurance coverage and recurrence of an episode. For both conditions, these variables were defined from the enabling and need factors of the study's theoretical model.

When the care seeking determinants were used to establish their relevance to a model of provider selection, a reliable statistical model could be developed for LBP but not for NP. In the LBP model, the determinants of provider selection included ethnicity, marital status, MSA status, insurance coverage status, perceived health status and recurrence of an episode.

In this chapter an interpretation of the results, their implications, and the strengths and limitations of this study are addressed. The results are placed into the context of research on LBP and NP and research on the considerable issue of healthcare access. The chapter is divided into four sections. The first section considers the final samples drawn from the MEPS and then discusses the results in relation to the four research

questions posed in the introduction comparing the findings to those presented in previously published literature. The second section examines the implications of the results to the theoretical models that guided the study. The third section considers the implications of the results to broader health policy and to the professions engaged in treating LBP and NP. The final section describes the study's strengths and limitations and provides some guidance for future research.

Discussion of Findings

The Study Samples

The context of an analysis of care seeking, consumption and provider selection revolves around both the health system being studied and the sample selected. In order to generalize results to the entire health system, a nationally drawn sample is necessary. For the current study, this was the case. In order to generalize results to all persons with the conditions under study, the study samples should mirror characteristics of persons with the conditions.

In this sample drawn from MEPS Panel 6 participants, the 2 year period prevalence rate for LBP was 8.9% and for NP 1.7%. In spite of methodological differences in definitions and condition identification, the rate for LBP falls above the 7.6% from the study by Carey, et al. (1996) and the 6.8% from the study by Deyo and Tsui Wu (1987). The prevalence rate for NP generated in this study is lower than any reported in the literature from any country. Cote at al. (1998) found a point prevalence rate of 22.2% from the Saskatchewan Health and Back Pain Survey. In a later study,

Cote et al (2004) found an annual incidence rate of 14.6%. The NP prevalence rate of 1.7% is the first reported rate of NP generated from a nationally based sample in the U.S.

The AHRQ literature about the MEPS and its appropriateness for population prevalence estimates presents the reader with two distinct opinions. J. Cohen (1997) wrote that the MEPS design makes population level estimates of both health care use and health conditions prevalence possible. According to literature from an AHRQ workshop on MEPS analysis however, prevalence estimates may be biased because of vague condition reporting and clustering of ICD-9 codes in the "not elsewhere classified" coding. After condition verification, AHRQ analysts have calculated error rates for condition coding to be 2.5%.

The demographic characteristics of the two samples were similar to characteristics described in the literature as social and demographic determinants of LBP and NP. The highest prevalence rates for persons with LBP or NP were among women, persons with an educational level of a high school degree or less and persons who identify race as white (Carey, et al., 1996, Cote, Cassidy, & Carroll, 1998, Deyo & Tsui Wu, 1987, Reisbord & Greenland, 1985). This demographic profile is similar to previous literature and provides some additional confirmation that the sample is representative of persons with LBP and NP.

Rates of Care Seeking

This study was designed to estimate care seeking rates for two separate conditions and also estimate these rates for single and multiple providers. Care seeking is measured as the end point of the first theoretical model which is a model of healthcare access,

demonstrating realized access. Care seeking occurred at a rate of 64.9% for LBP and 75% for NP. These figures indicate that most persons did seek care for their condition of LBP or NP.

The rate of care seeking for LBP from this study does not reflect the acuteness or chronicity of the condition. The rate is lower than the estimate for care seeking for chronic LBP of 73% (Carey et al., 1995) but higher than the 39% estimate for care seeking for acute LBP (Carey et al., 1996). Deyo and Tsui Wu's (1987a) estimate of 85% also did not specify whether the problem was acute or chronic LBP. The difference in the rate found in this study and those prior to it may relate more to methodological issues such as the definition of LBP or the timeframe under study.

Rates of care seeking for NP in the U.S. were not found in the literature. The care seeking rate for NP at 75% is higher than that of LBP. It is difficult to ascertain why these two conditions produce this difference in care seeking rates. One explanation could be that NP as a condition is more disabling or produces a greater intensity of symptoms. Cote et al. (1998) and Cassidy et al. (1998) published studies that used the Saskatchewan Health and Back Pain Survey data to examine NP and LBP prevalence, disability and symptoms. Comparing the two studies, one finds that pain intensity ratings and disability scores are comparable for the two conditions across the three grades that classify the pain and disability produced by NP and LBP. On the basis of this one survey one can't say that NP is a more problematic condition to a patient. However, the combination of the higher rate of care seeking and the possibility of higher rates of disability certainly imply that NP may produce more need for healthcare services at the individual level.

Turning the rate of care seeking around, the rate of non-care seeking indicates that more than one third of adults do not seek care for their LBP or one quarter for their NP. This finding is not surprising given the advice and recommendations made to consumers in published guidelines. In fact, non care seeking may accurately be depicted as the first advice given. In the consumer's guide published by the former AHCPR (National Library of Medicine, Health Services/Technology Assessment) in conjunction with the Guidelines for Acute Low Back Problems (Bigos, 1994) the consumer was advised of the need to seek care only if symptoms were severe, prevented the person from doing typical daily activities or the problem did not go away in a few days time. The Medline Plus health information website published by the National Library of Medicine and the National Institutes of Health also provides a guide to self care stating that most persons will feel better within one week after back pain starts (Freedman, 2005). If consumers are following this advice for acute problems, then Carey's estimate for acute LBP may be the most accurate care seeking rate published, reflecting care for cases of acute LBP or NP that are more severe, more disabling or more lasting. The estimates of the current study are then possibly skewed by the presence of persons with chronic conditions. Still, these estimates accurately reflect overall care seeking regardless of the acuity of the condition for LBP and NP.

Care seeking rates by provider type demonstrate a profession specific aspect of realized access. The care seeking rate estimates by provider type for persons with NP and for persons with both conditions simultaneously are a unique finding of the current study. The highest rate for both NP and LBP was the rate of care seeking to physicians

only, followed by chiropractors, physical therapists with any other provider, and finally the combination of a physician and a chiropractor. This ordering of rates matches the order found by other researchers for care seeking for LBP. (Cote et al., 2001; Deyo & Tsui Wu, 1987a; Feuerstein et al., 2004). The previous studies referenced did not incorporate combinations of provider types in the same categories as this study but generally found a similar result. This ordering may again reflect the guidelines published both for consumers and providers (Bigos et al., 1994; Deyo & Weinstein, 2001). It may also reflect consumer preference, which would indicate that the most preferred or possibly trusted provider for both LBP and NP is a physician.

The magnitude of the provider specific care seeking rates from the current study do not match those previously published for any of the providers. For physicians, published rates of care seeking for LBP have been as high as 90.9% (Carey et al., 1995) and as low as 24% (Carey et al., 1996). The range of rates reflects differences in the acuity of the LBP population under study. Persons with more chronic conditions seek care from physicians at a higher rate. The rate of care seeking from physicians of 39% found for both LBP and NP in this study reflects a combination of chronic and acute conditions. The magnitude of this rate is closer to the acute conditions rate than the chronic conditions rate but likely reflects a mix of both levels of the condition of LBP.

Deyo and Tsui Wu (1987a) obtained a higher physician specific care seeking rate of 59% using a definition of LBP that did not specify acuity of the condition. Like their overall care seeking rate, this estimate is higher than the one obtained in the current study. Deyo and Tsui Wu (1987a) used data from the NHANES II survey that asked

specifically about the occurrence of LBP. In the MEPS no specific LBP or NP condition information is elicited; participants in the MEPS are asked about "any physical or mental health problems, accidents or injuries." The general nature of this line of questioning may have resulted in the lower estimates.

The rate of care seeking from a chiropractor for LBP generated in this study follows a similar pattern to that of the physicians. At 16.8%, this rate falls between the 24.6% estimates for chronic problems (Carey et al., 1995) and the 13% estimate for acute problems (Carey et al., 1996). The rate is lower than the 31% estimate from Deyo and Tsui Wu (1987a). Reasons for these differences are again related to methodologic differences in condition defnition.

Two additional provider category care seeking rates were established in this research. The care seeking rate for physical therapy and any other provider was lower than the 16% estimated by Deyo and Tsui Wu (1987a) and the 29% estimated for persons with chronic LBP by Carey et al. (1995). The care seeking rate for physician and chiropractor combined was lower than an 8% estimate from Cote et al., (2001) and a 21% estimate from Sundararajan et al. (1998). The lower rates found may reflect underreporting of specific providers used during an episode. It is also possible that the rates are lower due to the use of other provider types (massage, acupuncture).

Spine-related pain condition definitions, specifically whether the problem is acute or chronic in nature, likely drive the care seeking rates for all providers and for specific providers. In this study, in which acuity was not defined, the rates tended to fall into a

middle range of previous care seeking estimates reflecting an estimate of care seeking for a spine condition without regard to acuity or chronicity.

Care Consumption

The ideal quantity of care that should be consumed during an episode of LBP or NP is unknown. Due to the direct relationship between consumption of care and costs, there has been targeted interest in the amount of care consumed for an episode by third party payers and health planners. In some instances, practice guidelines and a utilization review process have been used to set the maximum number of visits allowable for a given diagnosis by a provider type, particularly for cases that are reimbursed through a worker's compensation claim (Eccleston et al., 2004). When standards of consumption exist, consumption of care statistics may be used to expose over or underutilization of services. Underutilization may point to restrictions in access to services while higher levels of utilization may be indicating unnecessary use of services.

Within the literature on LBP and NP a number of studies have measured and documented the quantity of care consumed during an episode. These measures are summarized in Table 27, which shows the values from a number of studies in descending order. The range of consumption estimates is broad and is mostly focused on persons with LBP. The highest consumption was for persons with chronic LBP who saw a physical therapist and on average had 17.2 visits, and the lowest consumption was for persons with LBP who saw a physician and had 3.2 visits.

The estimates for care consumption for LBP in the present study for physicians of 3.13 visits would be situated toward the lower end of estimation in the table while the

Table 27

Published Data on the Mean Number of Visits Per Episode of Care by Provider Type

Provider Type	Study	Population	Mean Number of Visits
Physician			
	Carey (1995)	Persons with chronic LBP	11
	Shekelle (1995a)	Persons with either LBP or NP	5.0 Orthopedist 3.4 Internist 3.2 Osteopath 2.3 GP
	Kominski (2005)	Persons with LBP	4.4
	Feuerstein (2004)	Persons with LBP in 1987 and 1997	3.6-3.8
Chiropractic			
	Carey (1995)	Persons with chronic LBP	15.7
	Hurwitz (1998)	Persons with LBP	14
	Shekelle (1995a)	Persons with either LBP or NP	10.4
	Feuerstein (2004)	Persons with LBP in 1987 and 1997	7.8-9.2
	Kominski (2005)	Persons with LBP	6.9-7.5
Physical Therapy			
	Carey (1995)	Persons with chronic LBP	17.2
	Jette (1994)	Persons with LBP	11
	Feuerstein (2004)	Persons with LBP in 1987 and 1997	8.4-10.4
	Swinkels (2005)	Persons with LBP	9.9
	Kominski (2005)	Persons with LBP	6.6

chiropractor and physical therapist estimates at 8.07 and 10.94 respectively would be situated at the midpoint in the ordering for each provider type. This likely reflects the mix of chronic and acute problems within the sample. The highest estimate for consumption is for persons who saw a chiropractor and a physician for an episode of care for either NP (19.41 visits) or LBP (16.73). These higher values may be reflective of more chronic problems. Lim, Jacobs and Klarenbach (2006) found that the receipt of care from multiple providers was associated with depressive symptoms. In turn, depressive symptoms have been associated with chronic spine disorders (Herr, Mobily & Smith, 1993). Given the association shown in the literature, this suspicion would have been better investigated had the study incorporated a measure of emotional or mental health.

Most of the consumption estimates from the literature are for persons with LBP with only one study incorporating but not separating out the persons with NP. This fact stands in contrast to the estimates for consumption developed in this study from the MEPS Panel 6 data. A comparison of the two conditions shows higher consumption for persons seeing a physician only or a physician and chiropractor combination in the presence of neck pain and lower consumption for persons seeing a chiropractor or physical therapist in the presence of back pain. This mix of findings renders it difficult to come to any conclusion about one condition encompassing a more intense use of resources over the other.

Recommendations have been made for an expected range of the number of visits per episode of care for physical therapists in the Guide to Physical Therapy Practice; this

range for LBP and NP is potentially quite broad at 8-24 visits per episode (American Physical Therapy Association, 2001, p. 229). The consumption estimates for both persons with LBP and persons with NP who saw a physical therapist fall easily within this range but it cannot be determined from this study whether the healthcare services provided were necessary or effective.

The values for physician care consumption of 3.1 visits for LBP and 5.7 visits for NP. National estimates of care consumption indicate that the number of visits per person per year ranged from 1.7 to 6.5 depending on age (Statistical Abstract of the U.S., 1999). A person seeking care for LBP or NP does not exceed these estimates but is likely having most of their care due to either of these conditions.

In a number of states, specific guidelines with consumption values have been developed for persons whose care is provided through a workers compensation claim. Massachusetts's guidelines are used as an example of the values provided. According to the Massachusetts Department of Industrial Accidents Treatment Guidelines (Department of Industrial Accidents, 1993), a person with an acute neck or back injury is allowed a maximum of 4 physician visits, and 18 chiropractic or physical therapy visits during weeks 1-6 from the date of injury. A person with a subacute neck or back injury is allowed a maximum of 2 physician visits, and 10 chiropractic or physical therapist visits during weeks 7-12 from the date of injury. A person with a chronic pain condition is allowed 20 chiropractic or physical therapy visits. If a person has a nerve root entrapment the visit range values climb to as high as 12 physician visits and 42 visits allowable for chiropractic or physical therapy. This range of visits for treatment would

suggest that these types of guidelines might not drive the consumption estimates produced in the current study. Wasiak and McNeely (2006) concur with this conclusion, finding that restrictive policies on payment by worker's compensation did lower the costs of care but had no impact on the number of visits per person to a chiropractor.

It remains to be determined what are the drivers of the consumption estimates developed within this study. The estimates do fall within previously published ranges, and within the ranges of both professional and third party payer guidelines. Consumption estimates, however, only portray one element of care since expenditures for a condition can exceed those spent only on visits and may include prescriptions and other healthcare items. While the estimates do answer the research question asked, they leave room for further inquiry.

Care Seeking Determinants

The determinants of care seeking for LBP were MSA status, insurance coverage, perceived health status, number of comorbid conditions and number of episodes. The determinants of care seeking for NP were insurance coverage and number of episodes. These variables are all derived utilizing concepts of the enabling and need factors of the study's theoretical model. Predisposing factors, which are predominantly sociodemographic variables, did not play a role in determining who seeks care.

Sociodemographic variables and their influence on healthcare access are health system specific and country specific. Thus, the findings are best compared to care seeking studies conducted on populations in the U.S. The construct-based findings above stand in contrast to the finding by Carey et al., (1996) that demographics, specifically

race was a predictor of care seeking for acute LBP. However, the findings are in agreement with most studies that found that sociodemographic variables were not determinants of care seeking for LBP (Carey et al., 1995; Cote et al., 2001; Hurwitz & Morgenstern, 1999; Waxman, 1998).

In a system in which access to care is equitable, variations in care seeking would be best explained by only need factors. In the present study, the largest number of predictive factors did come from the need construct which might indicate that access for LBP and NP is, in fact, provided in an equitable manner. However, the finding that MSA status for LBP and insurance coverage for LBP and NP are determinants precludes this conclusion.

MSA status was a determinant only in the case of LBP in which living in an MSA reduced the odds of care seeking by 30%. Geographic location has not been previously explored in relation to care seeking. If examined in reverse, this finding would indicate that rural access to services for LBP or NP is not a significant policy issue. Pathman, Ricketts and Konrad (2006) studied access issues among persons in the rural Southeast of the U.S. and found that it was not uncommon to travel for care and that density of physicians was not related to actual use of services on an outpatient basis. Ricketts and Konrad's finding may well explain that the persons residing out of an MSA did seek care. The fact that those residing in an MSA sought care at a lower level is still open to a plausible explanation. Possibly an urban lifestyle and its demands preclude the time to seek care for LBP or LBP is simply an accepted accompaniment to urban life and care seeking is thus seen as unnecessary.

Uninsured persons with either NP or LBP were less likely to be care seekers. This finding is true for other conditions and diseases as well and indicates a system wide problem of access for the uninsured (Ayanian et al., 2000; Hafner-Eaton, 1993). Uninsured persons, particularly those who have chronic conditions have been shown to have poorer physician access (Ayanian et al., 2000; Hafner-Eaton, 1993). Of greater concern is the fact that persons who are uninsured will develop a lower health status and progression of their disease and condition status. This decline has been demonstrated to affect not only the condition, but also function, particularly mobility (Baker et al., 2002). The decline in health status and lack of access is a concern for conditions such as LBP and NP which are highly prevalent and which affect people during their most economically productive ages. Access to care and services for the uninsured with LBP and NP needs to be addressed in an appropriate policy venue either through the provision of an insurance program or through the provision of appropriate care.

Need factors played a prominent role in care seeking for both LBP and NP. This finding is consistent with a number of previous studies on care seeking (Carey et al., 1995; Carey et al., 1996; Cote e al., 2001; Hurwitz & Morgenstern, 1999) in spite of differences in how the construct of need is operationalized. In the present study, the factors that only influenced care seeking for LBP were perceived health status and number of comorbid conditions, while number of prior episodes during the 2 year period influenced care seeking in the case of either condition.

Persons at the lowest level of perceived health status with LBP had 60% greater odds of care seeking. This may be because these people have other types of conditions

and they already have access to the system. This measure of perceived health status, though not condition specific, is picking up a finding similar to the condition specific finding that persons with higher levels of disability due to back pain were more likely to be care seekers (Hurwitz & Morgenstern, 1999).

The presence of more than one comorbid condition increased the likelihood that a person with LBP was a care seeker. Hurwitz and Morgenstern (1999) found that persons who sought care for comorbidities were less likely to seek care for LBP. It would appear in this study that having more comorbid conditions similar to having a lower perceived health status actually enhances a person's access to the health care system and promotes care seeking. This finding does not support the concept of prioritizing of conditions that Hurwitz and Morgenstern (1999) discussed; rather it supports the idea that once in the healthcare system, a person has a greater likelihood of seeking care for any condition present. This idea of a higher likelihood of care seeking with prior system access could be analyzed further with the data from the MEPS.

For persons with LBP having more than one episode had the greatest influence on care seeking, increasing the odds of care seeking by threefold over persons with only one episode. Those who had already had access to the system were able to once again access it when the condition recurred. This is similar to the finding by Vingard et al., (2000) in which previous back pain was a predictor of care seeking. In a study on persons with recurrent LBP, Wasiak and McNeely (2006) found that persons with recurrences are not only likely to seek care but their subsequent care for the recurrence is more costly and of longer duration. The recurrent nature of the condition of LBP and the impact of

recurrence on care seeking should encourage greater policy efforts toward secondary prevention for persons with LBP.

For NP the finding that having more than one episode reduces the odds of care by 60% seeking seems counterintuitive. Possible reasons for this finding could include a lack of satisfaction with previous care or less severe recurrences of NP. Neither of these two concepts were measured within this dataset.

Both the determinants and the rates of care seeking were different for persons with NP and LBP. This finding warranted a closer look at how the condition itself functioned as a determinant of care seeking. An a posteriori analysis to explore the impact of condition on care seeking was undertaken. In this analysis the population of interest was all persons identified with the condition LBP or NP (n=2,043). A variable was constructed to identify whether the person's condition was LBP or NP and this variable was entered as an independent variable with the dependent variable being care seeking as depicted in Table 28.

Table 28

Care Seeking by Condition

	Care Seekers (n=1343) n (weighted %)	Non Care Seekers (n=700) n (weighted %)
Persons with LBP	1097 (81.5)	616 (88.0)
Persons with NP	246 (18.5)	84 (12.0)

In the univariate chi square analysis, condition was significant (χ^2=149.06, p=.001). Condition was then entered as an independent variable in a logistic regression

of the full theoretical model and in a logistic regression in which the variables from the final "care seeking for LBP reduced model" from Chapter 4 were used. The full model produced an F (24, 209) of 4.76 (p=0.00). The reduced model produced an F (14, 219) of 7.87 (p=0.00). The reduced model is presented in Table 29. In both the full and the reduced model, condition as an independent variable achieved statistical significance within the models. The odds of seeking care if the person had the condition of NP were 78% higher than if the person had the condition of LBP. This indicates that condition is a determinant of care seeking.

That condition is a determinant is consistent with the finding from Freburger, et al. (2005) who found that care seeking for physical therapy specifically was determined by diagnosis and level of involvement. Different from the Freburger study are the magnitude of the odds difference and the presence of higher care seeking rates among persons with NP. This analysis of care seeking by condition may lend some credence to the concept that neck pain is in some way a condition with more severity or more perceived need for care than LBP.

Provider Selection Determinants

Variables from all three constructs of the original theoretical model were determinants of provider selection for LBP but not for NP. The findings can only be compared to previous studies that contrasted care seekers using physicians and chiropractors. Both Carey et al., (1996) and Shekelle et al. (1995b) found that males were more likely to select a chiropractor for care. However, in the current model, gender was not a significant variable in the multinomial regression. Interestingly, marital status,

Table 29

Logistic Regression Results for Care Seeking Incorporating Condition as an Independent Variable

	β	SE	*P*	OR (95% CI)
Predisposing Factors				
Age (years)	.003	.005	.499	1.00 (.994, 1.01)
Gender				
Male[a]				
Female	.137	.114	.233	1.15 (.915, 1.44)
Ethnicity				
Hispanic[a]				
Not Hispanic	.145	.156	.353	1.15 (.850, 1.57)
Marital Status				
Married[a]				
Previously married	-.071	.137	.605	.931 (.711, 1.22)
Never married	-.128	.152	.401	.879 (.652, .908)
Enabling Factors				
MSA				
Non-MSA[a]				
MSA	-.378	.136	.006	.685 (.524, .894)
Insurance Coverage				
Any private[a]				
Public only	.212	.164	.197	1.24 (.895, 1.71)
Uninsured	-.434	.169	.011	.648 (.464, .904)
Need Factors				
Perceived Health Status				
Very good - Excellent[a]				
Good	.250	.130	.056	1.28 (.993, 1.66)
Poor - Fair	.250	.154	.107	1.28 (.947, 1.74)
Comorbidities				
0[a]				
1	.370	.166	.027	1.45 (1.04, 2.01)
2+	.297	.164	.071	1.35 (.974, 1.85)
Episodes				
1[a]				
2+	.869	.165	.000	2.38 (1.72, 3.30)
Condition				
LBP[a]				
NP	.575	.165	.001	1.78 (1.29, 2.46)

a variable often related to gender was associated with provider choice in the current study. Persons who were married were more likely to see a physical therapist. Cote et al. (2001) found that married persons were more likely to select a chiropractor over a physician. The relationship of marital status to provider selection may exist because married persons often have responsibilities not only for themselves but also for others in their family unit and thus may be predisposed to seeking out rehabilitative care as opposed to the symptom based care provided by a physician alone.

The analysis of provider selection for physical therapists is in actuality an analysis of the pattern of physician referrals to physical therapy. There were only 22 cases for LPB and 8 for NP in which the provider of care for an episode was a physical therapist only. These cases likely represent censoring of the data set, and thus lost information about the referral source. In the U.S., very few physical therapy visits occur without referral from a physician (Dumholdt & Durchholz, 1992). For most episodes in this study in which a PT provided care, the additional provider during the episode was an MD (74% of cases for LBP and 70% of cases for NP). As a result, in the analysis of PT provider selection there is nearly no differentiation between the characteristics of patients who see physical therapists and patients who see physicians. The clearest distinction between these two groups of patients are the care seeking rates, with only a small percentage of all patients seen by physicans being referred onward to physical therapy.

Similar to the study by Cote, Cassidy and Carroll (2001) this study found that the persons who are selecting chiropractors are healthier. In addition, the current model suggests that they are less likely to have public insurance and less likely to live in an

urban area. These types of variables have been less frequently explored. The higher use of chiropractors in rural areas may be explained by the findings of Smith and Carber (2002) who studied chiropractic services in rural areas. Chiropractors in the most rural areas saw the highest volumes of patients. In rural areas, chiropractors may be the providers of choice for LBP due to the lower numbers of other healthcare providers.

Study Implications to the Theoretical Model

The two theoretical models that framed this study were derived from Andersen's "Behavioral Model of Health Services Utilization." The care seeking model proposed in Chapter 2 was shown to be valid in statistical modeling however, in the case of LBP the final model only correctly classified 67% of the cases, and in the case of the NP model 76% of the cases were classified correctly. For both statistical models, sensitivity values were high and specificity values were low. Thus, the models were good at detecting those who do seek care, but not strong at detecting those who do not seek care. A better fitting statistical model might have been developed if more condition specific variables were available within the MEPS dataset.

In the statistical modeling for provider selection a valid model could only be generated for the data from the care seekers with LBP and not for those with NP. Furthermore, constructs that were not significant in the care seeking statistical model were significant in the provider selection model. This indicated that perhaps provider selection should not have been modeled as a process derived out of the care seeking access model as theorized.

To test this supposition in greater detail, an a posteriori multinomial analysis of LBP care seekers and a second of NP care seekers was undertaken using all the variables from the original theoretical model of care seeking. In both cases, using all of the variables, the statistical model was statistically significant.

Results of the multinomial regression analysis for the full theoretical model for LBP are found on Table 30. There were four categories for the dependent variable: care by a MD, a DC, a physical therapist and any other provider and the combination of a DC and an MD. The analysis used the 1,097 care seekers with LBP and all of the variables from the theoretical model as independent variables. To assess the significance of the independent variables across all outcome categories, likelihood ratio tests were conducted and are shown in Table 31 for both the LBP and the NP analyses. The LBP multinomial regression analysis with all the variables from the full theoretical model produced an F (69, 162) of 374.48 (p=0.00).

The full theoretical model results for LBP differ slightly from the reduced model that was presented in Chapter 4. Of note is the addition of age, race and disabling condition as determinants of chiropractic care over physician care; the addition of perceived health status as a determinant of physical therapy care; and the addition of race as a determinant of care for the combination of a physician and a chiropractor.

Results of the multinomial regression analysis for the full theoretical model for NP are found on Table 32. There were three categories for the dependent variable: care by a MD, a DC, and a physical therapist and any other provider. The category care by a

Table 30

Full Theoretical Model Multinomial Regression Results for Provider Selection Among Persons with Low Back Pain

	DC (n=281) vs. MD				PT Plus (n=89) vs. MD				MD & DC (n=53) vs. MD			
Independent Variables	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI
Age	-.015	.006	.017	.984 .973, .997	-.004	.008	.598	.996 .979, 1.01	.017	.010	.087	1.02 .997, 1.04
Gender												
Male[a]												
Female	-.306	.177	.085	.737 .520, 1.04	.777	.271	.004	2.17 1.28, 3.71	.028	.402	.945	1.03 .466, 2.27
Race												
White[a]												
Black	-.816	.373	.030	.442 .212, .922	.013	.439	.977	1.01 .426, 2.40	-1.44	1.07	.177	.236 .029, 1.93
Other	-.038	.459	.933	.962 .390, 2.38	-1.64	1.04	.117	.193 .025, 1.51	-37.97	.339	.000	0.00 0.00, 0.00
Ethnicity												
Hispanic[a]												
Not Hispanic	.734	.354	.039	2.08 1.04, 4.19	.779	.575	.177	2.18 .701, 6.77	1.64	.834	.051	5.15 .996, 26.59
Marital Status												
Married[a]												
Previously married	.083	.234	.723	1.09 .685, 1.72	-.253	.360	.483	.776 .382, 1.58	.257	.356	.472	1.29 .641, 2.61
Never married	.088	.259	.734	1.09 .655, 1.82	.964	.313	.002	2.62 1.42, 4.86	-.143	.562	.799	.866 .286, 2.62

Table 30 (cont.)

Full Theoretical Model Multinomial Regression Results for Provider Selection Among Persons with Low Back Pain

	DC (n=281) vs. MD				PT Plus (n=89) vs. MD				MD & DC (n=53) vs. MD			
Independent Variables	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI
Education												
No degree[a]												
HS or GED	.491	.266	.067	1.63 .967, 2.76	.117	.405	.773	1.12 .506, 2.50	.595	.516	.250	1.81 .657, 5.01
College or University	.142	.344	.679	1.15 .586, 2.27	-.306	.498	.540	.737 .276, 1.96	.467	.661	.481	1.60 .434, 5.87
Other degree	.350	.357	.328	1.42 .703, 2.87	-.672	.695	.335	.511 .130, 2.01	.227	.816	.781	1.25 .251, 6.26
MSA												
Non-MSA[a]												
MSA	-.456	.219	.039	.634 .411, .977	.293	.397	.461	1.34 .613, 2.93	-.508	.350	.148	.602 .302, 1.20
Census Region												
Northeast[a]												
Midwest	.331	.258	.200	1.39 .838, 2.31	.010	.371	.979	1.01 .486, 2.10	.232	.567	.683	1.26 .412, 3.85
South	-.441	.296	.137	.643 .359, 1.15	-.315	.385	.414	.730 .342, 1.56	-.220	.550	.689	.802 .271, 2.37
West	-.347	.315	.272	.707 .380, 1.32	-.569	.490	.247	.566 .216, 1.49	.632	.539	.243	1.88 .650, 5.45

Table 30 (cont.)

Full Theoretical Model Multinomial Regression Results for Provider Selection Among Persons with Low Back Pain

	DC (n=281) vs. MD				PT Plus (n=89) vs. MD				MD & DC (n=53) vs. MD			
Independent Variables	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI
Total Income	0.00	0.00	.807	.999 .999, 1.00	0.00	0.00	.172	1.00 .999, 1.00	0.00	0.00	.303	1.00 .999, 1.00
Insurance Coverage												
Any private[a]												
Public only	-.790	.304	.010	.454 .249, .827	-.553	.401	.169	.575 .261, 1.27	-.303	.497	.543	.739 .278, 1.97
Uninsured	-.429	.325	.188	.651 .343, 1.23	-.385	.454	.396	.680 .278, 1.66	1.45	.478	.003	4.26 1.66, 10.93
Perceived Health Status												
Very good - Excellent[a]												
Good	-.641	.188	.001	.527 .364, .763	-.263	.302	.385	.769 .424, 1.39	-1.06	.359	.003	.345 .170, .700
Poor - Fair	-1.04	.260	.000	.353 .212, .589	-.707	.331	.033	.493 .257, .946	-.420	.505	.406	.657 .243, 1.78
Disabling Condition												
Yes[a]												
No	-.960	.185	.000	.383	.275	.264	.299	1.32	-.025	.378	.947	.975

Table 30 (cont.)

Full Theoretical Model Multinomial Regression Results for Provider Selection Among Persons with Low Back Pain

	DC (n=281) vs. MD				PT Plus (n=89) vs. MD				MD & DC (n=53) vs. MD			
Independent Variables	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI
				.266, .552				.782, 2.22				.463, 2.05
Comorbidities												
0[a]												
1	-.280	.237	.238	.756	.257	.388	.508	1.29	-.313	.498	.530	.731
				.474, 1.20				.602, 2.77				.274, 1.95
2+	-.199	.248	.424	.820	.229	.380	.549	1.26	-.165	.423	.698	.848
				.503, 1.34				.594, 2.66				.368, 1.95
Episodes												
1[a]												
2+	.617	.189	.001	1.85	.317	.260	.224	1.37	-.132	.403	.744	.877
				1.28, 2.69				.823, 2.29				.396, 1.94

[a]Reference category.

Table 31

Results of the Likelihood Ratio Tests from the Multinomial Regression for Provider Selection

	Low Back Pain		Neck Pain	
	χ^2	*P*	χ^2	*P*
Age	7.81	.050	2.56	.278
Gender				
Female	9.7	.021	2.35	.308
Race				
Black	10.04	.018	5.77	.056
Other and multiple races	10.24	.017	.65	.724
Ethnicity				
Not Hispanic	20.72	.000	10.41	.005
Marital Status				
Previously married	.26	.967	4.63	.099
Never married	8.92	.030	6.30	.043
Education				
HS or GED	3.56	.313	1.39	.498
College or University	2.63	.453	6.60	.037
Other degree	2.88	.411	1.22	.544
MSA				
MSA	10.08	.018	7.69	.021
Census Region				
Midwest	3.55	.314	6.96	.031
South	4.87	.182	6.35	.042
West	3.68	.298	.40	.819
Total Income	3.98	.364	.737	.692
Insurance Coverage				
Public only	17.31	.001	2.86	.240
Uninsured	10.47	.015	7.47	.024
Perceived Health Status				
Good	7.80	.050	10.75	.005
Poor - Fair	15.54	.001	5.49	.064
Disabling Condition				
Yes	31.48	.000	9.12	.010
Comorbidities				
1	1.75	.627	5.04	.081
2+	2.88	.411	4.84	.089
Episodes				
2+	11.87	.008	.37	.832

Table 32

Full Theoretical Model Multinomial Regression Results for Provider Selection Among Persons with Neck Pain

	DC (n=67) vs. MD				PT Plus (n=30) vs. MD			
Independent Variables	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI
Age	.022	.019	.252	1.02 .985, 1.06	.020	.021	.341	1.02 .979, 1.06
Gender								
Male[a]								
Female	-.168	.470	.721	.845 .334, 2.14	.800	.539	.139	2.23 .769, 6.45
Race								
White[a]								
Black	-.860	1.08	.426	.423 .051, 3.54	-1.03	1.03	.319	.357 .047, 2.73
Other	-.945	.779	.226	.386 .084, 1.81	-.390	1.13	.730	.677 .073, 6.25
Ethnicity								
Hispanic[a]								
Not Hispanic	1.17	.717	.103	3.24 .786, 13.33	1.67	.729	.023	5.29 1.26, 22.30

Table 32 (cont.)

Full Theoretical Model Multinomial Regression Results for Provider Selection Among Persons with Neck Pain

	DC (n=67) vs. MD				PT Plus (n=30) vs. MD			
Independent Variables	β	SE	*P*	RRR 95% CI	β	SE	*P*	RRR 95% CI
Marital Status								
Married[a]								
Previously married	-.692	.623	.268	.501 .147, 1.71	-1.65	.775	.034	.192 .042, .884
Never married	1.15	.607	.059	3.17 .957, 10.50	-.699	.888	.432	.497 .086, 2.86
Education								
No degree[a]								
HS or GED	-.095	.504	.851	.909 .337, 2.46	1.18	1.01	.247	3.24 .440, 23.88
College or University	.315	.600	.600	1.37 .419, 4.48	2.22	1.17	.060	9.17 .910, 92.39
Other degree	.524	.647	.419	1.69 .471, 6.05	1.16	1.24	.350	3.20 .276, 36.99
MSA								
Non-MSA[a]								
MSA	-1.59	.486	.001	.204 .078, .533	-.971	.626	.122	.379 .110, 1.30

Table 32 (cont.)

Full Theoretical Model Multinomial Regression Results for Provider Selection Among Persons with Neck Pain

	DC (n=67) vs. MD				PT Plus (n=30) vs. MD			
Independent Variables	β	SE	*P*	RRR 95% CI	β	SE	*P*	RRR 95% CI
Census Region								
Northeast[a]	-.343	.765	.654	.709	-2.27	.953	.018	.103
Midwest				.157, 3.21				.016, .678
	-.354	.644	.583	.702	-1.52	.817	.064	.218
South				.197, 2.50				.044, 1.09
	.269	.847	.751	1.31	-.554	.679	.416	.575
West				.246, 6.96				.151, 2.20
Total Income	0.00	0.00	.580	1.00	0.00	0.00	.977	1.00
				.999, 1.00				.999, 1.00
Insurance Coverage								
Any private[a]								
Public only	-1.26	.956	.191	.285	-.135	.759	.859	.873
				.043, 1.88				.195, 3.91
Uninsured	1.11	.716	.122	3.04	-.541	1.23	.660	.582
				.741, 12.50				.052, 6.75
Perceived Health Status								
Very good - Excellent[a]								
Good	-1.07	.598	.076	.344	-.146	.578	.801	.864
				.106, 1.12				.276, 2.70

Table 32 (cont.)

Full Theoretical Model Multinomial Regression Results for Provider Selection Among Persons with Neck Pain

	DC (n=67) vs. MD				PT Plus (n=30) vs. MD			
Independent Variables	*β*	SE	*P*	RRR 95% CI	*β*	SE	*P*	RRR 95% CI
Poor - Fair	-.122	.686	.859	.885 .229, 3.43	-2.20	1.41	.121	.111 .007, 1.80
Disabling Condition								
Yes[a]								
No	-1.22	.371	.001	.295 .142, .613	-.204	.698	.771	.816 .206, 3.23
Comorbidities								
0[a]								
1	.615	.694	.377	1.85 .470, 7.28	-.637	.666	.340	.529 .142, 1.97
2+	-.298	.622	.632	.742 .218, 2.53	-.811	.692	.243	.445 .114, 1.74
Episodes								
1[a]								
2+	-.258	.489	.599	.772 .294, 2.03	-.270	.647	.677	.764 .213, 2.73

[a]Reference category.

combination of a DC and an MD was dropped due to small numbers in this category (n=13). The analysis used the 233 care seekers with NP and all of the variables from the theoretical model as independent variables. The likelihood ratio tests for the independent variables from the analysis are shown in Table 31. The NP multinomial regression analysis with all the variables from the full theoretical model produced an F (46, 142) of 2.77 (p=0.00). In this model, determinants of chiropractic care over physician care were found to be MSA status and the presence of a disabling condition. Determinants of physical therapy care over physician care were ethnicity, marital status and census region.

Variables found to be significant in likelihood testing for the LBP model included gender, race, ethnicity, marital status, MSA, insurance coverage, perceived health status, disabling condition, and number of episodes. This represents an increase from six variables in the model tested with the a priori hypothesis to nine variables. The additional significance of three variables shows a greater role of the predisposing factors in provider selection. Variables significant for the NP model included ethnicity, marital status, education, MSA, census region, insurance coverage, perceived health status and disabling condition.

These findings would suggest that a redrawn model that better represents the determinants of provider selection would appear to be more similar to the original care seeking model. This new model is shown in Figure 6. Additionally the new model not derived from the care seeking determinants would imply that provider selection may not be an access issue but purely an issue of personal preferences. To explore this concept

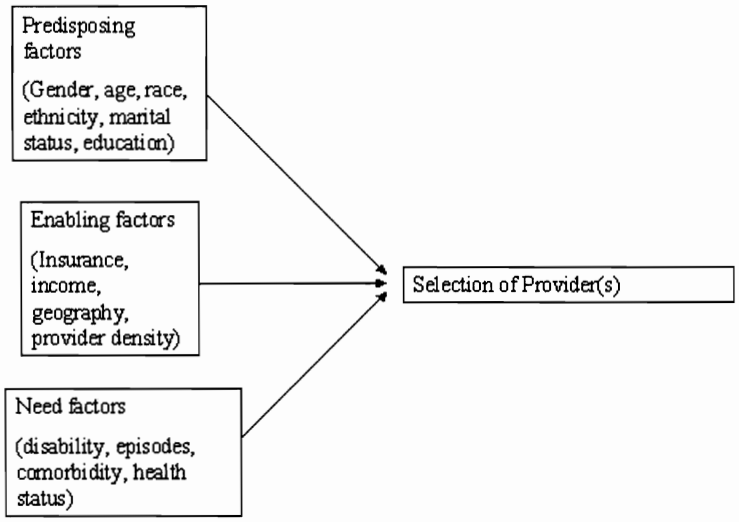

Figure 6. Revised Model of Provider Selection in Low Back and Neck Pain

further, variables related to provider density would need to be tested under the construct of enabling factors and should be explored in future research.

Study Strengths and Limitations

A number of limitations were present in both the design of this study and the data source for the study. The study design was an analysis of relationships intending to demonstrate the presence or absence of an association between the independent and the dependent variables. This association while modeled to be meaningful does not imply causality. Thus an analysis of this type is only a stepping off point to ascertain if and,

even potentially, where a problem in the healthcare system may exist. The study cannot, however, answer the question of what produces a potential problem of access.

Threats to the internal validity of the study such as history and maturation were not controlled through the study design. A cross-sectional study is only a picture of a moment in time. To expand this picture, two years of panel data were used. Still, it was possible, especially given the natural course of back and neck pain, that provider use preceded or followed the period of time used in the present study. Thus, data must be seen as potentially both right and left censored.

The use of a secondary data source also posed its own set of limitations. The source may have contained inaccurate data or insufficient data to measure the constructs under study. It is possible that data represented inaccurate answers or misinterpretations of the questions asked by interviewers. AHRQ has attempted to mitigate this problem by asking many of the questions multiple times over the course of panel interviews to ensure greater data reliability (S. B. Cohen, 1997). The MEPS employs a mode of interviewing that allows other family members to respond to questions asked by the interviewer if a person is not at home during interview time. Thus, some underreporting of conditions or health problems may be present in the dataset. Comparison of the prevalence rates of LBP in the derived sample to the U.S. literature revealed that underreporting was not a problem. These same estimates were not available for NP or for both conditions simultaneously, however the neck pain prevalence estimate from the MEPS Panel 6 data did appear low at 1.7%. The number of MEPS proxy respondents identified from all cases was nine (.4%) and thus, this did not seem to pose a limitation.

In the present study, the construct of need may not have been well represented by the variables available in the dataset. Most often, need variables shown to be determinants of care seeking incorporate a condition specific measure of pain or pain intensity (refs). This variable was not measured or available in the MEPS data. From the need construct variables that were used only the measure of disability days was directly associated with the condition of neck or back pain. All other measures were need factors that could have resulted from the condition of neck or back pain or from any other comorbidity. It is unfortunate that this type of variable was not a part of this dataset.

Suggestions for Future Research

Many of the findings of this study highlight areas for further research. This study only described consumption patterns and pointed to differences by provider and by condition. Future research to ascertain the determinants of consumption would aid health planners and members of each of the professions in determining how differing user groups consume the care they offer. Most important will be to tie in studies of care seeking to studies of outcomes and studies that differentiate the types of care provided tied to outcomes. Once a person with LBP or NP has entered the system the next step is to determine which persons may be adequately served by the system, that is, whose needs are truly met by the level of care provided for LBP and NP.

Further exploration of NP prevalence in the United States also appears warranted. With established prevalence rates, care seeking investigations into NP that incorporate more condition specific variables would better clarify the determinants of care seeking for this understudied condition.

Additional study of provider selection with variables that represent provider density may also prove informative as a possible determinant. The results of this study do indicate that the geographic variable of MSA does impact on care seeking and provider selection. Provider density would provide further information about this geographic finding.

Summary

The results of this study offer insight into the determinants of care seeking and the role that condition plays in care seeking. In terms of provider selection, this study has contributed to an understanding of an underlying model that may be used to analyze which patients go to which specific providers for LBP and NP care. The findings from this study help to fill in details about persons accessing the U.S. healthcare system for LBP and NP.

REFERENCES

Aday, L. A., & Awe, W. C. (1997). Health services utilization models. In D. S. Gochman (Ed.). *Handbook of Health Behavior Research I: Personal and Social Determinants* (pp. 153-172). New York, NY: Plenum Press.

American Physical Therapy Association. (2001). Guide to physical therapist practice (2nd ed.). *Physical Therapy, 81,* 9-744.

Andersen, R. M. (1968). *Behavioral model of families' use of health services* (Research Series No. 25). Chicago: University of Chicago.

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

Andersen, R. M., & Davidson, P. L. (2001). Improving access to care in America: Individual and contextual indicators. In R. M. Andersen, T. H. Rice, & G. F. Kominski (Eds.). *Changing the U.S. Healthcare System: Key Issues in Health Services, Policy and Management* (2nd ed.) (pp. 3-30). San Francisco, CA: Josey-Bass.

Andersson, G. B. (1999). Epidemiological features of chronic low back pain. *Lancet, 354,* 581-585.

Atlas, S. J., & Deyo, R. A. (2001). Evaluating and managing acute low back pain in the primary care setting. *Journal of General Internal Medicine, 16,* 120-131.

Ayanian, J. Z., Weissman, J. S., Schneider, E. C., Ginsburg, J. A., & Zaslavsky, A. M. (2000). Unmet health needs of uninsured adults in the United States. *JAMA: The Journal of the American Medical Association, 284,* 2061-2069.

Baker, D. W., Sudano, J. J., Albert, J. M., Borawksi, E. A., & Dor, A. (2002). Loss of health insurance and the risk for a decline in self-reported health and physical functioning. *Medical Care, 40,* 1126-1131.

Biering-Sorensen, F. (1982). Low back trouble in a general population of 30-, 40-, 50-, and 60-year-old men and women. Study design, representativeness and basic results. *Danish Medical Bulletin, 29,* 289-299.

Bigos, S. J., Bowyer, O. R., Braen, G. R., Brown, K., Deyo, R., Haldeman, S., et al. (1994). *Acute low back problems in adults. Clinical practice guideline no. 14* (AHCPR Publication No. 95-0642). Rockville, MD: Agency for Health Care Policy and Research.

Carey, T. S., Evans, A., Hadler, N., Kalsbeek, W., McLaughlin, C., & Fryer, J. (1995). Care-seeking among individuals with chronic low back pain. *Spine, 20*, 312-317.

Carey, T. S., Evans, A. T., Hadler, N. M., Lieberman, G., Kalsbeek, W. D., Jackman, A. M., et al. (1996). Acute severe low back pain. A population-based study of prevalence and care-seeking. *Spine, 21*, 339-344.

Carey, T. S., & Garrett, J. M. (2003). The relation of race to outcomes and the use of health care services for acute low back pain. *Spine, 28,* 390-394.

Carey, T. S., Garrett, J. M., Jackman, A., & Hadler, N. (1999). Recurrence and care seeking after acute back pain: Results of a long-term follow-up study. North Carolina Back Pain Project. *Medical Care, 37*, 157-164.

Carey, T. S., Garrett, J., Jackman, A., McLaughlin, C., Fryer, J., & Smucker, D. R. (1995). The outcomes and costs of care for acute low back pain among patients seen by primary care practitioners, chiropractors, and orthopedic surgeons. The North Carolina Back Pain Project. *New England Journal of Medicine, 333,* 913-917.

Cassidy, J. D., Carroll, L. J., & Cote, P. (1998). The Saskatchewan health and back pain survey. The prevalence of low back pain and related disability in Saskatchewan adults. *Spine, 23,* 1860-6.

Cherkin, D. C., Deyo, R. A., Battie, M., Street, J., & Barlow, W. (1998). A comparison of physical therapy, chiropractic manipulation, and provision of an educational booklet for the treatment of patients with low back pain. *New England Journal of Medicine, 339,* 1021-9.

Cherkin, D. C., Deyo, R. A., Volinn, E., & Loeser, J. D. (1992). Use of the International Classification of Diseases (ICD-9-CM) to identify hospitalizations for mechanical low back problems in administrative databases. *Spine,17,* 817-825.

Cherkin, D. C., Deyo, R. A., Sherman, K. J., Hart, L. G., Street, J. H., Hrbek, A., et al. (2002). Characteristics of visits to licensed acupuncturists, chiropractors, massage therapists, and naturopathic physicians. *The Journal of the American Board of Family Practice, 15,* 463-472.

Cherkin, D.C., Deyo, R. A., Wheeler, K., & Ciol, M. A. (1995). Physician views about treating low back pain. The results of a national survey. *Spine, 20,* 1-9.

Cherry, D. K., Burt, C. W., & Woodwell, D. A. (2003). *National ambulatory medical care survey: 2001 summary* (Advance Data from Vital and Health Statistics No. 237). Hyattsville, MD: National Center for Health Statistics.

Cohen, J. (1997). *Design and methods of the Medical Expenditure Panel Survey Household Component* (AHCPR Publication No. 97-0026). Rockville, MD: Agency for Health Care Policy and Research.

Cohen, J. W., & Krauss, N. A. (2003). Spending and service use among people with the fifteen most costly medical conditions, 1997. *Health Affairs, 22,* 129-138.

Cohen, S. B. (1997). *Sample design of the 1996 Medical Expenditure Panel Survey Household Component* (AHCPR Publication No. 97-0027). Rockville, MD: Agency for Health Care Policy and Research.

Cooper, R. A., & McKee, H. J. (2003). Chiropractic in the United States: trends and issues. *Milbank Quarterly, 81*, 107-38.

Cote, P., Cassidy, J. D., & Carroll, L. (1998). The Saskatchewan Health and Back Pain Survey. The prevalence of neck pain and related disability in Saskatchewan adults. *Spine, 23,* 1689-1698.

Cote, P., Cassidy, J. D., & Carroll, L. (2001). The treatment of neck and low back pain: Who seeks care? Who goes where? *Medical Care, 39*, 956-967.

Cote, P. Cassidy, J. D., Carroll, L. J., & Kristman, V. (2004). The annual incidence and course of neck pain in the general population: A population-based cohort study. *Pain, 112*, 267-273.

Coulter, I. D., Hurwitz, E. L., Adams, A. H., Genovese, B. J., Hays, R., & Shekelle, P. G. (2002). Patients using chiropractors in North America: Who are they, and why are they in chiropractic care? *Spine, 27*, 291-296.

Crout, K. L., Tweedie, J. H., & Miller, D. J. (1998). Physical therapists' opinions and practices regarding direct access. *Physical Therapy, 78*, 52-61.

Cypress, B. K. (1983). Characteristics of physician visits for back symptoms: A national perspective. *American Journal of Public Health, 73,* 389-395.

Daffner, S. D., Hilibrand, A. S., Hanscom, B. S., Brislin, B. T., Vaccaro, A. R., & Albert, T. J. (2003). Impact of neck and arm pain on overall health status. *Spine, 28,* 2030-2035.

de Vet, H. C., Heymans, M. W., Dunn, K. M., Pope, D. P., van der, B. E. A., Macfarlane, G. J., Bouter, L. M., & Croft, P. R. (2002). Episodes of low back pain: A proposal for uniform definitions to be used in research. *Spine, 27*, 2409-2416.

Department of Industrial Accidents. (1993). *Treatment guidelines*. Retrieved March 24, 2006, from http://www.mass.gov/dia/hcsb/treatguides.htm

Deyo, R. A. (1983). Conservative therapy for low back pain. Distinguishing useful from useless therapy. *JAMA: The Journal of the American Medical Association, 250*, 1057-1062.

Deyo, R. A., Cherkin, D., Conrad, D., & Volinn, E. (1991). Cost, controversy, crisis: Low back pain and the health of the public. *Annual Review of Public Health, 12*, 141-156.

Deyo, R. A., & Tsui-Wu, Y. J. (1987a). Descriptive epidemiology of low-back pain and its related medical care in the United States. *Spine, 12*, 264-268.

Deyo, R. A., & Tsui-Wu, Y. J. (1987b). Functional disability due to back pain. A population-based study indicating the importance of socioeconomic factors. *Arthritis and Rheumatism, 30*, 1247-1253.

Deyo, R. A., & Weinstein, J. N. (2001). Low back pain. *New England Journal of Medicine, 344*, 363-370.

Dionne, C. E., Von Korff, M., Koepsell, T. D., Deyo, R. A., Barlow, W. E., & Checkoway, H. (2001). Formal education and back pain: A review. *Journal of Epidemiology and Community Health, 55*, 455-468.

Domholdt, E., & Durchholz, A. G. (1992). Direct access use by experienced therapists in states with direct access. *Physical Therapy, 72*, 569-574.

Eccleston, S. M., Zhao, X., Liu, T. C., Watson, M., & Workers Compensation Research Institute (Cambridge Mass). (2004). *The anatomy of workers' compensation medical costs and utilization: Trends and interstate comparisons* (4th ed.). Cambridge, Mass.: Workers Compensation Research Institute.

Enthoven, P., Skargren, E., & Oberg, B. (2004). Clinical course in patients seeking primary care for back or neck pain: A prospective 5-year follow-up of outcome and health care consumption with subgroup analysis. *Spine, 29,* 2458-2465.

Eisenberg, D. M., Davis, R. B., Ettner, S. L., Appel, S., Wilkey, S., Van Rompay, M., et al. (1998). Trends in alternative medicine use in the United States, 1990-1997: results of a follow-up national survey. *JAMA: The Journal of the American Medical Association, 280,* 1569-1575.

Fanuele, J. C., Birkmeyer, N. J., Abdu, W. A., Tosteson, T. D., & Weinstein, J. N. (2000). The impact of spinal problems on the health status of patients: Have we underestimated the effect? *Spine, 25,* 1509-1514.

Feuerstein, M., Marcus, S. C., & Huang, G. D. (2004). National trends in nonoperative care for nonspecific back pain. *The Spine Journal, 4*, 56-63.

Fejer, R., Kyvik, K. O., & Hartvigsen, J. (2005). The prevalence of neck pain in the world population: A systematic critical review of the literature. *European Spine Journal, 14*.

Ferrari, R., & Russell, A. S. (2003). Regional musculoskeletal conditions: neck pain. *Best Practice and Research. Clinical Rheumatology, 17,* 57-70.

Foster, E. M. (2003). Propensity score matching: an illustrative analysis of dose response. *Medical Care, 41,* 1183-1192.

Freburger, J. K., Carey, T. S., & Holmes, G. M. (2006). Effectiveness of physical therapy for the management of chronic spine disorders: a propensity score approach. *Physical Therapy, 86,* 381-394.

Freburger, J. K., Carey, T. S., & Holmes, G. M. (2005a). Management of back and neck pain: Who seeks care from physical therapists? *Physical Therapy, 85,* 872-886.

Freburger, J. K., Carey, T. S., & Holmes, G. M. (2005b). Physician referrals to physical therapists for the treatment of spine disorders. *The Spine Journal, 5,* 530-541.

Freburger, J. K., Holmes, G. M., & Carey, T. S. (2003). Physicians' referral to physical therapy for the treatment of musculoskeletal conditions. *Archives of Physical Medicine and Rehabilitation, 84*, 1839-1849.

Freedman, K. B. (2005, July 7). *Back pain – low*. Retrieved March 24, 2006, from http://www.nlm.nih.gov/medlineplus/ency/article/003108.htm

Frymoyer, J. W., & Cats-Baril, W. L. (1991). An overview of the incidences and costs of low back pain. *The Orthopedic Clinics of North America, 22*, 263-271.

Gamache, G., Rosenheck, R. A., & Tessler, R. (2000). Factors predicting choice of provider among homeless veterans with mental illness. *Psychiatric Services, 51*, 1024-1028.

Gelberg, L., Andersen, R. M., & Leake, B. D. (2000). The behavioral model for vulnerable populations: Application to medical care use and outcomes for homeless people. *Health Services Research, 34*, 1273-1302.

Grooten, W. J., Wiktorin, C., Norrman, L., Josephson, M., Tornqvist, E. W., & Alfredsson, L. (2004). Seeking care for neck/shoulder pain: A prospective study of work-related risk factors in a healthy population. *Journal of Occupational and Environmental Medicine, 46,* 138-146.

Hafner-Eaton, C. (1993). Physician utilization disparities between the uninsured and insured. Comparisons of the chronically ill, acutely ill and well nonelderly

populations. *JAMA: The Journal of the American Medical Association, 269,* 787-792.

Hart, L. G., Deyo, R. A., & Cherkin, D. C. (1995). Physician office visits for low back pain. Frequency, clinical evaluation, and treatment patterns from a U.S. national survey. *Spine, 20*, 11-19.

Hawk, C., & Dusio, M. E. (1995). A survey of 492 U.S. chiropractors on primary care and prevention-related issues. *Journal of Manipulative and Physiological Therapeutics, 18*, 57-64.

Heistaro, S., Vartiainen, E., Heliovaara, M., & Puska, P. (1998). Trends of back pain in eastern Finland, 1972-1992, in relation to socioeconomic status and behavioral risk factors. *American Journal of Epidemiology, 148*, 671-682.

Herr, K. A., Mobily, P. R., & Smith, C. (1993). Depression and the experience of chronic pain: A study of related variables and age differences. *The Clinical Journal of Pain, 9,* 104-114.

Hillman, M., Wright, A., Rajaratnam, G., Tennant, A., & Chamberlain, M. A. (1996). Prevalence of low back pain in the community: implications for service provision in Bradford, UK. *Journal of Epidemiology and Community Health, 50*, 347-352.

Hornbrook, M. C., Hurtado, A. V., & Johnson R. E. (1985). Health care episodes: Definition, measurement and use. *Medical Care Rev, 42,* 163-218.

Hosmer, D. W., & Lemeshow, S. (2000). *Applied Logistic Regression* (2nd ed.). New York: John Wiley & Sons.

Hurwitz, E. L., Coulter, I. D., Adams, A. H., Genovese, B. J., & Shekelle, P. G. (1998). Use of chiropractic services from 1985 through 1991 in the United States and Canada. *American Journal of Public Health, 88*, 771-776.

Hurwitz, E. L., & Morgenstern, H. (1999). The effect of comorbidity on care seeking for back problems in the United States. *Annals of Epidemiology, 9,* 262-270.

Hurwitz, E. L., & Morgenstern, H. (1997a). Correlates of back problems and back-related disability in the United States. *Journal of Clinical Epidemiology, 50*, 669-681.

Hurwitz, E. L., & Morgenstern, H. (1997b). The effects of comorbidity and other factors on medical versus chiropractic care for back problems. *Spine, 22*, 2254-2263.

Hurwitz, E. L., Morgenstern, H., Harber, P., Kominski, G. F., Belin, T. R., et al. (2002). A randomized trial of medical care with and without physical therapy and chiropractic care with and without physical modalities for patients with low back pain: 6-month follow-up outcomes from the UCLS low back pain study. *Spine, 27,* 2193-2204.

IJzelenberg, W., & Burdorf, A. (2004). Patterns of care for low back pain in a working population. *Spine, 29*, 1362-1368.

Indahl, A., Velund, L., & Reikeraas, O. (1995). Good prognosis for low back pain when left untampered. A randomized clinical trial. *Spine, 20*, 473-7.

Jacob, T., Zeev, A., & Epstein, L. (2003). Low back pain--a community-based study of care-seeking and therapeutic effectiveness. *Disability and Rehabilitation, 25*, 67-76.

Jette, A. M., & Davis, K. D. (1991). A comparison of hospital-based and private outpatient physical therapy practices. *Physical Therapy, 71,* 366-375.

Jette, A. M., Smith, K., Haley, S. M., & Davis, K. D. (1994). Physical therapy episodes of care for patients with low back pain. *Physical Therapy, 74,* 101-110.

Jorgensen, C. K., Fink, P., & Olesen, F. (2001). Patients in general practice in Denmark referred to physiotherapists: A description of patient characteristics based on general health status, diagnoses, and sociodemographic characteristics. *Physical Therapy, 81*, 915-923.

Kelsey, J. L., White A. A., Pastides, H., & Bisbee G. E. (1979). The impact of musculoskeletal disorders on the population of the United States. *The Journal of Bone and Joint Surgery. American Volume, 61*, 959-964.

Kerssens, J. J., & Groenewegen, P. P. (1990). Referrals to physiotherapy: the relation between the number of referrals, the indication for referral and the inclination to refer. *Social Science and Medicine, 30*, 797-804.

Korn, E. L., & Graubard, B. I. (1999). *Analysis of Health Surveys*. New York: John Wiley & Sons.

Kubrin, A. I. (1995). The role of health insurance in the use of health services among the non-elderly. *Journal of Health and Social Policy, 6*, 73-90.

Leroux, I., Dionne, C. E., Bourbonnais, R., & Brisson C. (2005). Prevalence of musculoskeletal pain and associated factors in the Quebec working population. *International Archives of Occupational and Environmental Health, 78,* 379-386.

Li, L. C., & Bombardier, C. (2001). Physical therapy management of low back pain: an exploratory survey of therapist approaches. *Physical Therapy, 81*, 1018-1028.

Lim, K. L., Jacobs, P., & Klarenbach, S. (2006). A population-based analysis of healthcare utilization of persons with back disorders: Results from the Canadian Community Health Survey 2000-2001. *Spine, 31,* 212-218.

Loney, P. L., & Stratford, P. W. (1999). The prevalence of low back pain in adults: a methodological review of the literature. *Physical Therapy, 79*, 384-396.

Luo, X., Pietrobon, R., Sun, S. X., Liu, G. G., & Hey, L. (2004). Estimates and patterns of direct health care expenditures among individuals with back pain in the United States. *Spine, 29*, 79-86.

Machlin, S. R., & Taylor, A. K. (2000). *Design and methods and field results of the 1996 medical expenditure panel survey medical provider component.* (AHRQ Publication No. 00-00028). Rockville, MD: Agency for Healthcare Research and Quality.

Makela, M., Heliovaara, M., Sievers, K., Impivaara, O., Knekt, P., & Aromaa, A. (1991). Prevalence, determinants, and consequences of chronic neck pain in Finland. *American Journal of Epidemiology, 134,* 1356-1367.

McGeary, D. D., Mayer, T. G., Gatchel, R. J., Anagnostis, C., & Proctor, T. J. (2003). Gender-related differences in treatment outcomes for patients with musculoskeletal disorders. *The Spine Journal, 3*, 197-203.

Meeker, W. C., & Haldeman, S. (2002). Chiropractic: a profession at the crossroads of mainstream and alternative medicine. *Annals of Internal Medicine, 136*, 216-27.

Mielenz, T. J., Carey, T. S., Dyrek, D. A., Harris, B. A., Garrett, J. M., & Darter, J. D. (1997). Physical therapy utilization by patients with acute low back pain. *Physical Therapy, 77*, 1040-1051.

Molano, S. M., Burdorf, A., & Elders, L. A. (2001). Factors associated with medical care-seeking due to low-back pain in scaffolders. *American Journal of Industrial Medicine, 40*, 275-281.

Mortimer, M., Ahlberg, G., & MUSIC-Norrtaljie study group. (2003). To seek or not to seek? Care-seeking behaviour among people with low-back pain. *Scandinavian Journal of Public Health, 31,* 194-203.

Murphy, J. F., & Hepworth, J. T. (1996). Age and gender differences in health services utilization. *Research in Nursing and Health, 19*, 323-329.

Murt, H., Parsons, P. E., Harlan, W. R., Thomas, J. W., Lepkowski, J. M., Guire, K. E., et al. (1986). *Disability, utilization, and costs associated with musculoskeletal conditions, United States, 1980* (DHHS Publication No. 86-20405). Washington, DC: U. S. Government Printing Office.

National Library of Medicine, Health Services/Technology Assessment Text. (n.d.). *Understanding acute low back problems: Patient guide.* Retrieved March 24, 2006, from http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=hstat6.chapter.36500

Nelson, C. (1986). Physiotherapy office visits: National Ambulatory Care Survey. *Vital Health Stat 13*, 1-8.

Pathman, D. E., Ricketts, T. C., 3rd, & Konrad, T. R. (2006). How adults' access to outpatient physician services relates to the local supply of primary care physicians in the rural southeast. *Health Services Research, 41,* 79-102.

Pengel, L. H., Herbert, R. D., Maher, C. G., & Refshauge, K. M. (2003). Acute low back pain: Systematic review of its prognosis [Electronic version]. *British Medical Journal, 327,* 323.

Pengel, L. H., Refshauge, K. M., & Maher, C. G. (2004). Responsiveness of pain, disability, and physical impairment outcomes in patients with low back pain. *Spine, 29*, 879-83.

Phillips, K. A., Morrison, K. R., Andersen, R., & Aday, L. A. (1998). Understanding the context of healthcare utilization: Assessing environmental and provider-related variables in the behavioral model of utilization. *Health Services Research, 33,* 571-596.

Reisbord, L. S., & Greenland, S. (1985). Factors associated with self-reported back-pain prevalence: A population-based study. *Journal of Chronic Diseases, 38,* 691-702.

Rizzo, J. A., Abbott, T. A., & Berger, M. L. (1998). The labor productivity effects of chronic backache in the United States. *Medical Care, 36,* 1471-1488.

Shekelle, P. G. (1998). What role for chiropractic in health care? *New England Journal of Medicine, 339*, 1074-5.

Shekelle, P. G., & Brook, R. H. (1991). A community-based study of the use of chiropractic services. *American Journal of Public Health, 81*, 439-442.

Shekelle, P. G., Markovich, M., & Louie, R. (1995a). An epidemiologic study of episodes of back pain care. *Spine, 20*, 1668-1673.

Shekelle, P. G., Markovich, M., & Louie, R. (1995b). Factors associated with choosing a chiropractor for episodes of back pain care. *Medical Care, 33*, 842-50.

Skargen, E. I., Carlsson, P. G., & Oberg, B. E. (1998). One-year follow up comparison of the cost and effectiveness of chiropractic and physiotherapy as primary management for back pain. Subgroup analysis, recurrence, and additional health care utilization. *Spine, 23*, 1875-1883.

Skargren, E. I., Oberg, B. E., Carlsson, P. G., & Gade, M. (1997). Cost and effectiveness analysis of chiropractic and physiotherapy treatment for low back and neck pain. Six month follow-up. *Spine, 22*, 2167-2177.

Smedley, B. D., Stith, A. Y., & Nelson A. R. (Eds.). (2003). *Unequal treatment: Confronting racial and ethnic disparities in health care.* Washington, D.C.: National Academies Press.

Smith, M., & Carber, L. (2002). Chiropractic health care in health professional shortage areas in the United States. *American Journal of Public Health, 92,* 2001-2009.

Sundararajan, V., Konrad, T. R., Garrett, J. & Carey, T. (1998). Patterns and determinants of multiple provider use in patients with acute low back pain. *Journal of General Internal Medicine, 13*, 528-533.

Szpalski, M., Nordin, M., Skovron, M. L., Melot, C., & Cukier, D. (1995). Health care utilization for low back pain in Belgium. Influence of sociocultural factors and health beliefs. *Spine, 20*, 431-442.

Timmreck, T. C. (1998). *An introduction to epidemiology.* Sudbury, MA: Jones and Bartlett Publishers.

Tornqvist, E. W., Kilbom, A., Vingard, E., Alfredsson, L., Hagberg, M., Theorell, T., et al. (2001). The influence on seeking care because of neck and shoulder disorders from work-related exposures. *Epidemiology,12*, 537-545.

U.S. Census Bureau. (2001). *Time series of national population estimates: April 1, 2000 to July 1, 2001.* Retrieved May 3, 2006 from http://www.census.gov/popest /archives/2000s/vintage_2001/US-2001EST-01.html

van Tulder, M. W., Koes, B. W., & Bouter, L. M. (1997) Conservative treatment of acute and chronic nonspecific low back pain. A systematic review of randomized controlled trials of the most common interventions. *Spine, 22,* 2128-2156.

Vingard, E., Alfredsson, L., Hagberg, M., Kilbom, A., Theorell, T., Waldenstrom, M., et al. (2000). To what extent do current and past physical and psychosocial occupational factors explain care-seeking for low back pain in a working population? Results from the Musculoskeletal Intervention Center-Norrtalje Study. *Spine, 25*, 493-500.

Vingard, E., Mortimer, M., Wiktorin, C., Pernold R. P., Fredriksson, K., Nemeth, G., et al. (2002). Seeking care for low back pain in the general population: A two-year follow-up study: results from the MUSIC-Norrtalje Study. *Spine, 27*, 2159-2165.

Vogt, M. T., Simonsick, E. M., Harris, T. B., Nevitt, M.C., Kang, J. D., Rubin, S. M., et al. (2003). Neck and shoulder pain in 70 to 79 year old men and women: Findings

from the Health, Aging and Body Composition Study. *The Spine Journal, 3*, 435-441.

Von Korff, M., Deyo, R. A., Cherkin, D., & Barlow, W. (1993). Back pain in primary care. Outcomes at 1 year. *Spine, 18*, 855-862.

Walker, B. F., Muller, R., & Grant, W. D. (2004). Low back pain in Australian adults. Health provider utilization and care seeking. *Journal of Manipulative and Physiological Therapeutics, 27*, 327-335.

Wasiak, R., & McNeely, E. (2006). Utilization and costs of chiropractic care for work-related low back injuries: Do payment policies make a difference? *The Spine Journal, 6,* 146-153.

Waxman, R., Tennant, A., & Helliwell, P. (1998). Community survey of factors associated with consultation for low back pain. *British Medical Journal, 317*, 1564-1567.

Woolf, A. D., & Pfleger, B. (2003). Burden of major musculoskeletal conditions. *Bulletin of the World Health Organization, 81*, 646-656.

Wright, D., Barrow, S., Fisher, A. D., Horsley, S. D., & Jayson, M. I. (1995). Influence of physical, psychological and behavioural factors on consultations for back pain. *British Journal of Rheumatology, 34*, 156-161.

Appendix A

Public Use MEPS Files Used to Develop Study Sample

MEPS Files Used to Develop Panel 6 Sample

File Name	Description
H59f	2001 Outpatient visits file 16,274 observations 84 variables
H59g	2001 Office based medical provider visits file 147,490 observations 70 variables
H59if1	Appendix to MEPS 2001 Event files 314,599 observations 5 variables
H60	2001 Full year consolidated data file 33,556 observations 1,681 variables
H61	2001 Medical Conditions file 102,489 observations 87 variables
H67f	2002 Outpatient visits file 20,535 observations 86 variables
H67g	2002 Office based medical provider visits file 179,745 observations 73 variables
H67if1	Appendix to MEPS 2002 event files 388,065 observations 5 variables
H69	2002 Medical Conditions file 120,795 observations 86 variables
H70	2002 Full year consolidated data file 39,165 observations 1,626 variables
H71	MEPS Panel 6 Longitudinal weight file 21,135 observations 7 variables

Appendix B

Stata "Do" file Coding for Data Management and Analysis

```
* file to create, transform, and analyze meps data for Panel 6 only
program drop _all
set trace off
program define meps1
  # delimit ;
  version 8.0 ;
  drop _all ;
  set more off ;
  set logtype text ;
  capture log close ;
  quietly log using h:\vcu\meps,replace text ;
  global btime "$S_TIME" ;
  dis in yellow "Meps runs  $S_DATE " _continue ;
  dis in yellow "  $S_TIME " ;
  matrix drop _all ;
  quietly set matsize 800 ;
  set memory 120000 ;
* cntrl controls what the program does ;
  global cntrl=0 ;
  while $cntrl<1 | $cntrl>15{ ;
    capture confirm integer number `xx' ;
    dis "Choose an option" ;
    while _rc~=0 { ;
dis _newline "1 = merge and reduce characteristics files for Panel 6" ;
dis _newline "2 = merge longitudinal weight file with characteristics
files" ;
dis _newline "3 = read, correct, and save meps 01 condition file for BP
only " ;
dis _newline "4 = read, correct, and save meps 02 condition file for BP
only " ;
dis _newline "5 = append 01 and 02 office based and outpatient events" ;
dis _newline "6 = merge meps 01 condition file for BP only with CLNK
file" ;
dis _newline "7 = merge meps 02 condition file for BP only with CLNK
file " ;
dis _newline "8 = merge meps 01 condition file for BP/CLNK with 01
events file " ;
dis _newline "9 = merge meps 02 condition file for BP/CLNK with 02
events file " ;
dis _newline "10 = append the 01 and 02 condition/CLNK/events files ";
dis _newline "11 = merge the 01/02 condition/CLNK/events file with the
characteristics file";
dis _newline "12 = replace missing date values, create episodes" ;
dis _newline "13 = create file of first visits & file of last visits" ;
dis _newline "14 = first episode analysis" ;
dis _newline "15 = last episode analysis" ;
   dis "Enter your choice->" _request(cntrl) ;
   capture confirm integer number $cntrl ;
    } ;
  } ;
  tempfile a1 a2 ;
  if $cntrl==1 { ;
* Use the 2001 characteristics file, only selecting cases from Panel 6 ;
```

```
    use "o:\PUF Stata Files\h60" if panel01==6 ;
* Rename variables that are in both the 01 and 02 files ;
    ren rthlth31 rthlth1 ;
    ren rthlth42 rthlth2 ;
    ren rthlth53 rthlth301 ;
    quietly recode racex (5=1 White) (4=2 Black) (1 2 3=3 Other&Mixed),
gen(race) ;
    keep dupersid rthlth1 rthlth2 rthlth301 race region01
       msa01 age01x sex hispanx marry01x hidegyr ttlp01x
       inscov01 resp01 proxy01 ;
    sort dupersid ;
    save `a1' ;
    drop _all ;
* Use the 2002 characteristics file, only selecting cases from Panel 6 ;
    use "o:\PUF Stata Files\h70" if panel02==6 ;
* Rename variables that are in both the 01 and 02 files ;
    ren rthlth31 rthlth302 ;
    ren rthlth42 rthlth4 ;
    ren rthlth53 rthlth5 ;
    quietly recode racex (1=1 White) (2=2 Black) (3 4 5 6=3
Other&Mixed), gen(race) ;
    sort dupersid ;
    merge dupersid using `a1' ;
    ren _merge source ;
    tab source ;
    gen byte dsppop=1 ;
    label variable dsppop "Target population" ;
    label define pop 0 "No" 1 "Yes" ;
    label values dsppop pop ;
* Label as "no" cases that are only in one year on dsppop ;
    replace dsppop=0 if source~=3 ;
    tab dsppop ;
    sort dupersid ;
* Label as no cases that are under age 18 ;
    replace dsppop=0 if (age01x<18 & age01x~=-1) | (age02x>0
      & age02x<18) ;
    quietly replace age01x=age02x if age01x==-1  ;
    replace dsppop=0 if age01x==-1 ;
    gen byte proxyresp=1 ;
    label variable proxyresp "Was this the respondent?" ;
    label values proxyresp pop ;
    quietly replace proxyresp=0 if resp01==2 | resp02==2 ;
    compare rthlth302 rthlth301 if dsppop==1 ;
    gen byte rthlth3 = rthlth302 ;
    keep dupersid proxyresp region01 msa01 age01x
       sex race hispanx marry01x hidegyr ttlp01x
       inscov01 inscov02 rthlth1 rthlth2 rthlth3
       rthlth4 rthlth5 dsppop proxy01 ;
* save the Panel 6 characteristics file with 2 years of data ;
    sort dupersid ;
    save h:\vcu\h6070red,replace ;
  } ;
  else if $cntrl==2 { ;
```

```
* use the Panel 6 longitudinal weight file ;
    use "o:\PUF Stata Files\h71" ;
    keep dupersid varpsup6 varstrp6 longwtp6 ;
    sort dupersid ;
    save `a1' ;
    drop _all ;
* use the Panel 6 characteristics file with 2 years of data ;
    use h:\vcu\h6070red,replace ;
    merge dupersid using `a1' ;
    tab _merge ;
* only retain those cases that are in both files in dsppop ;
    replace dsppop=0 if _merge~=3 ;
    drop _merge ;
    sort dupersid ;
* save the Panel 6 characteristics file with the longitudinal weights ;
    save h:\vcu\h607071red,replace ;
  } ;
  else if $cntrl==3 | $cntrl==4 { ;
    if $cntrl==3 { ;
* use the 2001 medical conditions file ;
      use h:\vcu\cond01x ;
* select only cases from Panel 6 ;
      drop if panel01==5 ;
    } ;
    else { ;
* use the 2002 medical conditions file ;
      use h:\vcu\cond02x ;
* select only cases from Panel 6 ;
      drop if panel02==7 ;
    } ;
* create variables that identify general spine, LBP & NP cases;
    gen byte spcase=0 ;
    gen byte lbpcase=0 ;
    gen byte lbpcasect=0 ;
    gen byte npcase=0 ;
    gen byte npcasect=0 ;
    gen byte disabil=0 ;
    gen byte bothcase=0 ;
    gen byte bothrnd=0 ;
    label variable spcase "Person with either NP or LBP" ;
    label variable lbpcase "Person with LBP" ;
    label variable npcase "Person with NP" ;
    label variable bothcase "Person with both NP & LBP any round" ;
    label variable bothrnd "Person with both NP and LBP same round" ;
    label variable disabil "Condition associated with disability day" ;
    label variable lbpcasect "Number times person has condition LBP";
    label variable npcasect "Number of times person has condition NP" ;
    label define pop 0 "No" 1 "Yes" ;
    label values spcase pop ;
    label values lbpcase pop ;
    label values npcase pop ;
    label values disabil pop ;
    label values bothcase pop ;
```

```
    label values bothrnd pop ;
    quietly replace spcase=1 if
(icd9codx=="353"|icd9codx=="720"|icd9codx=="721"
               |icd9codx=="722" | icd9codx=="723"|icd9codx=="724" |
icd9codx=="739"
               |icd9codx=="846" | icd9codx=="847" | icd9codx=="953" ) ;
    quietly replace spcase=0 if icd9code=="353.0" ;
    quietly replace spcase=0 if icd9code=="353.1" ;
    quietly replace spcase=0 if icd9code=="353.3" ;
    quietly replace spcase=0 if icd9code=="353.5" ;
    quietly replace spcase=0 if icd9code=="353.6" ;
    quietly replace spcase=0 if icd9code=="353.7" ;
    quietly replace spcase=0 if icd9code=="353.8" ;
    quietly replace spcase=0 if icd9code=="353.9" ;
    quietly replace spcase=0 if icd9code=="720.3" ;
    quietly replace spcase=0 if icd9code=="720.4" ;
    quietly replace spcase=0 if icd9code=="720.5" ;
    quietly replace spcase=0 if icd9code=="720.6" ;
    quietly replace spcase=0 if icd9code=="720.7" ;
    quietly replace spcase=0 if icd9code=="720.8" ;
    quietly replace spcase=0 if icd9code=="720.9" ;
    quietly replace spcase=0 if icd9code=="721.2" ;
    quietly replace spcase=0 if icd9code=="721.5" ;
    quietly replace spcase=0 if icd9code=="721.6" ;
    quietly replace spcase=0 if icd9code=="721.7" ;
    quietly replace spcase=0 if icd9code=="721.8" ;
    quietly replace spcase=0 if icd9code=="721.9" ;
    quietly replace spcase=0 if icd9code=="722.8" ;
    quietly replace spcase=0 if icd9code=="724.1" ;
    quietly replace spcase=0 if icd9code=="739.0" ;
    quietly replace spcase=0 if icd9code=="739.2" ;
    quietly replace spcase=0 if icd9code=="739.3" ;
    quietly replace spcase=0 if icd9code=="739.5" ;
    quietly replace spcase=0 if icd9code=="739.6" ;
    quietly replace spcase=0 if icd9code=="739.7" ;
    quietly replace spcase=0 if icd9code=="739.8" ;
    quietly replace spcase=0 if icd9code=="847.1" ;
    quietly replace spcase=0 if icd9code=="847.5" ;
    quietly replace spcase=0 if icd9code=="847.6" ;
    quietly replace spcase=0 if icd9code=="847.7" ;
    quietly replace spcase=0 if icd9code=="847.8" ;
    quietly replace spcase=0 if icd9code=="953.1" ;
    quietly replace spcase=0 if icd9code=="953.3" ;
    quietly replace spcase=0 if icd9code=="953.4" ;
    quietly replace spcase=0 if icd9code=="953.5" ;
    quietly replace spcase=0 if icd9code=="953.6" ;
    quietly replace spcase=0 if icd9code=="953.7" ;
    quietly replace spcase=0 if icd9code=="953.8" ;
    quietly replace spcase=0 if icd9code=="953.9" ;
    gen byte spcasect = 1 if spcase==1 ;
    quietly replace lbpcase=1 if icd9code=="353.4" ;
    quietly replace lbpcase=1 if icd9code=="720.0" ;
    quietly replace lbpcase=1 if icd9code=="720.1" ;
```

```
quietly replace lbpcase=1 if icd9code=="720.2" ;
quietly replace lbpcase=1 if icd9code=="721.3" ;
quietly replace lbpcase=1 if icd9code=="721.4" ;
quietly replace lbpcase=1 if icd9code=="722.1" ;
quietly replace lbpcase=1 if icd9code=="722.2" ;
quietly replace lbpcase=1 if icd9code=="722.3" ;
quietly replace lbpcase=1 if icd9code=="722.5" ;
quietly replace lbpcase=1 if icd9code=="722.6" ;
quietly replace lbpcase=1 if icd9code=="722.7" ;
quietly replace lbpcase=1 if icd9code=="722.9" ;
quietly replace lbpcase=1 if icd9code=="724.0" ;
quietly replace lbpcase=1 if icd9code=="724.2" ;
quietly replace lbpcase=1 if icd9code=="724.3" ;
quietly replace lbpcase=1 if icd9code=="724.4" ;
quietly replace lbpcase=1 if icd9code=="724.5" ;
quietly replace lbpcase=1 if icd9code=="724.6" ;
quietly replace lbpcase=1 if icd9code=="724.7" ;
quietly replace lbpcase=1 if icd9code=="724.8" ;
quietly replace lbpcase=1 if icd9code=="724.9" ;
quietly replace lbpcase=1 if icd9code=="739.9" ;
quietly replace lbpcase=1 if icd9code=="739.4" ;
quietly replace lbpcase=1 if icd9code=="846.0" ;
quietly replace lbpcase=1 if icd9code=="846.1" ;
quietly replace lbpcase=1 if icd9code=="846.2" ;
quietly replace lbpcase=1 if icd9code=="846.3" ;
quietly replace lbpcase=1 if icd9code=="846.4" ;
quietly replace lbpcase=1 if icd9code=="846.5" ;
quietly replace lbpcase=1 if icd9code=="846.6" ;
quietly replace lbpcase=1 if icd9code=="846.7" ;
quietly replace lbpcase=1 if icd9code=="846.8" ;
quietly replace lbpcase=1 if icd9code=="846.9" ;
quietly replace lbpcase=1 if icd9code=="847.2" ;
quietly replace lbpcase=1 if icd9code=="847.3" ;
quietly replace lbpcase=1 if icd9code=="847.4" ;
quietly replace lbpcase=1 if icd9code=="847.9" ;
quietly replace lbpcase=1 if icd9code=="953.2" ;
quietly replace npcase=1 if icd9code=="353.2" ;
quietly replace npcase=1 if icd9code=="721.0" ;
quietly replace npcase=1 if icd9code=="721.1" ;
quietly replace npcase=1 if icd9code=="722.0" ;
quietly replace npcase=1 if icd9code=="722.4" ;
quietly replace npcase=1 if icd9code=="723.0" ;
quietly replace npcase=1 if icd9code=="723.1" ;
quietly replace npcase=1 if icd9code=="723.2" ;
quietly replace npcase=1 if icd9code=="723.3" ;
quietly replace npcase=1 if icd9code=="723.4" ;
quietly replace npcase=1 if icd9code=="723.5" ;
quietly replace npcase=1 if icd9code=="723.6" ;
quietly replace npcase=1 if icd9code=="723.7" ;
quietly replace npcase=1 if icd9code=="723.8" ;
quietly replace npcase=1 if icd9code=="723.9" ;
quietly replace npcase=1 if icd9code=="739.1" ;
quietly replace npcase=1 if icd9code=="847.0" ;
```

```
    quietly replace npcase=1 if icd9code=="953.0" ;
    quietly replace lbpcasect=1 if lbpcase==1 ;
    quietly replace npcasect=1 if npcase==1 ;
    sort dupersid ;
    quietly by dupersid: replace spcasect=sum(spcasect) ;
    quietly by dupersid: replace lbpcasect=sum(lbpcasect) ;
    quietly by dupersid: replace npcasect=sum(npcasect) ;
    quietly by dupersid: replace spcasect=spcasect[_N] ;
    quietly by dupersid: replace lbpcasect=lbpcasect[_N] ;
    quietly by dupersid: replace npcasect=npcasect[_N] ;
    quietly by dupersid: replace bothcase=1 if lbpcasect>0 & npcasect>0
;
    keep if lbpcasect>0 | npcasect>0 ;
    drop if icd9codx=="-1" | icd9codx=="-9" ;
    gen icd9cod=real(icd9codx) ;
    quietly recode icd9cod (001/139=1) (140/239=2) (240/279=3)
(280/289=4)
      (290/319=5) (320/352 354/389=6) (390/459=7) (460/519=8)
      (520/579=9) (580/629=10) (630/679=11) (680/709=12) (710/720
725/739=13)
      (740/759=14) (760/779=15) (780/799=16) (800/845 848/952
954/999=17)
      (.=18) (353 720 721 722 723 724 846 847 953=19), gen(icdrec) ;
    icd9 gen icd=icd9codx, description ;
* Eliminate cases coded with the "V" codes, these are not true
comorbidities ;
    drop if icdrec==18 ;
* Eliminate cases that are not specific conditions ;
* general symptoms ;
    drop if icd9cod==780 ;
* certain adverse eff ;
    drop if icd9cod==995 ;
* early/threatened labor ;
    drop if icd9cod==644 ;
* infertility ;
    drop if icd9cod==606 | icd9cod==628 ;
* Eliminate double coding of a condition within a round ;
    sort dupersid icd9cod ;
    quietly by dupersid icd9cod: drop if _n > 1 ;
* Count the number of comorbidities by round ;
    quietly egen byte comorbct=sum(spcase~=1), by(dupersid condrn);
* Mark the last condition in each round if the round has a spcase, that
is last ;
    sort dupersid condrn spcase;
    quietly by dupersid condrn: gen byte last=_n==_N ;
* Generate a variable that gives a cumulative count by round ;
    quietly by dupersid: gen byte cumcomor=sum(comorbct*(last==1));
    label variable cumcomor "Num comorbidities up to and including this
round" ;
    drop if spcase==0 ;
    quietly recode cumcomor (0=0 0) (1=1 1) (2=2 2) (3 4=3 3-4) (*=4
5+), gen(comorbids);
```

```
    label variable comorbids "Comorbidities up to and including this
round" ;
* Identify persons who have LBP and NP at the same time in a round ;
    quietly egen byte lbpctrnd=sum (lbpcase), by (dupersid condrn) ;
    quietly egen byte npctrnd=sum (npcase), by (dupersid condrn) ;
    quietly replace bothrnd=1 if lbpctrnd>0 & npctrnd>0 ;
* This is the variable that identifies if a condition has disability day
associated with it ;
    quietly replace disabil=1 if (misswork==1 | missschl==1 |
inbedflg==1) ;
    if $cntrl==3 { ;
      keep dupersid condrn condidx spcase spcasect bothcase bothrnd
           lbpcase npcase icd9codx lbpcasect npcasect disabil
           cumcomor comorbids ;
    } ;
    else { ;
      keep dupersid condrn condidx spcase spcasect bothcase bothrnd
           lbpcase npcase icd9codx lbpcasect npcasect disabil
           cumcomor comorbids ;
    } ;
    compress ;
    sum ;
     if $cntrl==3 { ;
* Save the BP conditions file for 2001 Panel 6 ;
    save h:\vcu\h61red,replace ;
    } ;
    else { ;
* Save the BP conditions file for 2002 Panel 6 ;
    save h:\vcu\h69red,replace ;
    } ;
  } ;
  else if $cntrl==5 { ;
  * Use the 2001 Outpt visits file ;
    use "o:\PUF Stata Files\h59f" ;
    keep dupersid evntidx opdateyr opdatemm opdatedd seedoc
       medptype opicd1x opicd2x opicd3x opicd4x opxp01x ;
    ren opdateyr dateyr ;
    ren opdatemm datemm ;
    ren opdatedd datedd ;
    ren opicd1x icd1x ;
    ren opicd2x icd2x ;
    ren opicd3x icd3x ;
    ren opicd4x icd4x ;
    ren opxp01x expend ;
    save `a1', replace ;
    drop _all ;
  * Use the 2001 Office based visits file ;
    use "o:\PUF Stata Files\h59g" ;
    keep dupersid evntidx obdateyr obdatemm obdatedd seedoc
       medptype obicd1x obicd2x obicd3x obicd4x obxp01x ;
    ren obdateyr dateyr ;
    ren obdatemm datemm ;
    ren obdatedd datedd ;
```

```
    ren obicd1x icd1x ;
    ren obicd2x icd2x ;
    ren obicd3x icd3x ;
    ren obicd4x icd4x ;
    ren obxp01x expend ;
    append using `a1' ;
* Save the combined 01 outpt and office based visits file ;
    save h:\vcu\h59f59gred,replace ;
    drop _all ;
* Use the 2002 Outpt visits file ;
    use "o:\PUF Stata Files\h67f" ;
    keep dupersid evntidx opdateyr opdatemm opdatedd seedoc
       medptype opicd1x opicd2x opicd3x opicd4x opxp02x ;
    ren opdateyr dateyr ;
    ren opdatemm datemm ;
    ren opdatedd datedd ;
    ren opicd1x icd1x ;
    ren opicd2x icd2x ;
    ren opicd3x icd3x ;
    ren opicd4x icd4x ;
    ren opxp02x expend ;
    save `a1', replace ;
    drop _all ;
* Use the 2002 office based visits file ;
    use "o:\PUF Stata Files\h67g" ;
    keep dupersid evntidx obdateyr obdatemm obdatedd seedoc
       medptype obicd1x obicd2x obicd3x obicd4x obxp02x;
    ren obdateyr dateyr ;
    ren obdatemm datemm ;
    ren obdatedd datedd ;
    ren obicd1x icd1x ;
    ren obicd2x icd2x ;
    ren obicd3x icd3x ;
    ren obicd4x icd4x ;
    ren obxp02x expend ;
    append using `a1' ;
* Save the combined 02 outpt and office based visits file ;
    save h:\vcu\h67f67gred, replace ;
 } ;
  else if $cntrl==6 { ;
* Use the 01 BP conditions file ;
    use h:\vcu\h61red ;
    sort condidx ;
    save `a1' ;
    drop _all ;
* Use the 2001 CLNK Appendix file ;
    use "o:\PUF Stata Files\h59if1" ;
* Only keep events which are outpt or office based visits ;
    keep if eventype == 1 | eventype == 2 ;
    sort condidx ;
    merge condidx using `a1' ;
     tab _merge ;
```

```
* Only keep cases which are on both files or on the conditions file
as these are the Panel 6 cases ;
    keep if _merge>1 ;
    drop _merge ;
* Create a variable to identify if an event is associated with each
condition ;
    gen byte havevent = 1 ;
    quietly replace havevent = 0 if eventype == . ;
    label variable havevent "Care Seeker" ;
    label values havevent pop ;
    tab havevent ;
* Save the 01 BP conditions file with the Appendix file variables ;
    save h:\vcu\h6159ired,replace ;
  } ;
  else if $cntrl==7 { ;
* Use the 02 BP conditions file ;
    use h:\vcu\h69red ;
    sort condidx ;
    save `a1' ;
    drop _all ;
* Use the 2002 CLNK Appendix file ;
    use "o:\PUF Stata Files\h67if1" ;
* Only keep cases which are outpt or office based visits ;
    keep if eventype == 1 | eventype == 2 ;
    sort condidx ;
    merge condidx using `a1' ;
     tab _merge ;
* Only keep cases which are in both files or on the conditions file as
these are Panel 6 cases ;
    keep if _merge>1 ;
    drop _merge ;
* Create a variable to identify if an event is associated with each
condition ;
    gen byte havevent = 1 ;
    quietly replace havevent = 0 if eventype == . ;
    label variable havevent "Care Seeker" ;
    label values havevent pop ;
    tab havevent ;
* Save the 02 BP Panel 6 conditions file with the Appendix file
variables ;
    save h:\vcu\h6967ired,replace ;
  } ;
  else if $cntrl==8 { ;
* Use the 01 combined visits file ;
    use h:\vcu\h59f59gred ;
    sort evntidx ;
    save `a1' ;
    drop _all ;
* Use the 01 BP conditions file with the Appendix file ;
    use h:\vcu\h6159ired ;
    sort evntidx ;
* Merge the conditions file with the visits file for 01 ;
    merge evntidx using `a1' ;
```

```
    tab _merge ;
* Only retain those cases that have records in either conditions or
both files ;
    drop if _merge == 2 ;
    tab _merge havevent ;
    drop _merge ;
    sort dupersid ;
* Save the BP conditions plus visits file for 2001 ;
    save h:\vcu\h59f59g5159ired,replace ;
  } ;
  else if $cntrl==9 { ;
* Use the 02 combined visits file ;
    use h:\vcu\h67f67gred ;
    sort evntidx ;
    save `a1' ;
    drop _all ;
* Use the 02 BP conditions file with the Appendix file ;
    use h:\vcu\h6967ired ;
    sort evntidx ;
    merge evntidx using `a1' ;
    tab _merge ;
* Only retain those cases that have records in either conditions or both
files ;
   drop if _merge == 2 ;
   tab _merge havevent ;
   drop _merge ;
   sort dupersid ;
* Save the BP conditions plus visits file for 2002 ;
   save h:\vcu\h67f67g6967ired,replace ;
   } ;
  else if $cntrl==10 { ;
* Use the BP conditions plus visits file for 01 ;
    use h:\vcu\h59f59g5159ired ;
    save `a1' ;
    drop _all ;
* Use the BP conditions plus visits file for 02 ;
    use h:\vcu\h67f67g6967ired ;
    append using `a1' ;
    sort condidx evntidx ;
* Drop out duplicates created for persons who have events in one
*   of the two years and whose condidx shows up in both ;
    by condidx: gen byte ctdup = _N ;
    by condidx: drop if ctdup>1 & evntidx =="" & _n==1 ;
    drop ctdup ;
    keep if medptype==-1 | medptype==1 | medptype==8 | havevent==0 ;
* Save the 01-02 BP conditions plus visits file ;
    save h:\vcu\h59f59g5159e67f67g6967ired,replace ;
  } ;
else if $cntrl==11 { ;
* Use the 01-02 BP conditions plus visits file ;
    use h:\vcu\h59f59g5159e67f67g6967ired ;
    sort dupersid ;
* Merge with the Panel 6 characteristics file ;
```

```
    merge dupersid using h:\vcu\h607071red ;
    tab _merge ;
* Mark persons who have BP but no visits with medptype 0 ;
    replace medptype = 0 if medptype == . & havevent==0  & spcase==1 ;
* Identify persons who are in sample but do not have BP ;
    replace dsppop=0 if medptype == . ;
* Drop out duplicate records that exist in the non-BP subpop ;
    sort dupersid dsppop medptype ;
    gen int counter=0 ;
    quietly by dupersid: replace counter=1 if dsppop==0 & _N>1 ;
    replace counter= sum(counter) ;
    display "drop of duplicates in dsppop=0" counter[_N] ;
    quietly by dupersid: drop if dsppop==0 & _n>1 ;
* Drop out records that do not have psu or strata ;
    drop if varpsup6==. & varstrp6==. ;
* Count the number of records on the file by dupersid ;
    quietly by dupersid: replace counter=_N ;
    tab counter dsppop ;
    drop counter ;
* Create a variable to identify provider type ;
    gen byte caretype=4 ;
    label variable caretype "Who provided care?" ;
    label define who 0 "No care" 1 "MD" 2 "DC" 3 "PT" 4 "No BP"  ;
    label values caretype who ;
* Persons who have condition but no visits = 0 ;
    quietly replace caretype=0 if medptype==0 & dsppop==1 ;
* Persons who have visited MD = 1 ;
    quietly replace caretype=1 if medptype==-1 & dsppop==1 ;
* Persons who have visited DC = 2 ;
    quietly replace caretype=2 if medptype==1 & dsppop==1 ;
* Persons who have visited PT = 3 ;
    quietly replace caretype=3 if medptype==8 & dsppop==1 ;
* Persons who are in subpop no BP = 4 ;
    quietly replace caretype=4 if dsppop==0 ;
    drop _merge ;
    sort dupersid ;
    save h:\vcu\h59f59g5159e67f67g6967i607071red,replace ;
  } ;
else if $cntrl==12 { ;
* This section deals with missing date values in the Panel 6 file ;
 use h:\vcu\h59f59g5159e67f67g6967i607071red ;
  sort dupersid ;
  capture gen byte unknown=0 ;
  replace unknown=1 if datemm==-8 | datemm==-9 | datedd==-8 | datedd==-9
;
  capture egen byte has= sum(unknown), by(dupersid) ;
* Case 41387014 has one record with no date making up a single episode
in Rnd 3 ;
  replace dateyr=2001 if dupersid=="41387014" & dateyr==-9 ;
  replace datemm=1 if dupersid=="41387014" & datemm==-9 ;
  replace datedd=1 if dupersid=="41387014" & datedd==-9 ;
  drop if dateyr==-9 | dateyr==-8 ;
  drop if datemm==-9 | datemm==-8 ;
```

```
* Replace missing day variables ;
  sort dupersid dateyr datemm datedd ;
  capture gen byte undd=0 ;
  by dupersid dateyr datemm: replace undd=1 if datedd==-8 | datedd==-9 ;
  capture egen int hasdd= sum(undd), by (dupersid dateyr datemm) ;
* If only one date is missing in a case then use 15 (mid month) ;
  replace datedd=15 if hasdd==1 & (datedd==-8 | datedd==-9) ;
* Randomize missing days for all other cases ;
  replace datedd=round((uniform()*30), 1) if hasdd>1 & (datedd==-8 |
datedd==-9)
    & (datemm==4 | datemm==6 | datemm==9 | datemm==11) ;
  replace datedd=round((uniform()*31), 1) if hasdd>1 & (datedd==-8 |
datedd==-9)
    & (datemm==1 | datemm==3 | datemm==5 | datemm==7 | datemm==8 |
datemm==10
    | datemm==12) ;
  replace datedd=round((uniform()*28), 1) if hasdd>1 & (datedd==-8 |
datedd==-9)
    & datemm==2 ;
  replace datedd=1 if datedd==0 ;
* Create a variable using the mdy function that represents the elapsed
date ;
  capture gen edate = mdy(datemm, datedd, dateyr) ;
  sort dupersid edate ;
  capture by dupersid: gen int episode=_n==1 ;
  label variable episode "Episode Number" ;
* Create episodes following the rule of no visits for a 90 day period ;
  local num=_N ;
  forvalues a1=1(1)`num' { ;
    if episode[`a1']==0 { ;
      if edate[`a1']-edate[`a1'-1]>90 { ;
        quietly replace episode=episode[`a1'-1]+1 if _n==`a1' ;
      } ;
      else { ;
        quietly replace episode=episode[`a1'-1] if _n==`a1'  ;
      } ;
    } ;
    } ;
  capture by dupersid:gen int toteps=episode[_N] ;
  label variable toteps "Number of episodes in 2 year period" ;
  tab episode ;
  sort dupersid episode ;
  capture by dupersid:gen byte first=_n==1 ;
  capture by dupersid:gen byte last=_n==_N ;
  label variable first "First episode" ;
  label variable last "Last episode" ;
  tab toteps if first==1 ;
  drop edate unknown has hasdd undd ;
  sort dupersid episode ;
  capture gen byte visitnum=0 ;
  quietly by dupersid episode: replace visitnum=_N if caretype ~=0 | 4 ;
  capture egen int mdvisit=sum(caretype==1), by(dupersid episode) ;
  capture egen int dcvisit=sum(caretype==2), by(dupersid episode) ;
```

```
  capture egen int ptvisit=sum(caretype==3), by(dupersid episode) ;
  label variable visitnum "Number visits this episode" ;
  label variable mdvisit "Number MD visits this episode" ;
  label variable dcvisit "Number DC visits this episode" ;
  label variable ptvisit "Number PT visits this episode" ;
  gen byte whosaw=0 ;
  label variable whosaw "Practitioners seen during episode" ;
  label define saw 0 "None" 1 "MD Only" 2 "DC Only" 3 "PT only" 4 "MD &
DC" 5 "MD & PT"
      6 "DC & PT" 7 "MD & DC & PT" ;
  label values whosaw saw ;
  quietly replace whosaw=1 if mdvisit > 0 & dcvisit==0 & ptvisit==0 ;
  quietly replace whosaw=2 if mdvisit==0 & dcvisit > 0 & ptvisit==0 ;
  quietly replace whosaw=3 if mdvisit==0 & dcvisit==0 & ptvisit > 0 ;
  quietly replace whosaw=4 if mdvisit > 0 & dcvisit > 0 & ptvisit==0 ;
  quietly replace whosaw=5 if mdvisit > 0 & dcvisit==0 & ptvisit > 0 ;
  quietly replace whosaw=6 if mdvisit==0 & dcvisit > 0 & ptvisit > 0 ;
  quietly replace whosaw=7 if mdvisit > 0 & dcvisit > 0 & ptvisit > 0 ;
* Identify perceived health status during the round in which the
condition was ID'd ;
  gen byte rthlth=0 ;
  label variable rthlth "Perceived health status" ;
  label define health 1 "Excellent" 2 "Very Good" 3 "Good" 4 "Fair" 5
"Poor" ;
  label values rthlth health ;
  quietly replace rthlth=rthlth1 if condrn==1 ;
  quietly replace rthlth=rthlth2 if condrn==2 ;
  quietly replace rthlth=rthlth3 if condrn==3 ;
  quietly replace rthlth=rthlth4 if condrn==4 ;
  quietly replace rthlth=rthlth5 if condrn==5 ;
  quietly replace rthlth=1 if dsppop==0 & rthlth==0 | rthlth==-1 ;
  quietly replace rthlth=. if rthlth==-1 ;
* Replace negative income values with the value zero ;
  quietly replace ttlp01x=0 if ttlp01x<0 ;
* Recode education ;
  quietly recode hidegyr (-8 0 1=1 Nodeg) (2/3=2 HS_GED) (4/6=3
College_Uni) (7=4 Othdeg), gen(educ) ;
  label define gend 1 "Male" 2 "Female" ;
  label values sex gend ;
  label define hisp 1 "Hispanic" 2 "Not Hispanic" ;
  label values hispanx hisp ;
  quietly recode marry01x (1=1 Married) (2 3 4=2 PreviouslyMarried) (5=3
NeverMarried), gen(marstat) ;
  quietly replace marstat=3 if dsppop==0 & marstat==6 | marstat==-8 ;
  quietly replace educ=1 if dsppop==0 & educ==-9 | educ==-7 | educ==8 ;
  label define msa 0 "Non-Msa" 1 "MSA" ;
  label values msa01 msa ;
  quietly replace msa=0 if dsppop==0 & msa==-1 ;
  label define cens 1 "Northeast" 2 "Midwest" 3 "South" 4 "West" ;
  label values region01 cens ;
  quietly replace region01=1 if dsppop==0 & region01==-1 ;
  label define insur 1 "Any Private" 2 "Public only" 3 "Uninsured" ;
  label values inscov01 insur ;
```

```
  quietly replace spcase=0 if spcase==. ;
  quietly replace lbpcase=0 if lbpcase==. ;
  quietly replace npcase=0 if npcase==. ;
  quietly replace bothcase=0 if bothcase==. ;
  quietly replace bothrnd=0 if bothrnd==. ;
  quietly replace havevent=0 if havevent==. ;
  quietly replace disabil=0 if disabil==. ;
  quietly replace comorbids=0 if comorbids==. ;
  quietly replace cumcomor=0 if cumcomor==. ;
    save h:\vcu\finalfile,replace ;
  } ;
else if $cntrl==13 { ;
  use if first==1 using h:\vcu\finalfile ;
  keep dupersid icd9codx condrn spcase lbpcase npcase bothcase bothrnd
     msa01 region01 ttlp01x inscov01 rthlth disabil comorbids cumcomor
     age01x sex race hispanx marstat educ havevent whosaw proxy01
     proxyresp dsppop varpsup6 varstrp6 longwtp6 caretype episode
     toteps visitnum mdvisit dcvisit ptvisit first last ;
  tab race, gen(rac) ;
  tab marstat, gen(mar) ;
  tab educ, gen(edu) ;
  tab region01, gen(region) ;
  tab inscov01, gen(insur) ;
  tab rthlth, gen(hlth) ;
  tab comorbids, gen (comor) ;
  quietly replace lbpcase=0 if bothrnd==1 ;
  quietly replace npcase=0 if bothrnd==1 ;
  gen byte lbppop=0 ;
  quietly replace lbppop=1 if dsppop==1 & lbpcase==1 ;
  gen byte nppop=0 ;
  quietly replace nppop=1 if dsppop==1 & npcase==1 ;
  gen byte bothpop=0 ;
  quietly replace bothpop=1 if dsppop==1 & bothrnd==1 ;
  gen byte bpseekpop=0 ;
  quietly replace bpseekpop=1 if lbppop==1 & havevent==1 ;
  gen byte npseekpop=0 ;
  quietly replace npseekpop=1 if nppop==1 & havevent==1 ;
  gen byte boseekpop=0 ;
  quietly replace boseekpop=1 if bothpop==1 & havevent==1 ;
  save h:\vcu\finalfilefirst,replace ;
  drop _all ;
  use if last==1 using h:\vcu\finalfile;
  keep dupersid icd9codx condrn spcase lbpcase npcase bothcase bothrnd
     msa01 region01 ttlp01x inscov01 rthlth disabil comorbids cumcomor
     age01x sex race hispanx marstat educ havevent whosaw proxy01
     proxyresp dsppop varpsup6 varstrp6 longwtp6 caretype episode
     toteps visitnum mdvisit dcvisit ptvisit first last ;
  tab race, gen(rac) ;
  tab marstat, gen(mar) ;
  tab educ, gen(edu) ;
  tab region01, gen(region) ;
  tab inscov01, gen(insur) ;
  tab rthlth, gen(hlth) ;
```

```
  tab comorbids, gen (comor) ;
  quietly replace lbpcase=0 if bothrnd==1 ;
  quietly replace npcase=0 if bothrnd==1 ;
  gen byte lbppop=0 ;
  quietly replace lbppop=1 if dsppop==1 & lbpcase==1 ;
  gen byte nppop=0 ;
  quietly replace nppop=1 if dsppop==1 & npcase==1 ;
  gen byte bothpop=0 ;
  quietly replace bothpop=1 if dsppop==1 & bothrnd==1 ;
  gen byte bpseekpop=0 ;
  quietly replace bpseekpop=1 if lbppop==1 & havevent==1 ;
  gen byte npseekpop=0 ;
  quietly replace npseekpop=1 if nppop==1 & havevent==1 ;
  gen byte boseekpop=0 ;
  quietly replace boseekpop=1 if bothpop==1 & havevent==1 ;
  save h:\vcu\finalfilelast,replace ;
 } ;
else if $cntrl==14 { ;
  use h:\vcu\finalfilefirst ;
  svyset [pweight= longwtp6], strata(varstrp6) psu(varpsup6) ;
  display "******************************" ;
  display "OUTPUT FOR THE FIRST EPISODES " ;
  display "******************************" ;
  tab lbppop ;
  display "ICD-9 codes for LBP" ;
  tab icd9codx if lbppop==1 ;
  display "Was the household respondent a proxy for LBP?" ;
  tab proxy01 if lbppop==1 ;
  display "Was the respondent the person with LBP?" ;
  tab proxyresp if lbppop==1 ;
  tab nppop ;
  display "ICD-9 codes for NP" ;
  tab icd9codx if nppop==1 ;
  display "Was the household respondent a proxy for NP?" ;
  tab proxy01 if nppop==1 ;
  display "Was the respondent the person with NP?" ;
  tab proxyresp if nppop==1 ;
  tab bothpop ;
  display "Was the household respondent a proxy for both LBP and NP?" ;
  tab proxy01 if bothpop==1 ;
  display "Was the respondent the person with LBP or NP?" ;
  tab proxyresp if bothpop==1 ;
  display "********************************" ;
  display "OUTPUT FOR THE FIRST EPISODE LBP" ;
  display "********************************" ;
  svytotal lbppop ;
  svyprop lbppop ;
  svyprop havevent, subpop(lbppop);
  svymean age01x, subpop(lbppop) ;
  svymean age01x, by(lbppop havevent) ;
  lincom [age01x]4 - [age01x]3 ;
  svylogit havevent age01x, subpop(lbppop) ;
  svylogit, or ;
```

```
svyprop sex, by(lbppop) ;
svyprop sex, by(lbppop havevent) ;
svytab sex havevent, subpop(lbppop)count row obs;
svylogit havevent sex, subpop(lbppop) ;
svylogit, or ;
svyprop race, by(lbppop) ;
svyprop race, by(lbppop havevent) ;
svytab race havevent, subpop(lbppop)count row obs ;
svylogit havevent rac2-rac3, subpop(lbppop) ;
svylogit, or ;
lincom rac2 + rac3, or ;
svyprop hispanx, by(lbppop) ;
svyprop hispanx, by(lbppop havevent) ;
svytab hispanx havevent, subpop(lbppop)count row obs ;
svylogit havevent hispanx, subpop(lbppop) ;
svylogit, or ;
svyprop marstat, by(lbppop) ;
svyprop marstat, by(lbppop havevent) ;
svytab marstat havevent, subpop(lbppop)count row obs ;
svylogit havevent mar2-mar3, subpop(lbppop) ;
svylogit, or ;
lincom mar2 + mar3, or ;
svyprop educ, by(lbppop) ;
svyprop educ, by(lbppop havevent) ;
svytab educ havevent, subpop(lbppop)count row obs ;
svylogit havevent edu2-edu4, subpop(lbppop) ;
svylogit, or ;
lincom edu2 + edu3 + edu4, or ;
svyprop msa01, by(lbppop) ;
svyprop msa01, by(lbppop havevent) ;
svytab msa01 havevent, subpop(lbppop)count row obs ;
svylogit havevent msa01, subpop(lbppop) ;
svylogit, or ;
svyprop region01, by(lbppop) ;
svyprop region01, by(lbppop havevent) ;
svytab region01 havevent, subpop(lbppop)count row obs ;
svylogit havevent region2-region4, subpop(lbppop) ;
svylogit, or ;
lincom region2 + region3 + region4, or ;
svymean ttlp01x, subpop(lbppop) ;
svymean ttlp01x, by(lbppop havevent) ;
lincom [ttlp01x]4 - [ttlp01x]3 ;
svylogit havevent ttlp01x, subpop(lbppop) ;
svylogit, or ;
svyprop inscov01, by(lbppop) ;
svyprop inscov01, by(lbppop havevent) ;
svytab inscov01 havevent, subpop(lbppop)count row obs ;
svylogit havevent insur2-insur3, subpop(lbppop) ;
svylogit, or ;
lincom insur2 + insur3, or ;
svyprop rthlth, by(lbppop) ;
svyprop rthlth, by(lbppop havevent) ;
svytab rthlth havevent, subpop(lbppop)count row obs ;
```

```
svylogit havevent hlth2-hlth5, subpop(lbppop) ;
svylogit, or ;
lincom hlth2 + hlth3 + hlth4 + hlth5, or ;
svyprop disabil, by(lbppop) ;
svyprop disabil, by(lbppop havevent) ;
svytab disabil havevent, subpop(lbppop)count row obs ;
svylogit havevent disabil, subpop(lbppop) ;
svylogit, or ;
svyprop comorbids, by(lbppop) ;
svyprop comorbids, by(lbppop havevent) ;
svytab comorbids havevent, subpop(lbppop)count row obs ;
svylogit havevent comor2-comor5, subpop(lbppop) ;
svylogit, or ;
lincom comor2 + comor3 + comor4 + comor5, or ;
svymean cumcomor, subpop(lbppop) ;
svymean cumcomor, by(lbppop havevent) ;
lincom [cumcomor]4 - [cumcomor]3 ;
svylogit havevent cumcomor, subpop(lbppop) ;
svylogit, or ;
quietly recode age01x (0/39=1 Young) (40/59=2 Mid) (60/85=3 Old),
  gen(agecat) ;
tab agecat, gen(age) ;
svyprop agecat, by(lbppop) ;
svyprop agecat, by(lbppop havevent) ;
svytab agecat havevent, subpop (lbppop) count row obs ;
svylogit havevent age2-age3, subpop(lbppop) ;
svylogit, or ;
lincom age2 + age3, or ;
svylogit havevent age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
       msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth5 disabil
       comor2-comor5, subpop(lbppop) ;
svylogit, or ;
svylogit havevent age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
       msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth5 disabil
       cumcomor, subpop(lbppop) ;
svylogit, or ;
svylogit havevent age01x sex hispanx mar2-mar3 msa01 region2-region4
       insur2-insur3 hlth2-hlth5 comor2-comor5, subpop(lbppop) ;
svylogit, or ;
svylogit havevent age01x sex hispanx mar2-mar3 msa01 region2-region4
       insur2-insur3 hlth2-hlth5 cumcomor, subpop(lbppop) ;
svylogit, or ;
logit havevent age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
       msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth5 disabil
       comor2-comor5 if lbppop==1 ;
est store A ;
lstat ;
logit havevent age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
       msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth5 disabil
       cumcomor if lbppop==1 ;
est store B ;
lstat ;
logit havevent age01x sex hispanx mar2-mar3 msa01 region2-region4
```

```
       insur2-insur3 hlth2-hlth5 comor2-comor5 if lbppop==1 ;
lstat ;
lroc, nograph ;
lsens, nograph ;
lrtest A, stats ;
logit  havevent age01x sex hispanx mar2-mar3 msa01 region2-region4
       insur2-insur3 hlth2-hlth5 cumcomor if lbppop==1 ;
lstat ;
lrtest B, stats ;
lroc, nograph ;
lsens, nograph ;
display "*******************************" ;
display "OUTPUT FOR THE FIRST EPISODE NP" ;
display "*******************************" ;
svytotal nppop ;
svyprop nppop ;
svyprop havevent, subpop(nppop);
svymean age01x, subpop(nppop) ;
svymean age01x, by(nppop havevent) ;
lincom [age01x]4 - [age01x]3 ;
svylogit havevent age01x, subpop(nppop) ;
svylogit, or ;
svyprop sex, by(nppop) ;
svyprop sex, by(nppop havevent) ;
svytab sex havevent, subpop(nppop)count row obs;
svylogit havevent sex, subpop(nppop) ;
svylogit, or ;
svyprop race, by(nppop) ;
svyprop race, by(nppop havevent) ;
svytab race havevent, subpop(nppop)count row obs ;
svylogit havevent rac2-rac3, subpop(nppop) ;
svylogit, or ;
lincom rac2 + rac3, or ;
svyprop hispanx, by(nppop) ;
svyprop hispanx, by(nppop havevent) ;
svytab hispanx havevent, subpop(nppop)count row obs ;
svylogit havevent hispanx, subpop(nppop) ;
svylogit, or ;
svyprop marstat, by(nppop) ;
svyprop marstat, by(nppop havevent) ;
svytab marstat havevent, subpop(nppop)count row obs ;
svylogit havevent mar2-mar3, subpop(nppop) ;
svylogit, or ;
lincom mar2 + mar3, or ;
svyprop educ, by(nppop) ;
svyprop educ, by(nppop havevent) ;
svytab educ havevent, subpop(nppop)count row obs ;
svylogit havevent edu2-edu4, subpop(nppop) ;
svylogit, or ;
lincom edu2 + edu3 + edu4, or ;
svyprop msa01, by(nppop) ;
svyprop msa01, by(nppop havevent) ;
svytab msa01 havevent, subpop(nppop)count row obs ;
```

```
  svylogit havevent msa01, subpop(nppop) ;
  svylogit, or ;
  svyprop region01, by(nppop) ;
  svyprop region01, by(nppop havevent) ;
  svytab region01 havevent, subpop(nppop)count row obs ;
  svylogit havevent region2-region4, subpop(nppop) ;
  svylogit, or ;
  lincom region2 + region3 + region4, or ;
  svymean ttlp01x, subpop(nppop) ;
  svymean ttlp01x, by(nppop havevent) ;
  lincom [ttlp01x]4 - [ttlp01x]3 ;
  svylogit havevent ttlp01x, subpop(nppop) ;
  svylogit, or ;
  svyprop inscov01, by(nppop) ;
  svyprop inscov01, by(nppop havevent) ;
  svytab inscov01 havevent, subpop(nppop)count row obs ;
  svylogit havevent insur2-insur3, subpop(nppop) ;
  svylogit, or ;
  lincom insur2 + insur3, or ;
  svyprop rthlth, by(nppop) ;
  svyprop rthlth, by(nppop havevent) ;
  svytab rthlth havevent, subpop(nppop)count row obs ;
  svylogit havevent hlth2-hlth5, subpop(nppop) ;
  svylogit, or ;
  lincom hlth2 + hlth3 + hlth4 + hlth5, or ;
  svyprop disabil, by(nppop) ;
  svyprop disabil, by(nppop havevent) ;
  svytab disabil havevent, subpop(nppop)count row obs ;
  svylogit havevent disabil, subpop(nppop) ;
  svylogit, or ;
  svyprop comorbids, by(nppop) ;
  svyprop comorbids, by(nppop havevent) ;
  svytab comorbids havevent, subpop(nppop)count row obs ;
  svylogit havevent comor2-comor5, subpop(nppop) ;
  svylogit, or ;
  lincom comor2 + comor3 + comor4 + comor5, or ;
  svymean cumcomor, subpop(nppop) ;
  svymean cumcomor, by(nppop havevent) ;
  lincom [cumcomor]4 - [cumcomor]3 ;
  svylogit havevent cumcomor, subpop(nppop) ;
  svylogit, or ;
  svyprop agecat, by(nppop) ;
  svyprop agecat, by(nppop havevent) ;
  svytab agecat havevent, subpop (nppop) count row obs ;
  svylogit havevent age2-age3, subpop(nppop) ;
  svylogit, or ;
  lincom age2 + age3, or ;
  svylogit havevent age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
           msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth5
disabil
           comor2-comor5, subpop(nppop) ;
  svylogit, or ;
  svylogit havevent age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
```

```
msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth5 disabil
cumcomor, subpop(nppop) ;
  svylogit, or ;
* Only using variables that were significant in univariate analysis ;
  svylogit havevent age01x sex hispanx ttlp01x insur2-insur3,
subpop(nppop) ;
  svylogit, or ;
* Using need factor variables in addition ;
  svylogit havevent age01x sex hispanx ttlp01x insur2-insur3 hlth2-hlth5
          cumcomor, subpop(nppop) ;
  svylogit, or ;
  logit havevent age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
          msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth5
disabil comor2-comor5 if nppop==1 ;
  logit havevent age01x sex hispanx ttlp01x insur2-insur3 if nppop==1 ;
  display "*********************************" ;
  display "OUTPUT FOR THE FIRST EPISODE BOTH" ;
  display "*********************************" ;
  svytotal bothpop ;
  svyprop bothpop ;
  svyprop havevent, subpop(bothpop);
  svymean age01x, subpop(bothpop) ;
  svymean age01x, by(bothpop havevent) ;
  lincom [age01x]4 - [age01x]3 ;
  svylogit havevent age01x, subpop(bothpop) ;
  svylogit, or ;
  svyprop sex, by(bothpop) ;
  svyprop sex, by(bothpop havevent) ;
  svytab sex havevent, subpop(bothpop)count row obs;
  svyprop race, by(bothpop) ;
  svyprop race, by(bothpop havevent) ;
  svytab race havevent, subpop(bothpop)count row obs ;
  svyprop hispanx, by(bothpop) ;
  svyprop hispanx, by(bothpop havevent) ;
  svytab hispanx havevent, subpop(bothpop)count row obs ;
  svyprop marstat, by(bothpop) ;
  svyprop marstat, by(bothpop havevent) ;
  svytab marstat havevent, subpop(bothpop)count row obs ;
  svyprop educ, by(bothpop) ;
  svyprop educ, by(bothpop havevent) ;
  svytab educ havevent, subpop(bothpop)count row obs ;
  svyprop msa01, by(bothpop) ;
  svyprop msa01, by(bothpop havevent) ;
  svytab msa01 havevent, subpop(bothpop)count row obs ;
  svyprop region01, by(bothpop) ;
  svyprop region01, by(bothpop havevent) ;
  svytab region01 havevent, subpop(bothpop)count row obs ;
  svymean ttlp01x, subpop(bothpop) ;
  svymean ttlp01x, by(bothpop havevent) ;
  lincom [ttlp01x]4 - [ttlp01x]3 ;
  svylogit havevent ttlp01x, subpop(bothpop) ;
  svylogit, or ;
  svyprop inscov01, by(bothpop) ;
```

```
svyprop inscov01, by(bothpop havevent) ;
svytab inscov01 havevent, subpop(bothpop)count row obs ;
svyprop rthlth, by(bothpop) ;
svyprop rthlth, by(bothpop havevent) ;
svytab rthlth havevent, subpop(bothpop)count row obs ;
svyprop disabil, by(bothpop) ;
svyprop disabil, by(bothpop havevent) ;
svytab disabil havevent, subpop(bothpop)count row obs ;
svyprop comorbids, by(bothpop) ;
svyprop comorbids, by(bothpop havevent) ;
svytab comorbids havevent, subpop(bothpop)count row obs ;
svymean cumcomor, subpop(bothpop) ;
svymean cumcomor, by(bothpop havevent) ;
lincom [cumcomor]4 - [cumcomor]3 ;
svylogit havevent cumcomor, subpop(bothpop) ;
svylogit, or ;
svyprop agecat, by(bothpop) ;
svyprop agecat, by(bothpop havevent) ;
svytab agecat havevent, subpop (bothpop) count row obs ;
display "****************************************" ;
display "OUTPUT FOR THE FIRST EPISODE CARESEEKERS" ;
display "****************************************" ;
tab bpseekpop ;
tab npseekpop ;
tab boseekpop ;
display "*********************************************" ;
display "OUTPUT FOR THE FIRST EPISODE LBP CARESEEKERS" ;
display "*********************************************" ;
svyprop whosaw, subpop(bpseekpop) ;
svymean visitnum, subpop(bpseekpop) ;
svymean mdvisit, subpop(bpseekpop) ;
svymean dcvisit, subpop(bpseekpop) ;
svymean ptvisit, subpop(bpseekpop) ;
svymean visitnum, by(bpseekpop whosaw) ;
display "*********************************************" ;
display "OUTPUT FOR THE FIRST EPISODE NP CARESEEKERS" ;
display "*********************************************" ;
svyprop whosaw, subpop(npseekpop) ;
svymean visitnum, subpop(npseekpop) ;
svymean mdvisit, subpop(npseekpop) ;
svymean dcvisit, subpop(npseekpop) ;
svymean ptvisit, subpop(npseekpop) ;
svymean visitnum, by(npseekpop whosaw) ;
display "*********************************************" ;
display "OUTPUT FOR THE FIRST EPISODE BOTH CARESEEKERS" ;
display "*********************************************" ;
svyprop whosaw, subpop(boseekpop) ;
svymean visitnum, subpop(boseekpop) ;
svymean mdvisit, subpop(boseekpop) ;
svymean dcvisit, subpop(boseekpop) ;
svymean ptvisit, subpop(boseekpop) ;
svymean visitnum, by(boseekpop whosaw) ;
} ;
```

```
else if $cntrl==15 { ;
  use h:\vcu\finalfilelast ;
  svyset [pweight= longwtp6], strata(varstrp6) psu(varpsup6) ;
  display "***************************" ;
  display "OUTPUT FOR THE LAST EPISODES" ;
  display "***************************" ;
  gen byte sppop=0 ;
  quietly replace sppop=1 if (lbppop==1 | nppop==1 | bothpop==1) ;
  quietly drop comor1-comor5 ;
  quietly drop hlth1-hlth5 ;
  quietly recode comorbids (0=0 None) (1=1 One) (2/4=2 Twoormore), gen
(comorbid2) ;
  quietly recode rthlth (1 2=1 VGoodExcel) (3=2 Good) (4 5=3 FairPoor),
gen (rthlth2) ;
  quietly recode toteps (1=0 One) (2/5=1 Twoormore), gen(epsod) ;
  tab sppop ;
  display "ICD-9 codes for all conditions" ;
  tab icd9codx if sppop==1 ;
  display "Was the household respondent a proxy for all conditions?" ;
  tab proxy01 if sppop==1 ;
  display "Was the respondent the person with the condition?" ;
  tab proxyresp if sppop==1 ;
  display "Analyses to compare proxyrespondents to nonproxy respondents
for all conditions" ;
  svymean age01x, by(sppop proxyresp);
  lincom [age01x]4 - [age01x]3 ;
  svytab sex proxyresp, subpop(sppop)count row obs ;
  svytab race proxyresp, subpop (sppop) count row obs ;
  svytab hispanx proxyresp, subpop(sppop)count row obs ;
  svytab marstat proxyresp, subpop(sppop)count row obs ;
  svytab educ proxyresp, subpop(sppop)count row obs ;
  svytab msa01 proxyresp, subpop(sppop)count row obs ;
  svytab region01 proxyresp, subpop(sppop)count row obs ;
  svymean ttlp01x, by(sppop proxyresp);
  lincom [ttlp01x]4 - [ttlp01x]3 ;
  svytab inscov01 proxyresp, subpop(sppop)count row obs ;
  svytab rthlth2 proxyresp, subpop(sppop)count row obs ;
  svytab disabil proxyresp, subpop(sppop)count row obs ;
  svytab comorbid2 proxyresp, subpop(sppop)count row obs ;
  svytab epsod proxyresp, subpop(sppop)count row obs ;
  tab lbppop ;
  display "ICD-9 codes for LBP" ;
  tab icd9codx if lbppop==1 ;
  display "Was the household respondent a proxy for LBP?" ;
  tab proxy01 if lbppop==1 ;
  display "Was the respondent the person with LBP?" ;
  tab proxyresp if lbppop==1 ;
  display "Analyses to compare proxyrespondents to nonproxy respondents
for LBP" ;
  svymean age01x, by(lbppop proxyresp);
  lincom [age01x]4 - [age01x]3 ;
  svytab sex proxyresp, subpop(lbppop)count row obs ;
  svytab race proxyresp, subpop (lbppop) count row obs ;
```

```
  svytab hispanx proxyresp, subpop(lbppop)count row obs ;
  svytab marstat proxyresp, subpop(lbppop)count row obs ;
  svytab educ proxyresp, subpop(lbppop)count row obs ;
  svytab msa01 proxyresp, subpop(lbppop)count row obs ;
  svytab region01 proxyresp, subpop(lbppop)count row obs ;
  svymean ttlp01x, by(lbppop proxyresp);
  lincom [ttlp01x]4 - [ttlp01x]3 ;
  svytab inscov01 proxyresp, subpop(lbppop)count row obs ;
  svytab rthlth2 proxyresp, subpop(lbppop)count row obs ;
  svytab disabil proxyresp, subpop(lbppop)count row obs ;
  svytab comorbid2 proxyresp, subpop(lbppop)count row obs ;
  svytab epsod proxyresp, subpop(lbppop)count row obs ;
  tab nppop ;
  display "ICD-9 codes for NP" ;
  tab icd9codx if nppop==1 ;
  display "Was the household respondent a proxy for NP?" ;
  tab proxy01 if nppop==1 ;
  display "Was the respondent the person with NP?" ;
  tab proxyresp if nppop==1 ;
  display "Analyses to compare proxyrespondents to nonproxy respondents
for NP" ;
  svymean age01x, by(nppop proxyresp);
  lincom [age01x]4 - [age01x]3 ;
  svytab sex proxyresp, subpop(nppop)count row obs ;
  svytab race proxyresp, subpop (nppop) count row obs ;
  svytab hispanx proxyresp, subpop(nppop)count row obs ;
  svytab marstat proxyresp, subpop(nppop)count row obs ;
  svytab educ proxyresp, subpop(nppop)count row obs ;
  svytab msa01 proxyresp, subpop(nppop)count row obs ;
  svytab region01 proxyresp, subpop(nppop)count row obs ;
  svymean ttlp01x, by(nppop proxyresp);
  lincom [ttlp01x]4 - [ttlp01x]3 ;
  svytab inscov01 proxyresp, subpop(nppop)count row obs ;
  svytab rthlth2 proxyresp, subpop(nppop)count row obs ;
  svytab disabil proxyresp, subpop(nppop)count row obs ;
  svytab comorbid2 proxyresp, subpop(nppop)count row obs ;
  svytab epsod proxyresp, subpop(nppop)count row obs ;
  tab bothpop ;
  display "Was the household respondent a proxy for both LBP and NP?" ;
  tab proxy01 if bothpop==1 ;
  display "Was the respondent the person with LBP or NP?" ;
  tab proxyresp if bothpop==1 ;
  display "Analyses to compare proxyrespondents to nonproxy respondents
for both" ;
  svymean age01x, by(bothpop proxyresp);
  lincom [age01x]4 - [age01x]3 ;
  svytab sex proxyresp, subpop(bothpop)count row obs ;
  svytab race proxyresp, subpop (bothpop) count row obs ;
  svytab hispanx proxyresp, subpop(bothpop)count row obs ;
  svytab marstat proxyresp, subpop(bothpop)count row obs ;
  svytab educ proxyresp, subpop(bothpop)count row obs ;
  svytab msa01 proxyresp, subpop(bothpop)count row obs ;
  svytab region01 proxyresp, subpop(bothpop)count row obs ;
```

```
  svymean ttlp01x, by(bothpop proxyresp);
  lincom [ttlp01x]4 - [ttlp01x]3 ;
  svytab inscov01 proxyresp, subpop(bothpop)count row obs ;
  svytab rthlth2 proxyresp, subpop(bothpop)count row obs ;
  svytab disabil proxyresp, subpop(bothpop)count row obs ;
  svytab comorbid2 proxyresp, subpop(bothpop)count row obs ;
  svytab epsod proxyresp, subpop(bothpop)count row obs ;
  quietly recode whosaw (0=0 None) (1 7=1 MD) (2=2 DC) (3 5 6=3 PTPlus)
(4=4 MDDC), gen(careseek) ;
  svyprop havevent, subpop (sppop) ;
  svyprop whosaw, subpop(sppop) ;
  svyprop careseek, subpop(sppop) ;
  svyprop havevent, subpop (lbppop) ;
  svyprop whosaw, subpop(lbppop) ;
  svyprop careseek, subpop(lbppop) ;
  svyprop havevent, subpop (nppop) ;
  svyprop whosaw, subpop (nppop) ;
  svyprop careseek, subpop (nppop) ;
  svyprop havevent, subpop (bothpop) ;
  svyprop whosaw, subpop (bothpop) ;
  svyprop careseek, subpop (bothpop) ;
  display "******************************" ;
  display "OUTPUT FOR THE LAST EPISODE LBP" ;
  display "******************************" ;
  svytotal lbppop ;
  svyprop lbppop ;
  svyprop havevent, subpop(lbppop);
  svymean age01x, subpop(lbppop) ;
  svymean age01x, by(lbppop havevent) ;
  lincom [age01x]4 - [age01x]3 ;
  svylogit havevent age01x, subpop(lbppop) ;
  svylogit, or ;
  svyprop sex, by(lbppop) ;
  svyprop sex, by(lbppop havevent) ;
  svytab sex havevent, subpop(lbppop)count row obs;
  svylogit havevent sex, subpop(lbppop) ;
  svylogit, or ;
  svyprop race, by(lbppop) ;
  svyprop race, by(lbppop havevent) ;
  svytab race havevent, subpop(lbppop)count row obs ;
  svylogit havevent rac2-rac3, subpop(lbppop) ;
  svylogit, or ;
  lincom rac2 + rac3 ;
  svyprop hispanx, by(lbppop) ;
  svyprop hispanx, by(lbppop havevent) ;
  svytab hispanx havevent, subpop(lbppop)count row obs ;
  svylogit havevent hispanx, subpop(lbppop) ;
  svylogit, or ;
  svyprop marstat, by(lbppop) ;
  svyprop marstat, by(lbppop havevent) ;
  svytab marstat havevent, subpop(lbppop)count row obs ;
  svylogit havevent mar2-mar3, subpop(lbppop) ;
  svylogit, or ;
```

```
lincom mar2 + mar3 ;
svyprop educ, by(lbppop) ;
svyprop educ, by(lbppop havevent) ;
svytab educ havevent, subpop(lbppop)count row obs ;
svylogit havevent edu2-edu4, subpop(lbppop) ;
svylogit, or ;
lincom edu2 + edu3 + edu4 ;
svyprop msa01, by(lbppop) ;
svyprop msa01, by(lbppop havevent) ;
svytab msa01 havevent, subpop(lbppop)count row obs ;
svylogit havevent msa01, subpop(lbppop) ;
svylogit, or ;
svyprop region01, by(lbppop) ;
svyprop region01, by(lbppop havevent) ;
svytab region01 havevent, subpop(lbppop)count row obs ;
svylogit havevent region2-region4, subpop(lbppop) ;
svylogit, or ;
lincom region2 + region3 + region4 ;
svymean ttlp01x, subpop(lbppop) ;
svymean ttlp01x, by(lbppop havevent) ;
lincom [ttlp01x]4 - [ttlp01x]3 ;
svylogit havevent ttlp01x, subpop(lbppop) ;
svylogit, or ;
svyprop inscov01, by(lbppop) ;
svyprop inscov01, by(lbppop havevent) ;
svytab inscov01 havevent, subpop(lbppop)count row obs ;
svylogit havevent insur2-insur3, subpop(lbppop) ;
svylogit, or ;
lincom insur2 + insur3 ;
tab rthlth2, gen (hlth) ;
svyprop rthlth2, by(lbppop) ;
svyprop rthlth2, by(lbppop havevent) ;
svytab rthlth2 havevent, subpop(lbppop)count row obs ;
svylogit havevent hlth2-hlth3, subpop(lbppop) ;
svylogit, or ;
lincom hlth2 + hlth3 ;
svyprop disabil, by(lbppop) ;
svyprop disabil, by(lbppop havevent) ;
svytab disabil havevent, subpop(lbppop)count row obs ;
svylogit havevent disabil, subpop(lbppop) ;
svylogit, or ;
tab comorbid2, gen (comor) ;
svyprop comorbid2, by(lbppop) ;
svyprop comorbid2, by(lbppop havevent) ;
svytab comorbid2 havevent, subpop(lbppop)count row obs ;
svylogit havevent comor2-comor3, subpop(lbppop) ;
svylogit, or ;
lincom comor2 + comor3 ;
svymean cumcomor, subpop(lbppop) ;
svymean cumcomor, by(lbppop havevent) ;
lincom [cumcomor]4 - [cumcomor]3 ;
svylogit havevent cumcomor, subpop(lbppop) ;
svylogit, or ;
```

```
  quietly recode age01x (0/39=1 Young) (40/59=2 Mid) (60/85=3 Old),
    gen(agecat) ;
  tab agecat, gen(age) ;
  svyprop agecat, by(lbppop) ;
  svyprop agecat, by(lbppop havevent) ;
  svytab agecat havevent, subpop (lbppop) count row obs ;
  svylogit havevent age2-age3, subpop (lbppop) ;
  svylogit, or ;
  lincom age2 + age3 ;
  svyprop toteps, by(lbppop) ;
  svyprop toteps, by(lbppop havevent) ;
  svytab toteps havevent, subpop (lbppop) count row obs ;
  svylogit havevent toteps, subpop (lbppop) ;
  svylogit, or ;
  svyprop epsod, by(lbppop) ;
  svyprop epsod, by(lbppop havevent) ;
  svytab epsod havevent, subpop (lbppop) count row obs ;
  svylogit havevent epsod, subpop (lbppop) ;
  svylogit, or ;
  display "Survey Full model" ;
  svylogit havevent age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
            msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3
disabil comor2-comor3 epsod, subpop(lbppop) ;
  svylogit, or ;
  display "Survey Model with univariate predictors moving forward" ;
  svylogit havevent age01x sex hispanx mar2-mar3 msa01 insur2-insur3
            hlth2-hlth3 comor2-comor3 epsod, subpop(lbppop) ;
  svylogit, or ;
  display "Survey Model with only variables significant moving forward
plus age" ;
  svylogit havevent age01x msa01 insur2-insur3 hlth2-hlth3 comor2-comor3
            epsod, subpop(lbppop) ;
  svylogit, or ;
  display "Survey Model with only variables significant moving forward
without age" ;
  svylogit havevent msa01 insur2-insur3 hlth2-hlth3 comor2-comor3
            epsod, subpop(lbppop) ;
  svylogit, or ;
  display "Model based full model" ;
  logit havevent age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
            msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3
disabil
            comor2-comor3 epsod if lbppop==1 ;
  est store A ;
  fitstat, saving(modA) ;
  lstat ;
  display "Model based model with univariate predictors moving forward"
;
  logit havevent age01x sex hispanx mar2-mar3 msa01 insur2-insur3
            hlth2-hlth3 comor2-comor3 epsod if lbppop==1 ;
  est store B ;
  fitstat, saving(modB) ;
  predict p1, p ;
```

```
  predict rstandard1, rstandard ;
  predict dev1, deviance ;
  extremes rstandard1 dev1 p1 havevent age01x sex, n(20) ;
  lstat ;
  lroc, nograph ;
  lsens, nograph ;
  lrtest A, stats ;
  linktest ;
  fitstat, using(modA) ;
  lfit, group(10) ;
  listcoef, const std ;
  prchange, fromto ;
  display "Model based model with only variables significant moving
forward plus age" ;
  logit havevent age01x msa01 insur2-insur3 hlth2-hlth3 comor2-comor3
            epsod if lbppop==1 ;
  predict p2, p ;
  predict rstandard2, rstandard ;
  predict dev2, deviance ;
  lstat ;
  lroc, nograph ;
  lsens, nograph ;
  lrtest B, stats ;
  linktest ;
  fitstat, using(modB) ;
  lfit, group(10) ;
  listcoef, const std ;
  prchange, fromto ;
  extremes rstandard2 dev2 p2 havevent age01x sex, n(20) ;
  display "Model based model with only variables significant moving
forward without age" ;
  logit havevent msa01 insur2-insur3 hlth2-hlth3 comor2-comor3
            epsod if lbppop==1 ;
  predict p3, p ;
  predict rstandard3, rstandard ;
  predict dev3, deviance ;
  lstat ;
  lroc, nograph ;
  lsens, nograph ;
  lrtest B, stats ;
  linktest ;
  fitstat, using(modB) ;
  lfit, group(10) ;
  listcoef, const std ;
  prchange, fromto ;
  extremes rstandard3 dev3 p3 havevent age01x sex, n(20) ;
  display "******************************" ;
  display "OUTPUT FOR THE LAST EPISODE NP" ;
  display "******************************" ;
  svytotal nppop ;
  svyprop nppop ;
  svyprop havevent, subpop(nppop);
  svymean age01x, subpop(nppop) ;
```

```
svymean age01x, by(nppop havevent) ;
lincom [age01x]4 - [age01x]3 ;
svylogit havevent age01x, subpop(nppop) ;
svylogit, or ;
svyprop sex, by(nppop) ;
svyprop sex, by(nppop havevent) ;
svytab sex havevent, subpop(nppop)count row obs;
svylogit havevent sex, subpop(nppop) ;
svylogit, or ;
svyprop race, by(nppop) ;
svyprop race, by(nppop havevent) ;
svytab race havevent, subpop(nppop)count row obs ;
svylogit havevent rac2-rac3, subpop(nppop) ;
svylogit, or ;
lincom rac2 + rac3 ;
svyprop hispanx, by(nppop) ;
svyprop hispanx, by(nppop havevent) ;
svytab hispanx havevent, subpop(nppop)count row obs ;
svylogit havevent hispanx, subpop(nppop) ;
svylogit, or ;
svyprop marstat, by(nppop) ;
svyprop marstat, by(nppop havevent) ;
svytab marstat havevent, subpop(nppop)count row obs ;
svylogit havevent mar2-mar3, subpop(nppop) ;
svylogit, or ;
lincom mar2 + mar3 ;
svyprop educ, by(nppop) ;
svyprop educ, by(nppop havevent) ;
svytab educ havevent, subpop(nppop)count row obs ;
svylogit havevent edu2-edu4, subpop(nppop) ;
svylogit, or ;
lincom edu2 + edu3 + edu4 ;
svyprop msa01, by(nppop) ;
svyprop msa01, by(nppop havevent) ;
svytab msa01 havevent, subpop(nppop)count row obs ;
svylogit havevent msa01, subpop(nppop) ;
svylogit, or ;
svyprop region01, by(nppop) ;
svyprop region01, by(nppop havevent) ;
svytab region01 havevent, subpop(nppop)count row obs ;
svylogit havevent region2-region4, subpop(nppop) ;
svylogit, or ;
lincom region2 + region3 + region4 ;
svymean ttlp01x, subpop(nppop) ;
svymean ttlp01x, by(nppop havevent) ;
lincom [ttlp01x]4 - [ttlp01x]3 ;
svylogit havevent ttlp01x, subpop(nppop) ;
svylogit, or ;
svyprop inscov01, by(nppop) ;
svyprop inscov01, by(nppop havevent) ;
svytab inscov01 havevent, subpop(nppop)count row obs ;
svylogit havevent insur2-insur3, subpop(nppop) ;
svylogit, or ;
```

```
  lincom insur2 + insur3 ;
  svyprop rthlth2, by(nppop) ;
  svyprop rthlth2, by(nppop havevent) ;
  svytab rthlth2 havevent, subpop(nppop)count row obs ;
  svylogit havevent hlth2-hlth3, subpop(nppop) ;
  svylogit, or ;
  lincom hlth2 + hlth3;
  svyprop disabil, by(nppop) ;
  svyprop disabil, by(nppop havevent) ;
  svytab disabil havevent, subpop(nppop)count row obs ;
  svylogit havevent disabil, subpop(nppop) ;
  svylogit, or ;
  svyprop comorbid2, by(nppop) ;
  svyprop comorbid2, by(nppop havevent) ;
  svytab comorbid2 havevent, subpop(nppop)count row obs ;
  svylogit havevent comor2-comor3, subpop(nppop) ;
  svylogit, or ;
  lincom comor2 + comor3 ;
  svymean cumcomor, subpop(nppop) ;
  svymean cumcomor, by(nppop havevent) ;
  lincom [cumcomor]4 - [cumcomor]3 ;
  svylogit havevent cumcomor, subpop(nppop) ;
  svylogit, or ;
  svyprop agecat, by(nppop) ;
  svyprop agecat, by(nppop havevent) ;
  svytab agecat havevent, subpop (nppop) count row obs ;
  svylogit havevent age2-age3, subpop(nppop) ;
  svylogit, or ;
  lincom age2 + age3 ;
  svyprop toteps, by(nppop) ;
  svyprop toteps, by(nppop havevent) ;
  svytab toteps havevent, subpop (nppop) count row obs ;
  svylogit havevent toteps, subpop (nppop) ;
  svylogit, or ;
  svyprop epsod, by(nppop) ;
  svyprop epsod, by(nppop havevent) ;
  svytab epsod havevent, subpop(nppop) count row obs ;
  svylogit havevent epsod, subpop (nppop) ;
  svylogit, or ;
  display "Survey Full model" ;
  svylogit havevent age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
             msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3
disabil
             comor2-comor3 epsod, subpop(nppop) ;
  svylogit, or ;
  display "Survey model with univariate predictors moving forward (all
sig)" ;
  svylogit havevent sex insur2-insur3 comor2-comor3 epsod,
            subpop(nppop) ;
  svylogit, or ;
  display "Survey Model with univariate predictors moving forward plus
age" ;
  svylogit havevent age01x sex insur2-insur3 comor2-comor3 epsod,
```

```
            subpop(nppop) ;
  svylogit, or ;
  display "Survey Model with univariate predictors moving forward plus
age and perceived healthstat" ;
  svylogit havevent age01x sex insur2-insur3 hlth2-hlth3 comor2-comor3
            epsod, subpop(nppop) ;
  svylogit, or ;
  display "Model based full model" ;
  logit havevent age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
             msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3
disabil
             comor2-comor3 epsod if nppop==1 ;
  est store A ;
  fitstat, saving(modA) ;
  lstat ;
  display "Model based model with univariate predictors moving forward"
;
  logit havevent sex insur2-insur3 comor2-comor3 epsod if nppop==1 ;
  est store B ;
  fitstat, saving(modB) ;
  predict p5, p ;
  predict rstandard5, rstandard ;
  predict dev5, deviance ;
  extremes rstandard5 dev5 p5 havevent age01x sex, n(20) ;
  lstat ;
  lroc, nograph ;
  lsens, nograph ;
  lrtest A, stats ;
  linktest ;
  fitstat, using(modA) ;
  lfit, group(10) ;
  listcoef, const std ;
  prchange, fromto ;
  display "Model based model with univariate predictors moving forward
plus age" ;
  logit havevent age01x sex insur2-insur3 comor2-comor3 epsod if
nppop==1 ;
  est store C ;
  fitstat, saving(modC) ;
  predict p6, p ;
  predict rstandard6, rstandard ;
  predict dev6, deviance ;
  extremes rstandard6 dev6 p6 havevent age01x sex, n(20) ;
  lstat ;
  lroc, nograph ;
  lsens, nograph ;
  lrtest A, stats ;
  linktest ;
  fitstat, using(modA) ;
  lfit, group(10) ;
  listcoef, const std ;
  prchange, fromto ;
```

```
  display "Model based model with univariate predictors moving
forward plus age and perceived healthstat" ;
  logit havevent age01x sex insur2-insur3 hlth2-hlth3 comor2-comor3
epsod if nppop==1 ;
  predict p7, p ;
  predict rstandard7, rstandard ;
  predict dev7, deviance ;
  extremes rstandard7 dev7 p7 havevent age01x sex, n(20) ;
  lstat ;
  lroc, nograph ;
  lsens, nograph ;
  lrtest A, stats ;
  linktest ;
  fitstat, using(modA) ;
  lfit, group(10) ;
  listcoef, const std ;
  prchange, fromto ;
  display "********************************" ;
  display "OUTPUT FOR THE LAST EPISODE BOTH" ;
  display "********************************" ;
  svytotal bothpop ;
  svyprop bothpop ;
  svyprop havevent, subpop(bothpop);
  svymean age01x, subpop(bothpop) ;
  svymean age01x, by(bothpop havevent) ;
  lincom [age01x]4 - [age01x]3 ;
  svylogit havevent age01x, subpop(bothpop) ;
  svylogit, or ;
  svyprop sex, by(bothpop) ;
  svyprop sex, by(bothpop havevent) ;
  svytab sex havevent, subpop(bothpop)count row obs;
  svyprop race, by(bothpop) ;
  svyprop race, by(bothpop havevent) ;
  svytab race havevent, subpop(bothpop)count row obs ;
  svyprop hispanx, by(bothpop) ;
  svyprop hispanx, by(bothpop havevent) ;
  svytab hispanx havevent, subpop(bothpop)count row obs ;
  svyprop marstat, by(bothpop) ;
  svyprop marstat, by(bothpop havevent) ;
  svytab marstat havevent, subpop(bothpop)count row obs ;
  svyprop educ, by(bothpop) ;
  svyprop educ, by(bothpop havevent) ;
  svytab educ havevent, subpop(bothpop)count row obs ;
  svyprop msa01, by(bothpop) ;
  svyprop msa01, by(bothpop havevent) ;
  svytab msa01 havevent, subpop(bothpop)count row obs ;
  svyprop region01, by(bothpop) ;
  svyprop region01, by(bothpop havevent) ;
  svytab region01 havevent, subpop(bothpop)count row obs ;
  svymean ttlp01x, subpop(bothpop) ;
  svymean ttlp01x, by(bothpop havevent) ;
  lincom [ttlp01x]4 - [ttlp01x]3 ;
  svylogit havevent ttlp01x, subpop(bothpop) ;
```

```
  svylogit, or ;
  svyprop inscov01, by(bothpop) ;
  svyprop inscov01, by(bothpop havevent) ;
  svytab inscov01 havevent, subpop(bothpop)count row obs ;
  svyprop rthlth2, by(bothpop) ;
  svyprop rthlth2, by(bothpop havevent) ;
  svytab rthlth2 havevent, subpop(bothpop)count row obs ;
  svyprop disabil, by(bothpop) ;
  svyprop disabil, by(bothpop havevent) ;
  svytab disabil havevent, subpop(bothpop)count row obs ;
  svyprop comorbid2, by(bothpop) ;
  svyprop comorbid2, by(bothpop havevent) ;
  svytab comorbid2 havevent, subpop(bothpop)count row obs ;
  svymean cumcomor, subpop(bothpop) ;
  svymean cumcomor, by(bothpop havevent) ;
  lincom [cumcomor]4 - [cumcomor]3 ;
  svylogit havevent cumcomor, subpop(bothpop) ;
  svylogit, or ;
  svyprop agecat, by(bothpop) ;
  svyprop agecat, by(bothpop havevent) ;
  svytab agecat havevent, subpop (bothpop) count row obs ;
  svyprop toteps, by(bothpop) ;
  svyprop toteps, by(bothpop havevent) ;
  svytab toteps havevent, subpop (bothpop) count row obs ;
  svylogit havevent toteps, subpop (bothpop) ;
  svylogit, or ;
  svyprop epsod, by(bothpop) ;
  svyprop epsod, by(bothpop havevent) ;
  svytab epsod havevent, subpop (bothpop) count row obs ;
  svylogit havevent epsod, subpop (bothpop) ;
  svylogit, or ;
  display "****************************************" ;
  display "OUTPUT FOR THE LAST EPISODE CARESEEKERS" ;
  display "****************************************" ;
  tab bpseekpop ;
  tab npseekpop ;
  tab boseekpop ;
  display "********************************************" ;
  display "OUTPUT FOR THE LAST EPISODE LBP CARESEEKERS" ;
  display "********************************************" ;
  svyprop whosaw, subpop(bpseekpop) ;
  svymean visitnum, subpop(bpseekpop) ;
  svymean mdvisit, subpop(bpseekpop) ;
  svymean dcvisit, subpop(bpseekpop) ;
  svymean ptvisit, subpop(bpseekpop) ;
  svymean visitnum, by(bpseekpop whosaw) ;
  quietly replace bpseekpop=0 if whosaw==7 ;
  quietly recode whosaw (0 1 7=1 MD) (2=2 DC) (3 5 6=3 PTPlus) (4=4
MDDC),
         gen (whorec) ;
  tab whorec, gen(whorecd) ;
  svyprop whorec, subpop (bpseekpop) ;
  svymean visitnum, by(bpseekpop whorec) ;
```

```
svymean age01x, subpop(bpseekpop) ;
svymean age01x, by(bpseekpop whorec) ;
lincom [age01x]5 - [age01x]6 - [age01x]7 - [age01x]8;
svymlogit whorec age01x, subpop(bpseekpop) ;
svymlogit, rrr ;
svyprop sex, by(bpseekpop) ;
svyprop sex, by(bpseekpop whorec) ;
svytab sex whorec, subpop(bpseekpop)count row obs ;
svymlogit whorec sex, subpop(bpseekpop) ;
svymlogit, rrr ;
svyprop race, by(bpseekpop) ;
svyprop race, by(bpseekpop whorec) ;
svytab race whorec, subpop(bpseekpop) count row obs ;
svymlogit whorec rac2-rac3, subpop(bpseekpop) ;
svymlogit, rrr ;
svyprop hispanx, by(bpseekpop) ;
svyprop hispanx, by(bpseekpop whorec) ;
svytab hispanx whorec, subpop(bpseekpop)count row obs ;
svymlogit whorec hispanx, subpop(bpseekpop) ;
svymlogit, rrr ;
svyprop marstat, by(bpseekpop) ;
svyprop marstat, by(bpseekpop whorec) ;
svytab marstat whorec, subpop(bpseekpop)count row obs ;
svymlogit whorec mar2-mar3, subpop(bpseekpop) ;
svymlogit, rrr ;
svyprop educ, by(bpseekpop) ;
svyprop educ, by(bpseekpop whorec) ;
svytab educ whorec, subpop(bpseekpop)count row obs ;
svymlogit whorec edu2-edu4, subpop(bpseekpop) ;
svymlogit, rrr ;
svyprop msa01, by(bpseekpop) ;
svyprop msa01, by(bpseekpop whorec) ;
svytab msa01 whorec, subpop(bpseekpop)count row obs;
svymlogit whorec msa01, subpop(bpseekpop) ;
svymlogit, rrr ;
svyprop region01, by(bpseekpop) ;
svyprop region01, by(bpseekpop whorec) ;
svytab region01 whorec, subpop(bpseekpop)count row obs;
svymlogit whorec region2-region4, subpop(bpseekpop) ;
svymlogit, rrr ;
svyprop inscov01, by(bpseekpop) ;
svyprop inscov01, by(bpseekpop whorec) ;
svytab inscov01 whorec, subpop(bpseekpop) count row obs ;
svymlogit whorec insur2-insur3, subpop(bpseekpop) ;
svymlogit, rrr ;
svyprop rthlth2, by(bpseekpop) ;
svyprop rthlth2, by(bpseekpop whorec) ;
svytab rthlth2 whorec, subpop(bpseekpop) count row obs ;
svymlogit whorec hlth2-hlth3, subpop(bpseekpop) ;
svymlogit, rrr ;
svyprop disabil, by(bpseekpop) ;
svyprop disabil, by(bpseekpop whorec) ;
svytab disabil whorec, subpop(bpseekpop)count row obs;
```

```
  svymlogit whorec disabil, subpop(bpseekpop) ;
  svymlogit, rrr ;
  svyprop comorbid2, by(bpseekpop) ;
  svyprop comorbid2, by(bpseekpop whorec) ;
  svytab comorbid2 whorec, subpop(bpseekpop) count row obs ;
  svymlogit whorec comor2-comor3, subpop(bpseekpop) ;
  svymlogit, rrr ;
  svymean cumcomor, subpop(bpseekpop) ;
  svymean cumcomor, by(bpseekpop whorec) ;
  lincom [cumcomor]5 - [cumcomor]6 - [cumcomor]7 - [cumcomor]8;
  svymlogit whorec cumcomor, subpop(bpseekpop) ;
  svymlogit, rrr ;
  svyprop epsod, by(bpseekpop) ;
  svyprop epsod, by(bpseekpop whorec) ;
  svytab epsod whorec, subpop(bpseekpop) count row obs ;
  svymlogit whorec epsod, subpop(bpseekpop) ;
  svymlogit, rrr ;
  svyprop agecat, by(bpseekpop) ;
  svyprop agecat, by(bpseekpop whorec) ;
  svytab agecat whorec, subpop(bpseekpop)count row obs;
  svymlogit whorec age2-age3, subpop(bpseekpop) ;
  svymlogit, rrr ;
  display "Survey model with all variables entered predicting MD only" ;
  svylogit whorecd1 age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
        msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
        comor2-comor3 epsod, subpop(bpseekpop) ;
  svylogit, or ;
  display "Survey model with 1st reduced model from logit predicting MD
only" ;
  svylogit whorecd1 age01x sex hispanx mar2-mar3 msa01 insur2-insur3
        hlth2-hlth3 comor2-comor3 epsod, subpop(bpseekpop) ;
  svylogit, or ;
  display "Survey model with all variables entered predicting DC only" ;
  svylogit whorecd2 age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
        msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
        comor2-comor3 epsod, subpop(bpseekpop) ;
  svylogit, or ;
  display "Survey model with 1st reduced model from logit predicting DC
only" ;
  svylogit whorecd2 age01x sex hispanx mar2-mar3 msa01 insur2-insur3
        hlth2-hlth3 comor2-comor3 epsod, subpop(bpseekpop) ;
  svylogit, or ;
  display "Survey model with all variables entered predicting PT Plus" ;
  svylogit whorecd3 age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
        msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
        comor2-comor3 epsod, subpop(bpseekpop) ;
  svylogit, or ;
  display "Survey model with 1st reduced model from logit predicting PT
Plus" ;
  svylogit whorecd3 age01x sex hispanx mar2-mar3 msa01 insur2-insur3
        hlth2-hlth3 comor2-comor3 epsod, subpop(bpseekpop) ;
  svylogit, or ;
  display "Survey model with all variables entered predicting MD & DC" ;
```

```
  svylogit whorecd4 age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
         msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3
disabil
         comor2-comor3 epsod, subpop(bpseekpop) ;
  svylogit, or ;
  display "Survey model with 1st reduced model from logit predicting MD
& DC" ;
  svylogit whorecd4 age01x sex hispanx mar2-mar3 msa01 insur2-insur3
         hlth2-hlth3 comor2-comor3 epsod, subpop(bpseekpop) ;
  svylogit, or ;
  display "Survey model with all the variables entered predicting all
providers" ;
  svymlogit whorec age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
         msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
         comor2-comor3 epsod, subpop(bpseekpop) ;
  svymlogit, rrr ;
  display "Survey model with 1st reduced model from logit predicting all
providers" ;
  svymlogit whorec age01x sex hispanx mar2-mar3 msa01 insur2-insur3
         hlth2-hlth3 comor2-comor3 epsod, subpop(bpseekpop) ;
  svymlogit, rrr ;
  display "Survey model with significant variables from logit plus age
predicting all providers" ;
  svymlogit whorec age01x msa01 insur2-insur3 hlth2-hlth3 comor2-comor3
epsod, subpop(bpseekpop) ;
  svymlogit, rrr ;
  display "Survey model with significant variables from logit predicting
all providers" ;
  svymlogit whorec msa01 insur2-insur3 hlth2-hlth3 comor2-comor3 epsod,
subpop(bpseekpop) ;
  svymlogit, rrr ;
  display "Model based model with all the variables entered predicting
all providers" ;
  mlogit whorec age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
         msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
         comor2-comor3 epsod if bpseekpop==1 ;
  listcoef ;
  fitstat ;
  prchange ;
  mlogtest, all ;
  display "Model based model with 1st reduced model from logit
predicting all providers" ;
  mlogit whorec age01x sex hispanx mar2-mar3 msa01 insur2-insur3
         hlth2-hlth3 comor2-comor3 epsod if bpseekpop==1 ;
  listcoef ;
  fitstat ;
  prchange ;
  mlogtest, all ;
  display "Model based model with significant variables from logit plus
age predicting all providers" ;
  mlogit whorec age01x msa01 insur2-insur3 hlth2-hlth3 comor2-comor3
epsod if bpseekpop==1 ;
  listcoef ;
```

```
  fitstat ;
  prchange ;
  mlogtest, all ;
  display "Model based model with significant variables from logit
predicting all providers" ;
  mlogit whorec msa01 insur2-insur3 hlth2-hlth3 comor2-comor3 epsod if
bpseekpop==1 ;
  listcoef ;
  fitstat ;
  prchange ;
  mlogtest, all ;
  display "*****************************************" ;
  display "OUTPUT FOR THE LAST EPISODE NP CARESEEKERS" ;
  display "*****************************************" ;
  svyprop whosaw, subpop(npseekpop) ;
  svymean visitnum, subpop(npseekpop) ;
  svymean mdvisit, subpop(npseekpop) ;
  svymean dcvisit, subpop(npseekpop) ;
  svymean ptvisit, subpop(npseekpop) ;
  svymean visitnum, by(npseekpop whosaw) ;
  svyprop whorec, subpop (npseekpop) ;
  svymean visitnum, by(npseekpop whorec) ;
  svymean age01x, subpop(npseekpop) ;
  svymean age01x, by(npseekpop whorec) ;
  lincom [age01x]5 - [age01x]6 - [age01x]7 - [age01x]8;
  svymlogit whorec age01x, subpop(npseekpop) ;
  svymlogit, rrr ;
  svyprop sex, by(npseekpop) ;
  svyprop sex, by(npseekpop whorec) ;
  svytab sex whorec, subpop(npseekpop)count row obs;
  svymlogit whorec sex, subpop(npseekpop) ;
  svymlogit, rrr ;
  svyprop race, by(npseekpop) ;
  svyprop race, by(npseekpop whorec) ;
  svytab race whorec, subpop(npseekpop)count row obs;
  svymlogit whorec rac2-rac3, subpop(npseekpop) ;
  svymlogit, rrr ;
  svyprop hispanx, by(npseekpop) ;
  svyprop hispanx, by(npseekpop whorec) ;
  svytab hispanx whorec, subpop(npseekpop)count row obs;
  svymlogit whorec hispanx, subpop(npseekpop) ;
  svymlogit, rrr ;
  svyprop marstat, by(npseekpop) ;
  svyprop marstat, by(npseekpop whorec) ;
  svytab marstat whorec, subpop(npseekpop)count row obs;
  svymlogit whorec mar2-mar3, subpop(npseekpop) ;
  svymlogit, rrr ;
  svyprop educ, by(npseekpop) ;
  svyprop educ, by(npseekpop whorec) ;
  svytab educ whorec, subpop(npseekpop)count row obs;
  svymlogit whorec edu2-edu4, subpop(npseekpop) ;
  svymlogit, rrr ;
  svyprop msa01, by(npseekpop) ;
```

```
svyprop msa01, by(npseekpop whorec) ;
svytab msa01 whorec, subpop(npseekpop)count row obs;
svymlogit whorec msa01, subpop(npseekpop) ;
svymlogit, rrr ;
svyprop region01, by(npseekpop) ;
svyprop region01, by(npseekpop whorec) ;
svytab region01 whorec, subpop(npseekpop)count row obs;
svymlogit whorec region2-region4, subpop(npseekpop) ;
svymlogit, rrr ;
svymean ttlp01x, subpop(npseekpop) ;
svymean ttlp01x, by(npseekpop whorec) ;
lincom [ttlp01x]5 - [ttlp01x]6 - [ttlp01x]7 - [ttlp01x]8;
svymlogit whorec ttlp01x, subpop(npseekpop) ;
svymlogit, rrr ;
svyprop inscov01, by(npseekpop) ;
svyprop inscov01, by(npseekpop whorec) ;
svytab inscov01 whorec, subpop(npseekpop) count row obs ;
svymlogit whorec insur2-insur3, subpop(npseekpop) ;
svymlogit, rrr ;
svyprop rthlth2, by(npseekpop) ;
svyprop rthlth2, by(npseekpop whorec) ;
svytab rthlth2 whorec, subpop(npseekpop) count row obs ;
svymlogit whorec hlth2-hlth3, subpop(npseekpop) ;
svymlogit, rrr ;
svyprop disabil, by(npseekpop) ;
svyprop disabil, by(npseekpop whorec) ;
svytab disabil whorec, subpop(npseekpop)count row obs;
svymlogit whorec disabil, subpop(npseekpop) ;
svymlogit, rrr ;
svyprop comorbid2, by(npseekpop) ;
svyprop comorbid2, by(npseekpop whorec) ;
svytab comorbid2 whorec, subpop(npseekpop) count row obs ;
svymlogit whorec comor2-comor3, subpop(npseekpop) ;
svymlogit, rrr ;
svymean cumcomor, subpop(npseekpop) ;
svymean cumcomor, by(npseekpop whorec) ;
lincom [cumcomor]5 - [cumcomor]6 - [cumcomor]7 - [cumcomor]8;
svymlogit whorec cumcomor, subpop(npseekpop) ;
svymlogit, rrr ;
svyprop epsod, by(npseekpop) ;
svyprop epsod, by(npseekpop whorec) ;
svytab epsod whorec, subpop(npseekpop) count row obs ;
svymlogit whorec epsod, subpop(npseekpop) ;
svymlogit, rrr ;
svyprop agecat, by(npseekpop) ;
svyprop agecat, by(npseekpop whorec) ;
svytab agecat whorec, subpop(npseekpop)count row obs;
svymlogit whorec age2-age3, subpop(npseekpop) ;
svymlogit, rrr ;
display "Survey model with all variables entered predicting MD only" ;
svylogit whorecd1 age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
       msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
       comor2-comor3 epsod, subpop(npseekpop) ;
```

```
  svylogit, or ;
  display "Survey model with reduced model from logit predicting MD
only" ;
  svylogit whorecd1 age01x sex insur2-insur3 comor2-comor3 epsod,
subpop(npseekpop) ;
  svylogit, or ;
  display "Survey model with all variables entered predicting DC only" ;
  svylogit whorecd2 age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
         msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
         comor2-comor3 epsod, subpop(npseekpop) ;
  svylogit, or ;
  display "Survey model with reduced model from logit predicting DC
only" ;
  svylogit whorecd2 age01x sex insur2-insur3 comor2-comor3 epsod,
subpop(npseekpop) ;
  svylogit, or ;
  display "Survey model with all variables entered predicting PT Plus" ;
  svylogit whorecd3 age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
         msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
         comor2-comor3 epsod, subpop(npseekpop) ;
  svylogit, or ;
  display "Survey model with reduced model from logit predicting PT
Plus" ;
  svylogit whorecd3 age01x sex insur2-insur3 comor2-comor3 epsod,
subpop(npseekpop) ;
  svylogit, or ;
  display "Survey model with all variables entered predicting MD & DC" ;
  svylogit whorecd4 age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
         msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
         comor2-comor3 epsod, subpop(npseekpop) ;
  svylogit, or ;
  display "Survey model with reduced model from logit predicting MD &
DC" ;
  svylogit whorecd4 age01x sex insur2-insur3 comor2-comor3 epsod,
subpop(npseekpop) ;
  svylogit, or ;
* Get rid of the MDDC category because of cells with zero ;
  gen byte npseekpop2=0 ;
  replace npseekpop2=1 if npseekpop==1 ;
  replace npseekpop2=0 if whorec==4 ;
  recode whorec (1 4 =1 MD) (2=2 DC) (3=3 PTPlus), gen(whorec2) ;
  display "Survey model with all the variables entered predicting all
providers" ;
  svymlogit whorec2 age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
         msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
         comor2-comor3 epsod, subpop(npseekpop2) ;
  svymlogit, rrr ;
  display "Survey model with reduced model from logit predicting all
providers" ;
  svymlogit whorec2 sex insur2-insur3 comor2-comor3 epsod,
subpop(npseekpop2) ;
  svymlogit, rrr ;
```

```
  display "Survey model with reduced model from logit plus age
predicting all providers" ;
  svymlogit whorec2 age01x sex insur2-insur3 comor2-comor3 epsod,
subpop(npseekpop2) ;
  svymlogit, rrr ;
  display "Model based model with all the variables entered predicting
all providers" ;
  mlogit whorec2 age01x sex rac2-rac3 hispanx mar2-mar3 edu2-edu4
         msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
         comor2-comor3 epsod if npseekpop2==1 ;
  listcoef ;
  fitstat ;
  prchange ;
  mlogtest, all ;
  display "Model based model with reduced model from logit predicting
all providers" ;
  mlogit whorec2 sex insur2-insur3 comor2-comor3 epsod if npseekpop2==1
;
  listcoef ;
  fitstat ;
  prchange ;
  mlogtest, all ;
  display "Model based model with reduced model from logit plus age
predicting all providers" ;
  mlogit whorec2 age01x sex insur2-insur3 comor2-comor3 epsod if
npseekpop2==1 ;
  listcoef ;
  fitstat ;
  prchange ;
  mlogtest, all ;
  display "*******************************************" ;
  display "OUTPUT FOR THE LAST EPISODE BOTH CARESEEKERS" ;
  display "*******************************************" ;
  svyprop whosaw, subpop(boseekpop) ;
  svymean visitnum, subpop(boseekpop) ;
  svymean mdvisit, subpop(boseekpop) ;
  svymean dcvisit, subpop(boseekpop) ;
  svymean ptvisit, subpop(boseekpop) ;
  svymean visitnum, by(boseekpop whosaw) ;
  svyprop whorec, subpop (boseekpop) ;
  svymean visitnum, by(boseekpop whorec) ;
  display "*********************************************" ;
  display "OUTPUT FOR THE ANALYSES WITH CONDITION AS AN IV" ;
  display "*********************************************" ;
  quietly replace sppop=0 if (sppop==1 & bothpop==1) ;
  tab icd9codx if sppop==1 ;
  gen byte condition = 0 ;
  label define cdtn 0 "LBP" 1 "NP" ;
  label variable condition "Was the condition LBP or NP" ;
  label values condition cdtn ;
  quietly replace condition = 1 if nppop==1 ;
  gen byte seekers = 0 ;
  label variable seekers "Careseekers" ;
```

```
label values seekers pop ;
quietly replace seekers = 1 if bpseekpop==1 | npseekpop==1 ;
gen byte spseekpop = 0 ;
quietly replace spseekpop = 1 if (sppop==1 & seekers==1) ;
svytotal sppop ;
svyprop sppop ;
svyprop seekers, subpop(sppop);
svymean age01x, subpop(sppop) ;
svymean age01x, by(sppop seekers) ;
lincom [age01x]3 - [age01x]2 ;
svylogit seekers age01x, subpop(sppop) ;
svylogit, or ;
svyprop sex, by(sppop) ;
svyprop sex, by(sppop seekers) ;
svytab sex seekers, subpop(sppop)count row obs;
svylogit seekers sex, subpop(sppop) ;
svylogit, or ;
svyprop race, by(sppop) ;
svyprop race, by(sppop seekers) ;
svytab race seekers, subpop(sppop)count row obs ;
svylogit seekers rac2-rac3, subpop(sppop) ;
svylogit, or ;
lincom rac2 + rac3 ;
svyprop hispanx, by(sppop) ;
svyprop hispanx, by(sppop seekers) ;
svytab hispanx seekers, subpop(sppop)count row obs ;
svylogit seekers hispanx, subpop(sppop) ;
svylogit, or ;
svyprop marstat, by(sppop) ;
svyprop marstat, by(sppop seekers) ;
svytab marstat seekers, subpop(sppop)count row obs ;
svylogit seekers mar2-mar3, subpop(sppop) ;
svylogit, or ;
lincom mar2 + mar3 ;
svyprop educ, by(sppop) ;
svyprop educ, by(sppop seekers) ;
svytab educ seekers, subpop(sppop)count row obs ;
svylogit seekers edu2-edu4, subpop(sppop) ;
svylogit, or ;
lincom edu2 + edu3 + edu4 ;
svyprop msa01, by(sppop) ;
svyprop msa01, by(sppop seekers) ;
svytab msa01 seekers, subpop(sppop)count row obs ;
svylogit seekers msa01, subpop(sppop) ;
svylogit, or ;
svyprop region01, by(sppop) ;
svyprop region01, by(sppop seekers) ;
svytab region01 seekers, subpop(sppop)count row obs ;
svylogit seekers region2-region4, subpop(sppop) ;
svylogit, or ;
lincom region2 + region3 + region4 ;
svymean ttlp01x, subpop(sppop) ;
svymean ttlp01x, by(sppop seekers) ;
```

```
lincom [ttlp01x]3 - [ttlp01x]2 ;
svylogit seekers ttlp01x, subpop(sppop) ;
svylogit, or ;
svyprop inscov01, by(sppop) ;
svyprop inscov01, by(sppop seekers) ;
svytab inscov01 seekers, subpop(sppop)count row obs ;
svylogit seekers insur2-insur3, subpop(sppop) ;
svylogit, or ;
lincom insur2 + insur3 ;
svyprop rthlth2, by(sppop) ;
svyprop rthlth2, by(sppop seekers) ;
svytab rthlth2 seekers, subpop(sppop)count row obs ;
svylogit seekers hlth2-hlth3, subpop(sppop) ;
svylogit, or ;
lincom hlth2 + hlth3 ;
svyprop disabil, by(sppop) ;
svyprop disabil, by(sppop seekers) ;
svytab disabil seekers, subpop(sppop)count row obs ;
svylogit seekers disabil, subpop(sppop) ;
svylogit, or ;
svyprop comorbid2, by(sppop) ;
svyprop comorbid2, by(sppop seekers) ;
svytab comorbid2 seekers, subpop(sppop)count row obs ;
svylogit seekers comor2-comor3, subpop(sppop) ;
svylogit, or ;
lincom comor2 + comor3 ;
svymean cumcomor, subpop(sppop) ;
svymean cumcomor, by(sppop seekers) ;
lincom [cumcomor]3 - [cumcomor]2 ;
svylogit seekers cumcomor, subpop(sppop) ;
svylogit, or ;
svyprop agecat, by(sppop) ;
svyprop agecat, by(sppop seekers) ;
svytab agecat seekers, subpop (sppop) count row obs ;
svylogit seekers age2-age3, subpop (sppop) ;
svylogit, or ;
lincom age2 + age3 ;
svyprop toteps, by(sppop) ;
svyprop toteps, by(sppop seekers) ;
svytab toteps seekers, subpop (sppop) count row obs ;
svylogit seekers toteps, subpop (sppop) ;
svylogit, or ;
svyprop epsod, by(sppop) ;
svyprop epsod, by(sppop seekers) ;
svytab epsod seekers, subpop (sppop) count row obs ;
svylogit seekers epsod, subpop (sppop) ;
svylogit, or ;
svyprop condition, by(sppop) ;
svyprop condition, by(sppop seekers) ;
svytab condition seekers, subpop(sppop)count row obs ;
display "Survey Full model" ;
svylogit seekers condition age01x sex rac2-rac3 hispanx mar2-mar3
edu2-edu4
```

```
            msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3
disabil
            comor2-comor3 epsod, subpop(sppop) ;
  svylogit, or ;
  display "Survey Model with univariate predictors moving forward from
LBP model" ;
  svylogit seekers condition age01x sex hispanx mar2-mar3 msa01 insur2-
insur3
            hlth2-hlth3 comor2-comor3 epsod, subpop(sppop) ;
  svylogit, or ;
  display "Model based Full model" ;
  logit seekers condition age01x sex rac2-rac3 hispanx mar2-mar3 edu2-
edu4
            msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3
disabil
            comor2-comor3 epsod if sppop==1 ;
  est store A ;
  fitstat, saving(modA) ;
  lstat ;
  display "Model based model with univariate predictors moving forward
from LBP model" ;
  logit seekers condition age01x sex hispanx mar2-mar3 msa01 insur2-
insur3
            hlth2-hlth3 comor2-comor3 epsod if sppop==1 ;
  est store B ;
  fitstat, saving(modB) ;
  predict p8, p ;
  predict rstandard8, rstandard ;
  predict dev8, deviance ;
  extremes rstandard8 dev8 p8 seekers age01x sex, n(20) ;
  lstat ;
  lroc, nograph ;
  lsens, nograph ;
  lrtest A, stats ;
  linktest ;
  fitstat, using(modA) ;
  lfit, group(10) ;
  listcoef, const std ;
  prchange, fromto ;
  svyprop whosaw, subpop(spseekpop) ;
  svymean visitnum, subpop(spseekpop) ;
  svymean mdvisit, subpop(spseekpop) ;
  svymean dcvisit, subpop(spseekpop) ;
  svymean ptvisit, subpop(spseekpop) ;
  svymean visitnum, by(spseekpop whosaw) ;
  replace spseekpop=0 if (whorec==4) ;
  svyprop whorec2, subpop (spseekpop) ;
  svymean visitnum, by(spseekpop whorec2) ;
  svymean age01x, subpop(spseekpop) ;
  svymean age01x, by(spseekpop whorec2) ;
  lincom [age01x]4 - [age01x]5 - [age01x]6 ;
  svymlogit whorec2 age01x, subpop(spseekpop) ;
  svymlogit, rrr ;
```

```
svyprop sex, by(spseekpop) ;
svyprop sex, by(spseekpop whorec2) ;
svytab sex whorec2, subpop(spseekpop)count row obs ;
svymlogit whorec2 sex, subpop(spseekpop) ;
svymlogit, rrr ;
svyprop race, by(spseekpop) ;
svyprop race, by(spseekpop whorec2) ;
svytab race whorec2, subpop(spseekpop) count row obs ;
svymlogit whorec2 rac2-rac3, subpop(spseekpop) ;
svymlogit, rrr ;
svyprop hispanx, by(spseekpop) ;
svyprop hispanx, by(spseekpop whorec2) ;
svytab hispanx whorec2, subpop(spseekpop)count row obs ;
svymlogit whorec2 hispanx, subpop(spseekpop) ;
svymlogit, rrr ;
svyprop marstat, by(spseekpop) ;
svyprop marstat, by(spseekpop whorec2) ;
svytab marstat whorec2, subpop(spseekpop)count row obs ;
svymlogit whorec2 mar2-mar3, subpop(spseekpop) ;
svymlogit, rrr ;
svyprop educ, by(spseekpop) ;
svyprop educ, by(spseekpop whorec2) ;
svytab educ whorec2, subpop(spseekpop)count row obs ;
svymlogit whorec2 edu2-edu4, subpop(spseekpop) ;
svymlogit, rrr ;
svyprop msa01, by(spseekpop) ;
svyprop msa01, by(spseekpop whorec2) ;
svytab msa01 whorec2, subpop(spseekpop)count row obs;
svymlogit whorec2 msa01, subpop(spseekpop) ;
svymlogit, rrr ;
svyprop region01, by(spseekpop) ;
svyprop region01, by(spseekpop whorec2) ;
svytab region01 whorec2, subpop(spseekpop)count row obs;
svymlogit whorec2 region2-region4, subpop(spseekpop) ;
svymlogit, rrr ;
svymean ttlp01x, subpop(spseekpop) ;
svymean ttlp01x, by(spseekpop whorec2) ;
lincom [ttlp01x]4 - [ttlp01x]5 - [ttlp01x]6 ;
svyprop inscov01, by(spseekpop) ;
svyprop inscov01, by(spseekpop whorec2) ;
svytab inscov01 whorec2, subpop(spseekpop) count row obs ;
svymlogit whorec2 insur2-insur3, subpop(spseekpop) ;
svymlogit, rrr ;
svyprop rthlth2, by(spseekpop) ;
svyprop rthlth2, by(spseekpop whorec2) ;
svytab rthlth2 whorec2, subpop(spseekpop) count row obs ;
svymlogit whorec2 hlth2-hlth3, subpop(spseekpop) ;
svymlogit, rrr ;
svyprop disabil, by(spseekpop) ;
svyprop disabil, by(spseekpop whorec2) ;
svytab disabil whorec2, subpop(spseekpop)count row obs;
svymlogit whorec2 disabil, subpop(spseekpop) ;
svymlogit, rrr ;
```

```
  svyprop comorbid2, by(spseekpop) ;
  svyprop comorbid2, by(spseekpop whorec2) ;
  svytab comorbid2 whorec2, subpop(spseekpop) count row obs ;
  svymlogit whorec2 comor2-comor3, subpop(spseekpop) ;
  svymlogit, rrr ;
  svymean cumcomor, subpop(spseekpop) ;
  svymean cumcomor, by(spseekpop whorec2) ;
  lincom [cumcomor]4 - [cumcomor]5 - [cumcomor]6 ;
  svymlogit whorec2 cumcomor, subpop(spseekpop) ;
  svymlogit, rrr ;
  svyprop epsod, by(spseekpop) ;
  svyprop epsod, by(spseekpop whorec2) ;
  svytab epsod whorec2, subpop(spseekpop) count row obs ;
  svymlogit whorec2 epsod, subpop(spseekpop) ;
  svymlogit, rrr ;
  svyprop agecat, by(spseekpop) ;
  svyprop agecat, by(spseekpop whorec2) ;
  svytab agecat whorec2, subpop(spseekpop)count row obs ;
  svymlogit whorec2 age2-age3, subpop(spseekpop) ;
  svymlogit, rrr ;
  svyprop condition, by(spseekpop) ;
  svyprop condition, by(spseekpop whorec2) ;
  svytab condition whorec2, subpop(spseekpop) count row obs ;
  svymlogit whorec2 condition, subpop(spseekpop) ;
  svymlogit, rrr ;
  display "Survey model with all variables entered predicting MD only" ;
  svylogit whorecd1 condition age01x sex rac2-rac3 hispanx mar2-mar3
edu2-edu4
         msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
         comor2-comor3 epsod, subpop(spseekpop) ;
  svylogit, or ;
  display "Survey model with 1st reduced model from logit predicting MD
only" ;
  svylogit whorecd1 condition age01x sex hispanx mar2-mar3 msa01 insur2-
insur3
         hlth2-hlth3 comor2-comor3 epsod, subpop(spseekpop) ;
  svylogit, or ;
  display "Survey model with all variables entered predicting DC only" ;
  svylogit whorecd2 condition age01x sex rac2-rac3 hispanx mar2-mar3
edu2-edu4
         msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
         comor2-comor3 epsod, subpop(spseekpop) ;
  svylogit, or ;
  display "Survey model with 1st reduced model from logit predicting DC
only" ;
  svylogit whorecd2 condition age01x sex hispanx mar2-mar3 msa01 insur2-
insur3
         hlth2-hlth3 comor2-comor3 epsod, subpop(spseekpop) ;
  svylogit, or ;
  display "Survey model with all variables entered predicting PT Plus" ;
  svylogit whorecd3 condition age01x sex rac2-rac3 hispanx mar2-mar3
edu2-edu4
         msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
```

```
        comor2-comor3 epsod, subpop(spseekpop) ;
  svylogit, or ;
  display "Survey model with 1st reduced model from logit predicting PT
Plus" ;
  svylogit whorecd3 condition age01x sex hispanx mar2-mar3 msa01 insur2-
insur3
        hlth2-hlth3 comor2-comor3 epsod, subpop(spseekpop) ;
  svylogit, or ;
  display "Survey model with all the variables entered predicting all
providers" ;
  svymlogit whorec2 condition age01x sex rac2-rac3 hispanx mar2-mar3
edu2-edu4
        msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
        comor2-comor3 epsod, subpop(spseekpop) ;
  svymlogit, rrr ;
  display "Survey model with 1st reduced model from logit predicting all
providers" ;
  svymlogit whorec2 condition age01x sex hispanx mar2-mar3 msa01 insur2-
insur3
        hlth2-hlth3 comor2-comor3 epsod, subpop(spseekpop) ;
  svymlogit, rrr ;
  display "Model based model with all the variables entered predicting
all providers" ;
  mlogit whorec2 condition age01x sex rac2-rac3 hispanx mar2-mar3 edu2-
edu4
        msa01 region2-region4 ttlp01x insur2-insur3 hlth2-hlth3 disabil
        comor2-comor3 epsod if spseekpop==1 ;
  listcoef ;
  fitstat ;
  prchange ;
  mlogtest, all ;
  display "Model based model with 1st reduced model from logit
predicting all providers" ;
  mlogit whorec2 condition age01x sex hispanx mar2-mar3 msa01 insur2-
insur3
        hlth2-hlth3 comor2-comor3 epsod if spseekpop==1 ;
  listcoef ;
  fitstat ;
  prchange ;
  mlogtest, all ;
 } ;
  log close ;
end ;
```

Appendix C

ICD-9-CM codes used to classify low back pain and neck pain

Diagnostic Codes from MEPS

ICD– 9-CM 3 digit heading	4 digit codes: low back pain	4 digit codes: neck pain
353: Nerve root and plexus disorders	353.4	353.2
720: Ankylosing spondylitis and other inflammaroty spondylopathies	720.0 720.1 720.2	
721: Spondylosis and Allied Disorders	721.3 721.4	721.0 721.1
722: Intervertebral Disc Disorders	722.1 722.2 722.3 722.5 722.6 722.7 722.9	722.0 722.4
723: Other Disorders of the Cervical region		723.0 – 723.9
724: Other and Unspecified Disorders of Back	724.0 724.2 724.3 724.4 724.5 724.6 724.7 724.8 724.9	
739: Nonallopathic lesions, not elsewhere classified	739.9 739.4	739.1
846: Sprains and Strains of Sacroiliac Region	846.0-846.9	

Diagnostic Codes from MEPS

ICD– 9-CM 3 digit heading	4 digit codes: low back pain	4 digit codes: neck pain
847: Sprains and Strains of Other and Unspecified Parts of Back	847.2 847.3 847.4 847.9	847.0
953: Injury to nerve roots and spinal plexus	953.2	953.0

VITA

Julia Chevan was born in 1962 in Philadelphia, Pennsylvania. She received her Bachelor of Science in Physical Therapy from Boston University in 1985, and a Master of Public Health degree from the University of Massachusetts in 1989. In 1995 she completed a Master of Science degree in Orthopaedic Physical Therapy at Quinnipiac University. She is a Board Certified Clinical Specialist in Orthopaedic Physical Therapy. She is currently a member of the Physical Therapy faculty at Springfield College, Springfield, Massachusetts.