RACIAL AND GENDER CONCORDANCE: EFFECTS ON UTILIZATION OF HEALTH SERVICES AMONG INDIVIDUALS ENROLLED IN A PRIMARY CARE CASE MANAGEMENT DELIVERY SYSTEM

by

Galen Hartman Smith III

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Approved by:

____
Dr. Teresa L. Scheid

____
Dr. William P. Brandon

____
Dr. Jennifer L. Troyer

____
Dr. Joseph M. Whitmeyer

____
Dr. M. Maureen Brown

ABSTRACT

GALEN HARTMAN SMITH III. Racial and gender concordance: effects on utilization of health services among individuals enrolled in a primary care case management delivery system. (Under the direction of DR. TERESA LINEA SCHEID)

Very few studies to date have directly examined the impact of race or gender patient-provider concordance on the utilization of health services. This is particularly noteworthy given the role that the linkage between concordance and health service utilization may play in the eradication of race- and gender-based health disparities. This dissertation, grounded on the theory of Andersen's (1995) Emerging Model of Health Services Utilization (Phase Four), used data collected from a stratified random sample of adult beneficiaries enrolled in North Carolina Medicaid's primary care case management managed care delivery system to study this phenomenon. The data were obtained from two sources: (1) a computer assisted telephone survey of 2,815 respondents that used the *North Carolina Medicaid Consumer Assessment of Healthcare Providers and Systems (CAHPS) 3.0 Adult Survey 2006* as the survey instrument and, (2) enrollment data provided by plan administrators. Propensity score matching techniques were used to sort respondents on their propensity for race concordance and gender concordance, respectively, to establish a post-test only comparison research design. The utilization of five different forms of health services – primary care, specialty care, emergency care, inpatient care, and prescription drugs – were analyzed using factor analysis, ordinary least squares linear regression, and logistic regression methodologies. The key findings are that race and gender patient-primary care provider concordance did not directly impact the utilization of primary, specialty, emergency, or inpatient care. However, concordance between patient and primary care provider was demonstrated to decrease the likelihood of using prescription drugs. The research, which is unique in its ability to control for socioeconomic and health insurance status, informs policymakers and other stakeholders tasked with allocating resources that impact the utilization of health services and other health outcomes in the quest to eliminate race- and gender-based health disparities.

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LIST OF ABBREVIATIONS

A&D	Asthma and Diabetes (Disease Management) Group
AAPOR	American Association for Public Opinion Research
AHCPR	Agency for Health Care Policy and Research
AHRQ	Agency for Healthcare Research and Quality
AIDS	Acquired Immune Deficiency Syndrome
AIR	American Institutes for Research
CA-II	Carolina ACCESS-II
CAHPS	Consumer Assessment of Healthcare Providers and Systems
CAP	Community Alternatives Program
CATI	Computer Assisted Telephone Interview
CCNC	Community Care of North Carolina
CI	Confidence interval
CMS	Centers for Medicare and Medicaid Services
Coastal Pl; Coast	Coastal Plain region
DQ	Disqualified
ERS	Economic Research Services (of the U.S. Department of Agriculture)
Exp[B]	Exponential of B, or odds ratio
GED	General Educational Development, General Equivalency Diploma, General Educational Diploma
HBM	Health belief model
HCFA	Health Care Financing Administration
HIV	Human immunodeficiency virus

KMO – MSA	Kaiser – Meyer – Olkin Measure of Sampling Adequacy
LLC	Limited Liability Company
M-AB	Medicaid to the Blind
M-AD	Medicaid to the Disabled
M-AF	Medicaid to Families with Dependent Children
MD	Physician; doctor
M-IC	Medicaid to Infants and Children
Mon prac	Months in practice
Mount	Mountain region
MPW	Medicaid for Pregnant Women
MSA	Measure of Sampling Adequacy
MSB	Aid to the Blind Medicaid Assistance
No Prob	No Problem
NS	Not significant
OLS	Ordinary Least Squares
PA	Physician assistant
PCCM	Primary care case management
Pied	Piedmont region
PSM	Propensity score matching
QMB	Medicare Qualified Beneficiaries
RN	Registered nurse; nurse
RTI	Research Triangle Institute
Satisfac	Satisfaction

SBM	Sociobehavioral model
SCHIP	State Children’s Health Insurance Program
S.E.	Standard error
SSI	Supplemental Security Income
TANF	Temporary Assistance to Needy Families
TRA	Theory of reasoned action
UCLA	University of California at Los Angeles
UNC Chapel Hill	University of North Carolina at Chapel Hill
UNC Charlotte	University of North Carolina at Charlotte
U.S.	United States
VIF	Variance Inflation Factor

CHAPTER 1: INTRODUCTION

1.1 Linking the Utilization of Health Services to Health Disparities

In his seminal work on agenda setting, Kingdon (1984) established a theoretical framework for policymaking that integrates human values into problem identification criteria while also recognizing the importance of policy entrepreneurs and the events that trigger a response to action. Kingdon's model established three distinct areas, or "streams," that link together to bring a policy problem to the public decision agenda. The *problem stream* consists of conditions that elevate to problem status when they violate important values or deviate considerably from the status quo when compared with other countries or jurisdictions. The *policy stream* describes the flow of ideas, strategies, and technologies generated by academic specialists, career bureaucrats, and congressional staffers that serve as a "pool" of possible policy alternatives of proposals. The *politics stream* consists of developments in the political sphere and may include swings in national mood, shifts in political power or ideologies, and the demands of interest groups. A *complete linkage* occurs when a problem from the problem stream, a proposal from the policy stream, and the action of skillful actors in the politics stream, often in tandem with some triggering event, converge into a single package, thereby dramatically increasing the chances of the problem passing through the *policy window* and reaching the decision agenda.

Kingdon’s model provides an excellent theoretical framework from which to launch this dissertation, which is focused on studying the impact of race and gender concordance on five types of health service utilization – primary care, specialty care, emergency care, inpatient care, and prescription drugs – in the context of race and gender-based health disparities. These disparities, which are more thoroughly documented in Chapter Two, satisfy the requisite criteria that define a “problem” within the Kingdon framework and “reside” in the problem stream. Having established the classification of health disparities within the problem stream, the politics stream as it applies to health disparities consists of a number of the relevant stakeholders tasked with confronting and combating disparities. These include federal and state-level legislators, agency administrators, and the wide array of interest and advocacy groups dedicated to remedial efforts. This dissertation, with its focus on the subject of studying the impact of social factors on the utilization of health services, is poised to make a substantial contribution to Kingdon’s policy stream of ideas and strategies from which policy proposals designed to counteract health disparities may evolve. The current political climate for such action may be particularly advantageous with a number of social progressives occupying key positions in the executive and legislative branches of government, thereby opening a “policy window” wide enough to allow the complete linkage of problem, politics, and policy streams to advance to the policy agenda.

LaVeist et al. (2003) make a compelling argument that links the utilization of health services to health disparities. This argument may be summarized by the following paragraph excerpted from the *Journal of Public Health Policy*:

> “It has been well established that racial and ethnic minorities experience barriers to accessing health services and, as a result, have lower health care utilization

> rates than whites. Although lower utilization rates are partially explained by lower rates of health insurance, lower socio-economic status, and lack of a regular source of care, those factors do not fully explain health care utilization disparities. Non-financial barriers to health service use have received limited attention in the research literature but they may be as important as financial barriers in explaining racial disparities in health services use." *LaVeist, Nuru-Jeter, and Jones. 2003. Journal of Public Health Policy, Volume 24, No. 3/4, p. 312.*

Indeed, a number of non-financial factors such as the satisfaction patients derive from encounters with their health providers, the trust that patients impart to their providers, and the effectiveness of patient-provider communication may determine whether patients seek and, ultimately, use health care. Malat (2001) describes the phenomenon of "social distance" between providers and patients where patients of lower socioeconomic status tend to feel more distant from their providers than those of higher socioeconomic status and blacks and other nonwhites tend to feel more distant from white providers than from providers of their own race or ethnicity. She suggests that greater social distance between patients and their providers leads to lower levels of trust and satisfaction and that race concordance – the situation when patient and provider are of the same race or ethnicity – decreases social distance, thereby increasing trust and satisfaction. The logical inference that may be drawn from her work is that decreased social distance via race concordance should translate to increased utilization of health services.

The race (or gender) concordance hypothesis suggests that matching patients and health providers on the basis of race or gender improves communication and patients' perceptions of care and, by extension, encourages patients to seek and utilize care. The creation of a climate that fosters minorities to seek care, combined with increases in the number of minority health care providers, could potentially reduce the troubling disparities in health outcomes among women and racial and ethnic minorities that characterize twenty-first century health care in the United States.

1.2 Context: Medicaid and Medicaid Managed Care

The focus of this dissertation is to determine the impact of race and gender concordance on the utilization of health services. This objective is accomplished by examining the experience of a Medicaid managed care population who were surveyed in late 2006 and early 2007 using the Consumer Assessment of Healthcare Providers and Systems (CAHPS) survey instrument. Thus, a brief overview of Medicaid, Medicaid managed care, and the CAHPS survey instrument appear here to provide the requisite context.

Medicaid is a federal entitlement program jointly funded by the federal and state governments that pays for medical assistance to individuals and families with low incomes and low resources (U.S. Department of Health and Human Services, Centers for Medicare and Medicaid Services, 2006). Each state administers its own Medicaid program and establishes its own eligibility standards and scope of services within a broad regulatory framework instituted by the federal government. Nationally, nearly 45 million Americans were enrolled in state Medicaid programs in 2006, a figure that constituted a 33.1% increase in enrollment since 2001 (Sanofi Aventis U.S. LLC, 2007). In North Carolina slightly more than 1.6 million people (18.1% of the state's population) were enrolled in the state Medicaid program in 2006 (North Carolina Department of Health and Human Services, Division of Medical Assistance, 2007).

Many states have implemented some form of managed care to address the challenges of increasing numbers of Medicaid enrollees, expanding benefits and services, and constrained public budgets. Most states have opted to enroll their beneficiaries into health maintenance organizations (HMOs). However, North Carolina has chosen the *primary care case management* model as its preferred form of managed care. This type of managed care arrangement designates primary care providers as case managers who function as “gatekeepers,” and are reimbursed using traditional Medicaid fee-for-service in addition to receiving a nominal management fee (Kongstvedt, 2007). The primary care case managers include a variety of primary care providers (physicians, nurse practitioners, physician assistants, and certified nurse mid-wives) who provide necessary care to Medicaid enrollees and refer enrollees to specialty care, when appropriate.

Health care provided to North Carolina Medicaid enrollees via the primary care case management program is organized and delivered via one of two possible arrangements. The first is known as Carolina ACCESS and is characterized by primary care providers who treat enrollees and regulate access to specialty care (North Carolina Department of Health and Human Services, Division of Medical Assistance, 2007). The second care delivery and organizational arrangement is known as *Community Care of North Carolina (CCNC)* that “aims to build upon Carolina ACCESS by working with community providers to better manage the enrolled Medicaid population” (North Carolina Department of Health and Human Services, Division of Medical Assistance, 2007, p. 35). The care provided within CCNC is organized and delivered via “fourteen local community networks involving local physicians, hospitals, and health and social services departments in each of the state’s 100 counties” (Brandon, Schoeps, Sun, and Smith, 2008, p. 9). The CCNC networks use risk stratification, disease management, and case management to optimize the health of program enrollees. The North Carolina

Department of Health and Human Services provides resources, information, and technical support to personnel at the level of the local networks. Capitated reimbursement mechanisms are used to pay providers who participate as care managers in the PCCM organizational arrangements. Providers organized in Carolina ACCESS, which lacks a network structure, are reimbursed at a rate of $1.00 per member per month for management services. By contrast, providers organized within the network structure of the CCNC receive a payment of $2.50 per member per month and the CCNC networks receive $3 for ordinary Medicaid beneficiaries and $2.50 to manage the care of those children who have been transitioned to Medicaid from N.C. Health Choice (North Carolina's version of State Child Health Insurance Program, a non-Medicaid program) (Betty West, personal communication, 28 July 2008; North Carolina Department of Health and Human Services, Division of Medical Assistance, 2007).

1.3 The Consumer Assessment of Healthcare Providers and Systems (CAHPS) Survey

The CAHPS project is a private-public partnership that originated in 1995 with government support from the Agency for Healthcare Research and Quality (AHRQ, formerly known as the Agency for Health Care Policy and Research, or AHCPR), an entity housed within the U.S. Public Health Service of the U.S. Department of Health and Human Services (U.S. Department of Health and Human Services, Agency for Health Research and Quality, 2002). Private research organizations that were involved in the earliest stages of the development of the CAHPS survey products included the Harvard Medical School in Boston, Massachusetts, the RAND Corporation, a global policy think tank headquartered in Santa Monica, California, the Research Triangle Institute (RTI), one of the world's leading research institutes located in Research Triangle Park, North

Carolina, and Westat, a survey research firm with clients in both the private and public sectors and headquartered in Rockville, Maryland. The Health Care Financing Administration (HCFA, now known as the Centers for Medicare and Medicaid Services, or CMS) joined AHCPR as a CAHPS partner in January of 1996. The project officers from AHRQ and CMS, along with the contracting organizations (which now includes the American Institutes for Research, or AIR) and their partners and subcontractors constitute the CAHPS Consortium.

A large number of Medicaid managed care programs in the U.S. have adopted CAHPS survey as their instrument for collecting data related to enrollee access, satisfaction, and utilization of health care, and consider it an important adjunct in evaluating program performance. The rationale for studying responses related to these dimensions of health care was established by Donabedian (1980 and 1985), who considered each dimension to be an important indicator of the quality of a health care delivery system.

In an attempt to improve the instrument's validity and reliability, the CAHPS survey instrument has been updated and revised over time (Hargraves et al., 2003). Reliability of CAHPS 3.0 was evaluated by Fongwa et al. (2006) who collected data from 109,980 Medicare managed care enrollees in their quest to compare the psychometric performance of the CAHPS 3.0 health plan survey for whites and African Americans enrolled in Medicare managed care plans. They reported that, although health plan level reliabilities may have been lower for African Americans than for whites due to sample size considerations, internal consistency reliabilities did not differ by race and achieved reliability scores of at least 0.7 for each of the five scales that were tested.

The North Carolina Department of Health and Human Services used the CAHPS 3.0 Health Plan Survey to obtain information from Medicaid beneficiaries enrolled in primary care case management services in late 2006 and early 2007. The survey was administered to program enrollees in either English or Spanish and was organized into broad categories as follows (U.S. Department of Health and Human Services, Agency for Health Research and Quality, 2002, p.8):

- A global assessment of the enrollee's health plan,
- A global assessment of the quality of care received by enrollees,
- Getting needed care,
- Getting care without long waits,
- How well doctors (or other health providers) communicate,
- The courtesy, respect, and helpfulness of office staff, and
- Health plan customer service, information, and paperwork.

The CAHPS 3.0 Health Plan Survey administered to adults enrolled in North Carolina Medicaid's primary care case management program appears in its entirety in Appendix A. The percentage distributions of responses to each survey question appear in Appendix B.

Having established the foundation for understanding the fundamental aspects of the health delivery system and survey instrument as they apply to this dissertation, the attention shifts to the organization of the dissertation by providing an overview of the dissertation's chapters.

1.4 Overview of Chapters

Very few studies have directly examined the impact of race or gender concordance on the utilization of health services, thereby compromising our ability to more fully comprehend and narrow race- and gender-based health disparities. The primary purpose of this study is to analyze the impact of race and gender concordance on the utilization of health services. In addition to this overarching goal, the study also seeks to identify other key variables that influence health service utilization and to examine key bivariate relationships that relate to race and gender concordance. These objectives are achieved by organizing the dissertation into seven distinct chapters, each of which is briefly summarized below.

Chapter Two provides a brief, yet essential, overview of the state of health disparities in America. Using framework established by The Kaiser Family Foundation's *Key Facts: Race, Ethnicity, and Medical Care, 2007 Update*, health disparities are discussed in terms of health status, health insurance coverage, preventive/primary care, and specialty. The final portions of the chapter draw attention to the significance of concordance and the role that it may play in reducing or eliminating health disparities and offer a comprehensive exploration of the role that race and gender concordance play in health outcomes.

Chapter Three introduces the reader to Andersen's framework for health service utilization, the theoretical model that underpins the dissertation, and discusses the rationale for its selection among several other well-known theories of utilization. The chapter concludes by providing an explicit list of the research questions that the dissertation seeks to address along with the corresponding research hypotheses. The dissertation's causal model based on the Andersen framework is also introduced here.

Chapter Four describes the methods used to address the research questions and hypotheses raised in Chapter Three. The chapter summarizes important features of the data and also examines the study's complex sampling methods. The chapter also describes the study's research design and the conceptualization and operationalization of the variables under study. The rationale for propensity score matching is presented along with the specific procedures involved in implementing this technique. The final portions of the chapter are devoted to descriptions of the factor analysis and regression methods employed by the study and to the statistics used to analyze the data.

Chapter Five examines a number of bivariate relationships that revolve around race and gender concordance and is organized into three major sections. The first section examines the bivariate relationships observed in the sub-sample of survey respondents matched on their probability inclusion in the race concordant group. The second section is organized in a similar manner, but examines the bivariate relationships associated with the sub-sample of respondents matched on their probability of inclusion in the gender concordant group. The third section recaps the significant findings revealed in the previous two sections of Chapter Five.

Chapter Six explores the causal analysis of health utilization by examining the appropriate regression model associated with each of the five utilization measures that function as dependent variables. The chapter is organized in a manner similar to Chapter Five, with the regression models associated with the subsample of subjects matched on their propensity for inclusion in the race concordant group appearing first followed by regression models relating to subjects matched on their propensity for inclusion in the gender concordant group. A recap of significant findings appears at the chapter’s end.

The primary objective of Chapter Seven is to link the theory and background information that appeared in the early chapters with the quantitative findings that appear in the later chapters in order to address the research questions presented in Chapter Three. The chapter uses a discussion format to highlight these linkages and to describe the study’s limitations. The chapter concludes by examining the policy implications of the dissertation’s findings.

CHAPTER 2. BACKGROUND AND SIGNIFICANCE

2.1 Overview of Racial and Gender Health Disparities

Twenty-first century health care in the United States is characterized by unsurpassed state-of-the-art technology that is the envy of many nations. The degree of technological superiority is exemplified by sophisticated surgical techniques, complex treatment regimens, and highly specialized diagnostic interventions that have radically transformed the practice of medicine in a relatively short span of time. Access to these technologies, however, has not kept pace with their rapid development, which has resulted in a wide array of health disparities. These disparities are usually the result of financial (i.e., differences in income) or geographic barriers (i.e., living in areas with few health providers) that frequently intersect with other social forces (i.e., lower rates of health insurance, transportation issues, getting time off from work, etc.) to limit access to care (SteelFisher, 2004). Race and gender are two variables within this social context that contribute to differences in health care delivery and play a prominent role in terms of describing and understanding health disparities.

Race- and gender-based health disparities in the United States have been extensively studied in recent years as evidenced by the exhaustive literature amassed in these subject areas. The Kaiser Family Foundation's *Key Facts: Race, Ethnicity, and Medical Care, 2007 Update* provides a fairly concise summary of these disparities by organizing them into four broad categories: health status, health insurance coverage, preventive/primary care, and specialty. Each of these categories is briefly illustrated below to establish the context upon which this study is based.

A number of the common indicators of health status illustrate the occurrence of health disparities. The age-adjusted prevalence of obesity among non-Hispanic black women age 20 years and older in 2003-2006 was 53% compared to 42% of women of Mexican origin and 32% of non-Hispanic white women (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2008). Most racial and ethnic minorities rate their overall state of health worse than non-Hispanic whites (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2008) and that this persists even within various income groups (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2006). When health status is expressed in terms of life expectancy and mortality rates, Non-Hispanic African Americans have lower life expectancies and higher infant mortality rates compared to Non-Hispanic whites. For example, the life expectancy at birth in the year 2005 for African-Americans was 73.2 years compared to 78.3 years for whites and, despite the narrowing disparity in infant mortality rates over time, African-American mothers experienced an infant mortality rate of 13.7 for every 1,000 live births in 2005 compared to just 5.7 for every 1,000 live births to white mothers (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2008).

Disparities in health insurance coverage are also problematic for minorities. Racial and ethnic minorities are more likely to be uninsured compared to whites (even among those who are employed) and are more likely to be enrolled in Medicaid or other low-income public insurance programs with limited eligibility features (Urban Institute and Kaiser Commission on Medicaid and the Uninsured, 2005). Fronstin (2003) analyzed Current Population Survey data for people under age 65 and reported that overall 17.3% of non-elderly Americans in 2002 were uninsured, but that figure increased to 34.1% for Hispanics and 21.6% for African Americans compared to just 12.5% for whites. People of Mexican origin were more likely to remain uninsured for a longer period of time with 32% lacking coverage for more than 12 months (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2008). In terms of health insurance disparities pertaining to gender, 40% of uninsured young adult women did not receive a needed health service in the 12 months prior to being interviewed due to the high cost of care compared to just 28% of uninsured young adult men. Additionally, nearly twice as many young insured women (14%) compared to young insured men (8%) reported that they did not receive at least one needed health service in the past 12 months due to the cost of care (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2008).

Disparities in preventive and primary care, particularly with respect to timely prenatal care, dental care, immunizations, and some cancer screenings, are well documented among minority groups. (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2008; U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2006; U.S. Department of Health and

Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2005; U.S. Department of Health and Human Services, Agency for Health Research and Quality, 2008). Racial and ethnic minorities are less likely to have a usual source of health care or to make routine health care visits (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2006). In 2005, the disparity in the percentage of mothers with early prenatal care was substantial with only 70% of American Indian or Alaska Native mothers receiving this care compared to 89% for non-Hispanic white mothers (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2008). People of Mexican origin (51%) and non-Hispanic blacks (54%) were less likely to see a dental professional for teeth cleaning compared to 65% of non-Hispanic whites (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2008). In 1998, a sizable disparity was documented in the percentage of women who received Pap tests used for screening cervical cancer with only 49% of Asian women receiving the Pap test compared to the national average of 64% (Collins et al., 1999). The U.S. General Accounting Office (2003) in its briefing to then-Senator Majority Leader Bill Frist documented that only 50% of older African Americans and 48% of older Hispanics received influenza vaccinations compared to 69% of older whites.

Specialty care is another area of health care where disparities are evident. The age-adjusted rate of diabetes among all adults 20 years of age and older in the United States from 2003 to 2006 was 10.2%; yet, the rate for African Americans and for people of Mexican origin was 16.0% and 15.7%, respectively compared to just 8.8% for whites

(U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2008). Hispanics are less likely to receive the recommended tests to monitor diabetes (U.S. Department of Health and Human Services, Agency for Health Research and Quality, 2008) while African Americans and Hispanics have higher rates of diabetes-related end stage renal disease (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 2006) and are more likely to be hospitalized as a result of diabetes compared to other racial and ethnic groups (U.S. Department of Health and Human Services, Agency for Health Research and Quality, 2008). Additionally, Cowie and Harris (1997) reported that African American diabetics are 30% less likely than their white counterparts to have an eye care visit, an important consideration given the link between diabetes and acquired blindness.

Racial, ethnic, and gender disparities related to the incidence and treatment of HIV (human immunodeficiency virus) and AIDS (acquired immune deficiency syndrome) are also well documented. Statistics cited in the *National Healthcare Disparities Report, 2007* indicate that the rate of new AIDS cases among African Americans in 2003 was 75.0 per 100,000 people in the population at-large and 26.4 per 100,000 among Hispanics. By contrast, the rate for whites was just 7.5 per 100,000 (U.S. Department of Health and Human Services, Agency for Health Research and Quality, 2008). In terms of death rates attributable to HIV, disparities along racial and ethnic lines persist despite the reduction in the magnitude of the disparity since 1995. The age-adjusted death rate due to HIV for males in 2005 was 28.2 per 100,000 for African-

American males, 7.5 per 100,000 for Hispanic males, but only 3.0 per 100,000 for white males (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2008). Shapiro et al. (1999) reported that in 1998, 20% of African Americans did not receive the standard of care for HIV infection compared to just 12% for whites and, in terms of gender disparities in HIV/AIDS, Berg et al. (2004) noted that the rate of adherence to antiretroviral therapy appears to be higher for males compared to females.

Asthma is another example of a disease state characterized by racial, ethnic, and gender disparities. Much like the disease states discussed thus far, blacks fare poorly relative to other minority subgroups. Unlike the other disease states, however, whites do not fare as well compared to other minority groups. For example, the asthma prevalence rate for non-Hispanic blacks and whites was 7.8% and 7.1%, respectively, but only 5.0% for Hispanics and 4.6% for Asians (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2008). Additionally, the rates of hospitalization for asthma among adult African Americans are 3.5 times that of adult whites (U.S. Department of Health and Human Services, Agency for Health Research and Quality, 2005). The gender disparity in asthma is illustrated by examining the current asthma prevalence from 2004-2006 where prevalence was 9% among women compared to 5% among men.

The use of cardiac care services is yet another area where disparities based on race and ethnicity are evident. Lillie-Blanton et al. (2002) reviewed eighty-one methodologically rigorous studies related to the use of cardiac care and conducted over the last two decades. They reported that a large proportion these studies provided evidence that African Americans were less likely than white Americans to receive cardiac diagnostic procedures, revascularization interventions, and thrombolytic therapy, even after adjusting for age, gender, insurance status, co-morbidities, and heart disease severity. Their research also indicated that disparities persisted with patients who were already in the health care system or had similar health insurance status, suggesting that the disparities were not attributable to health care access. The authors concede that a number of factors may contribute to the observed disparities in the use of cardiac care; however, they underscore the role that physician behavior may play in the genesis of health disparities and suggest that physicians should be integrally involved in understanding why disparities occur and implementing strategies that marginalize their impact on society.

2.2 Concordance and its Significance

The Institute of Medicine's report *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care* (2003) suggests that racial and ethnic disparities in the U.S. health care system may be at least partially attributable to aspects of the patient-physician relationship. Cooper and Powe (2004) assert that "race-discordant" relationships, which are defined as patients seeking care from health providers with different racial or ethnic backgrounds compared to their own and which may result from the under-representation of minorities in the various health professions, adversely influence health care quality in terms of less involvement in decision making (Kaplan et al., 1995), less partnership with physicians (Cooper-Patrick et al., 1999), lower levels of trust in physicians (Doescher et al., 2000; Boulware et al. 2003), and lower levels of satisfaction with care (Saha et al., 1999). Conversely, Cooper and Powe examined the link between patient-physician race concordance (i.e., the patient's race is aligned with physician's race) and patient satisfaction and health outcomes and argue that racial and ethnic concordance is associated with higher levels of patient satisfaction and better health care processes.

Cooper and Powe (2004) and LaVeist et al. (2003) suggest increasing the number of minority health care providers as a means of creating more patient-physician race concordant relationships toward the end of reducing disparities in health care. Others (Atkinson, 1983; Sue, 1988) argue that moral, ethical, and political principles should drive any increases in the number of female, ethnic, or racial minority providers. However, very few studies to date have directly examined the impact of race (or gender) concordance on the utilization of health services, a key component in the link between race (or gender) concordance and the narrowing of health disparities (Cooper and Powe). Demonstrating that racial and gender concordance actually increases the utilization of health services supports the notion that increasing the number of minority providers to achieve more race- and gender-concordant relationships may eventually reduce health disparities. Failure to demonstrate this impact may suggest that different strategies may be necessary to combat these disparities.

Considering the "race concordance" hypothesis summarizes the preceding discussion of concordance and its possible impact on the utilization of health services and establishes a link between health disparities and health service utilization theory. This hypothesis suggests that matching patients and health providers on the basis of race improves communication and patients' perceptions of care. By extension, improved communication and perception of care encourages patients to seek and utilize care. The creation of a climate that fosters minorities to seek care, combined with increases in the number of minority health care providers, could potentially reduce health disparities among racial and ethnic minorities (LaVeist, Nuru-Jeter, and Jones, 2003). Figure 2-1 summarizes the race (gender) concordance hypothesis and its relationship to health disparities.

2.3 Literature Review

The literature related to patient-provider race and gender concordance has evolved as researchers and policymakers strive to address the conundrum of health disparities in the U.S. health care system. Brown et al. (2007) suggest that this literature can be organized into four broad categories: patient satisfaction, patient choice of physician, physician choice of location, and utilization/outcomes of health care. These categories

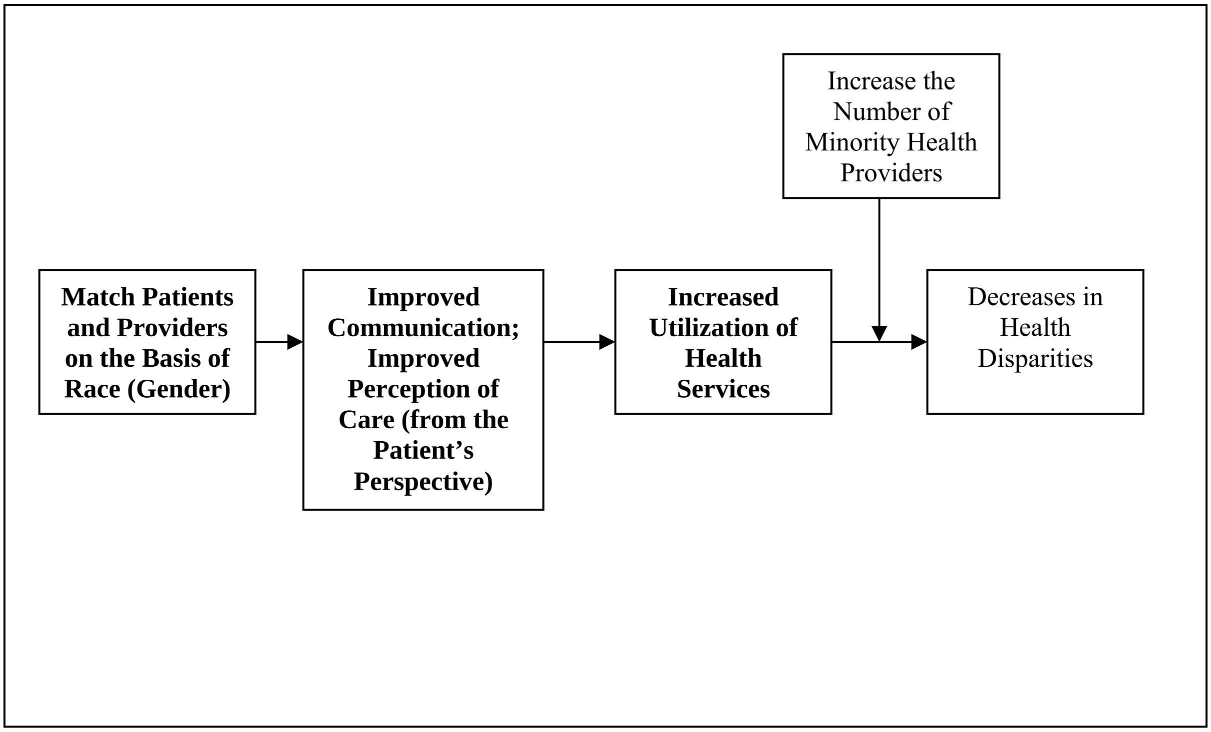

Figure 2-1: The Race (Gender) Concordance Hypothesis (bold typeface indicates focus of this study).

will be employed to direct the organization of this literature review.

A substantial body of literature linking racial concordance with patient satisfaction has been established. Saha et al. (1999) used data obtained in the Commonwealth Fund 1994 National Comparative Survey of Minority Health Care, a telephone survey of a random sample of 3,789 adults in the 48 contiguous states, to analyze the responses of the 2,201 respondents who indicated that they had a regular physician and discovered that black respondents with black physicians were more likely to rate their physician as excellent, more likely to report receiving preventive care, and more likely to report receiving all needed care compared to black respondents with nonblack physicians. The same study revealed that Hispanics who had Hispanic physicians were inclined to report that they were very satisfied with their overall health care compared to Hispanics with non-Hispanic physicians. LaVeist and Nuru-Jeter (2002) used the same data set to analyze responses from 2,720 respondents and discovered that physician satisfaction was greater for respondents in race concordant relationships among each racial or ethnic group compared to respondents who were not race concordant. LaVeist and Carroll (2002) used Commonwealth Fund Minority Health Survey data and reported that physician satisfaction was higher among the 745 African American respondents with race concordant physicians compared to those with race discordant physicians. Cooper-Patrick et al. (1999) researched participatory decision making, an important component of patients' satisfaction with their physicians, and reported that patients in race concordant relationships with their physicians rated their physicians' decision-making style as more participatory compared to patients in race-discordant relationships. Cooper et al. (2003) studied 252 adults (142 African-American patients and 110 white patients) receiving care from 31 physicians (18 African-American and 13 white) and concluded that race-concordant visits were longer and had higher ratings of patient positive affect, a composite variable that summarizes engagement, interest, friendliness, and responsiveness. The authors suggest that factors such as patient and physician attitudes may mediate the relationship between race concordance and higher patient ratings of care.

At least two recent doctoral dissertations have informed the scientific community with respect to the association of race or gender concordance with patient satisfaction. Wolfsenberger (1996) reported that gender concordance for female physicians might play a role in the satisfaction ratings of both male and female family medicine physicians because female physicians garnered higher satisfaction ratings. Blanchard (2006) reported that minorities were significantly more likely than whites to report being treated with disrespect or being looked down upon in the patient-provider relationship. Blanchard’s study, however, found that racial concordance of the patient and provider did not affect whether a patient perceived being treated with respect in the patient-provider setting.

There is also a considerable volume of research that reveals patients’ preferences for physicians of their own race or ethnicity. LaVeist and Carroll (2002) studied 745 African American respondents in the Commonwealth Fund Minority Health Survey and reported that having a choice in the selection of a physician was a significant predictor of race concordance. Saha et al. (2000) analyzed data obtained in the Commonwealth Fund 1994 National Comparative Survey of Minority Health Care, a telephone survey of a random sample of 3,789 adults in the 48 contiguous states, and reported that black and Hispanic Americans sought care from physicians of their own race based primarily on personal preference and language proficiency compared to geographic accessibility. Gray and Stoddard (1997) analyzed 1987 National Medical Expenditure Survey data and found that after controlling for a number of socioeconomic variables, minority patients were five times more likely than nonminority patients to report that their primary physician was a member of a racial or ethnic minority. Moy and Bartman (1995) studied a representative sample of 15,081 U.S. adults using 1987 National Medical Expenditure Survey data and indicated that individuals receiving care from minority physicians were more likely to be ethnic minorities. Specifically, they found that minority patients were more than four times more likely to receive care from nonwhite physicians compared to non-Hispanic white patients and that nonwhite physicians were more likely to care for medically indigent and sicker patients. Murray-Garcia et al. (2001) examined the impact of language on the patient-provider relationship in a cross-sectional study of billing data from 13,681 patient visits at a Northern California pediatric medical center and found that African American, Asian, and Latino pediatric residents were more likely to serve patients of their own ethnicity, regardless of language proficiency. The authors contend that “a (medical) resident’s race or ethnicity may reflect a unique set of skills that is highly valued by patients or health care systems” (p. 1232).

Bender (2005) studied racial and gender concordance in the context of the dental profession to satisfy the requirements of his doctoral dissertation. A major advantage of his study was the ability to use an experimental research design that employed random assignment. He studied 120 male and female Caucasian, African American, Hispanic, and Asian dental patients of a private dental clinic and found that some black and Hispanic patients preferred a racially concordant dentist and that some female patients preferred a gender concordant dentist. Hispanic females, however, were especially likely to prefer racial and gender concordance. However, the overall findings of his research suggest that the racial concordance hypothesis may not apply when choosing a dentist.

Fenton et al. (1987) studied data from a national survey used to explore whether the patients of male and female psychiatrists differed in terms of their demographic or clinical characteristics and whether there were differences in psychiatrists' treatment in gender-concordant relationships compared to gender-discordant relationships. Few differences were discovered between the two groups. However, they reported that better educated clients of both genders tended to have same-gender therapists.

The third broad category of the race concordance literature is related to research associated with physicians' choices to serve patients from their own racial or ethnic group. Stinson and Thurston (2002) analyzed 6,053 observations sampled from data derived from the Practice Patterns of Young Physicians Survey of 1991 and the AMA Physician Masterfile and concluded that variables influenced by a doctor's choice (location, physician specialty, and practice setting) were more pertinent to racial matching than was the physician's race. Komaromy et al. (1996) surveyed 718 primary care physicians in California and reported that black and Hispanic physicians care for more black and Hispanic patients and practice in areas where the percentage of black and Hispanic residents is higher.

Analyses by Cohen et al. (1990), Keith et al. (1985), Brotherton et al. (2000), Xu et al. (1997) and Rabinowitz et al. (2000) drew similar conclusions. Cohen at al. (1990)

studied 5,865 young physicians and suggested that black and Hispanic physicians served disproportionately in their respective communities. Keith et al. (1985) reported that minority physicians who graduated from the UCLA School of Medicine in 1975 were more likely to serve patients of their own ethnic group. Brotherton et al. (2000) studied 1,044 pediatricians who participated in a 1996 survey and reported that the underrepresented minority pediatricians in their study were more likely to care for minority patients. Xu et al. (1997) surveyed 1,581 generalist physicians who received the MD degree in 1983 or 1984 and reported that generalist physicians from underrepresented minorities were more likely to care for medically underserved populations. Similarly, Rabinowitz et al. (2000) analyzed survey results of 2,955 allopathic and osteopathic generalist physicians who graduated from medical school in 1983 or 1984 and found that physician membership in an underserved ethnic/minority groups was one of four factors highly predictive of generalist physicians' care for the underserved. Cantor et al. (1996) surveyed physicians from several states and reported that minority and women physicians were more likely to serve minorities.

Strumpf's (2007) doctoral dissertation investigated the role of concordance on the rates of preventive screening and on the length of outpatient primary care visits in the course of her analysis of National Ambulatory Medical Care Survey data for general practice and internal medicine physicians. She found that the physician's race was a more important predictor of these outcomes than either the patient's race or concordance.

Cooper and Powe (2004) suggest that there is considerable room for expanding the literature in the fourth broad category that links race concordance with the utilization of health services. LaVeist et al. (2003) examined the utilization of health services in the context of race concordance and reported that white, black, Asian, and Hispanic patients in racially concordant relationships with their physicians were more likely to use needed health services and less likely to postpone seeking health care. King et al. (2004) analyzed data from a prospective, cohort study of a national probability sample of 1,241 adults receiving HIV care with linked data from 287 providers and found that African-American patients with white providers received protease inhibitors significantly later (in relation to the FDA approval date of the first protease inhibitor) than the African-American patients with African-American providers.

Sandman's (2002) doctoral dissertation examined the impact of gender concordance between patients and their physicians on the receipt and delivery of preventive care by analyzing the Commonwealth Fund 1998 Survey of Men's and Women's Health. He found that physician gender had a significant effect on the provision of care. Gender concordance and patient gender, however, did not have a significant effect on care provision.

The review of the literature indicates that there is considerable research linking race and gender concordance to patient preferences, physician preferences, and satisfaction with care but relatively little that specifically examines the impact of racial or gender concordance on the utilization of health services. This study sought to fill that void and expand the knowledge base in this area by examining the effect of race and gender concordance on the utilization of health services, an important component in the race/gender concordance hypothesis linking the use of health services to health disparities. The next step in affirming the linkage between utilization and disparities is a thorough examination of utilization theory, which occurs next in Chapter Three.

CHAPTER 3: THEORETICAL FOUNDATION

As the title implies, Chapter Three is organized into three major sections. The first section establishes the theoretical foundation for health service utilization upon which the dissertation is based. The chapter's second section consists of a review of the body of literature examining the relationship between race and gender concordance and a number of different health outcomes. The chapter concludes by imparting an explicit array of research questions that the dissertation seeks to address along with the corresponding research hypotheses. The dissertation's causal model based on the chosen theoretical framework is also introduced here.

3.1 Health Service Utilization Theory

Chapter Two introduced the reader to the race concordance hypothesis and the role that concordance may play in influencing health utilization and, ultimately, health disparities. Before proceeding to the analytical phases of the dissertation, it is incumbent upon the researcher to establish the theoretical framework upon which the dissertation is based. After careful consideration of several theories of health utilization, Andersen's sociobehavioral model was selected to fulfill this role. The rationale for selecting this particular theory becomes fairly obvious when one considers the available data elements and the features of each theory, which are profiled below.

A handful of theories based in the social sciences have been advanced to explain the utilization of health services. Most of these theories adopt a holistic approach that elevates the importance of an individual's social and environmental circumstances as determinants of health service utilization. Three different theories – the sociobehavioral model (SBM), initially proposed in the 1960s by Andersen (1968), the *health belief model* (HBM), initially proposed by Rosenstock (1966) and revised by Eraker, Kirscht, and Becker (1984), and the *theory of reasoned action* (TRA) introduced by Fishbein (1979) – are particularly noteworthy due to the resilience that they have displayed over time.

Andersen's initial behavioral model specified the utilization of health services as "a function of their predisposition to use services, factors which enable or impede use, and their need for care" (Andersen, 1995, p. 1). The predisposition to use services, or *predisposing characteristics*, consist of an individual's demographic characteristics that represent biological factors that direct the need for health services (i.e., age and gender), social structure factors that determine an individual's standing in a community (i.e., education, occupation, and ethnicity), and health beliefs or the "attitudes, values, and knowledge that people have about health and health services that might influence their subsequent perceptions of need and use of health services" (Andersen, p. 2). Factors that enable or impede use, or *enabling resources*, consist of personal or family resources (income, health insurance, a regular source of care, travel times, waiting times) and community resources (i.e., the availability of health personnel and facilities in relation to where people live and work, the ability to get to those services). *Need* is conceptualized in the model as *perceived* (how people view their own health status and whether or not their health problems are severe enough to warrant seeking professional help) or *evaluated* ("the biological imperative that accounts for some of people's help-seeking" and that represents the “professional judgment about people’s health status and their need for medical care”) (Andersen, p. 3). The outcome variable in Andersen’s initial behavioral is *health service use* and was measured “in units of physician ambulatory care, hospital and physician inpatient services, and dental care which families consumed over a year’s time” (Andersen, p. 3). Andersen’s initial behavioral model is summarized diagrammatically in Figure 3-1.

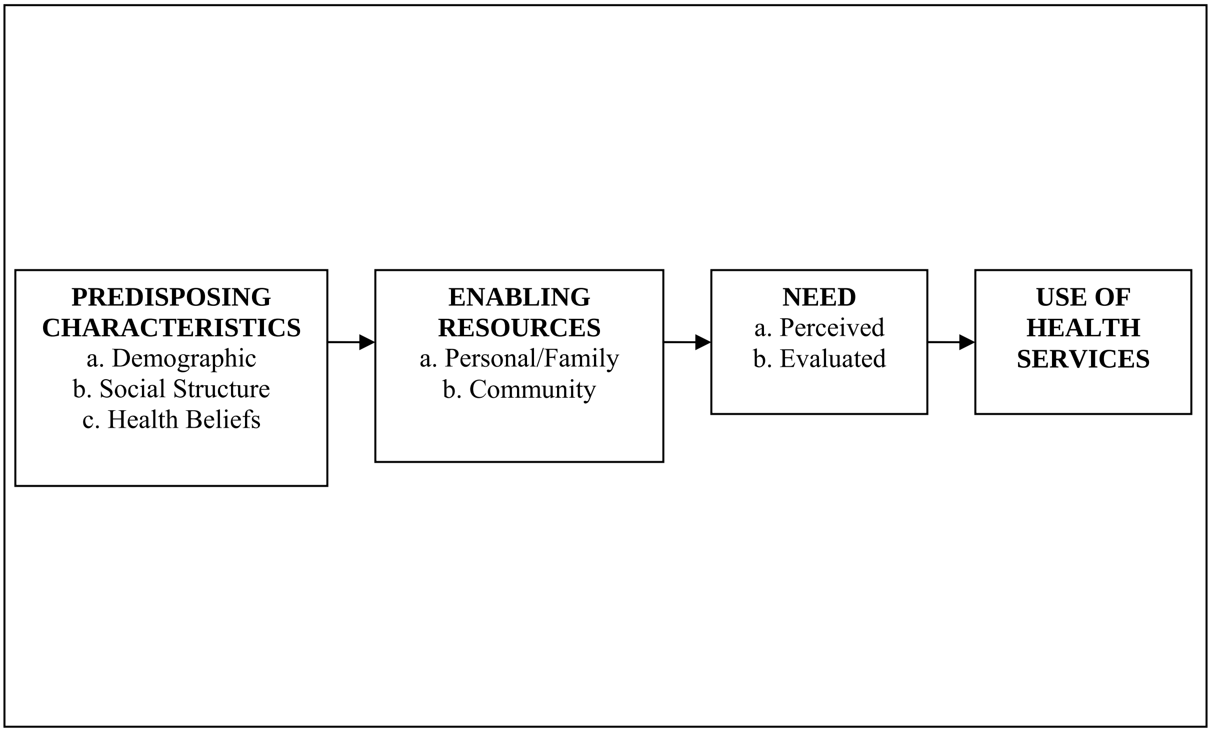

Figure 3-1: Andersen’s Initial Behavioral Model of Health Services Utilization (1960s).

Over time, Andersen (1995) has modified the initial work conducted in the 1960’s to formally recognize the impact of the health care system, specific measures of health services use, consumer satisfaction, health status outcomes, and the impact of the external environment on health services’ use. The latest iteration of his work in this area is referred to as the *Emerging Model – Phase 4* and “portrays the multiple influences on health services' use and, subsequently, on health status. It also includes feedback loops showing that outcome, in turn, affects subsequent predisposing factors and perceived need for services as well as health behavior" (p. 7). Andersen's Emerging Model – Phase 4 can be viewed in Figure 3-2.

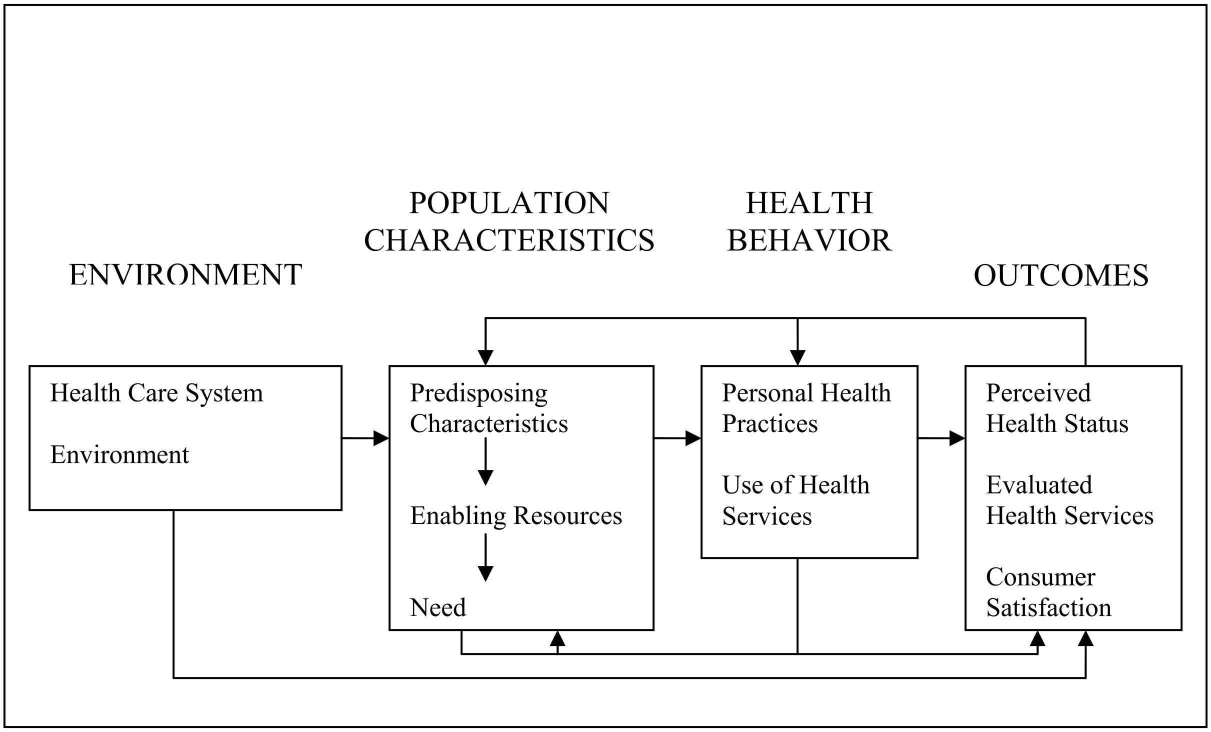

Figure 3-2: Andersen's Emerging Model – Phase 4 (1995).

The health belief model (Rosenstock, 1966) is a second type of health service utilization theory that evolved from the discipline of social psychology. This theory examines how an individual's general health beliefs (e.g, concerns about health matters in general; willingness to seek and accept medical treatment; satisfaction with the patient-physician relationship and other medical encounters) and specific health beliefs (e.g., perceived susceptibility to disease; perceived severity of condition) interact with his or her preferences (e.g., health provider recommendations; decision analysis; risk – benefit calculations; quality vs. quantity of life; heuristics and biases), experiences with health problems and providers (e.g., disease; diagnostic and therapeutic interventions; health care providers), and knowledge (e.g., disease; diagnostic and therapeutic interventions) to influence decisions to seek care, their health behaviors, and outcomes. Eraker, Kirscht, and Becker's revisions to the health belief model (1984) added a social interaction component (e.g., social networks; social support; patient supervision) and a sociodemographic component (age, gender, income, education, and health insurance status), each of which directly or indirectly influences an individual's experience or knowledge.

The third major theory of health service utilization with some degree of longevity and the potential to direct the dissertation is the theory of reasoned action. Much like Andersen's sociobehavioral model, this theory, introduced by Ajzen and Fishbein (1980) accounts for access to the health system, but is primarily focused in many of the same areas as the health belief model (e.g., motivations, assessment of risk, and the avoidance of negative outcomes).

Two compelling reasons make the Andersen framework particularly useful for understanding health care utilization in the context of this study. The first is the fact that the specific data elements available for use are compatible with many of the components that comprise the Andersen model. The second relates to the precedent established by research conducted by LaVeist et al. (2003) where the Andersen model was applied in the researchers' quest to understand the association between doctor-patient race concordance and the utilization of health services. In the course of their work, they broadly categorized the independent variables in their study as predisposing variables, enabling factors, and need variables. The dependent variable, health care utilization, was measured in three different ways: failure to use needed care, delay in seeking needed care, and entry into care. The authors included doctor-patient race concordance as a predisposing independent variable and "hypothesize[d] that patients who are race concordant with their doctor have a greater predisposition to utilize health services after controlling for need, enabling and other predisposing factors" (p. 314). A schematic diagram of their research as applied to Andersen's model appears in Figure 3-3.

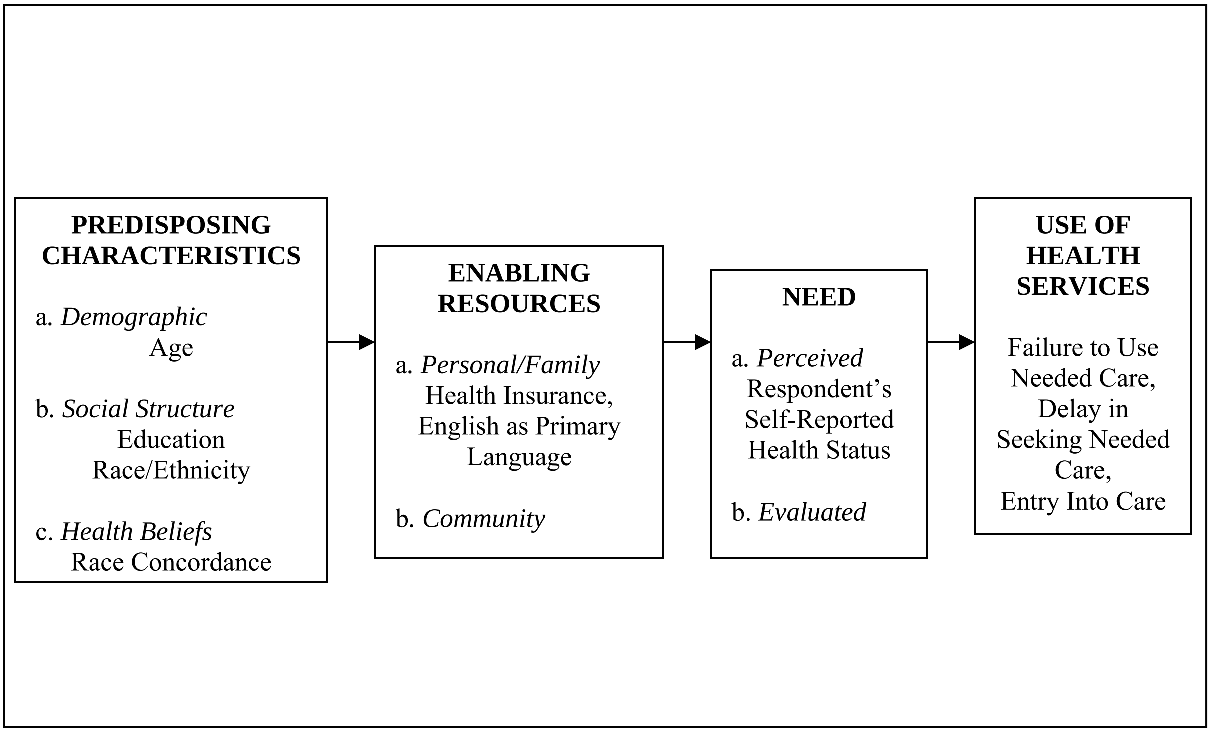

Figure 3-3: LaVeist et al. (2003) Application of Andersen's Initial Behavioral Model.

The primary objective of this study is to determine the impact of race and gender concordance on the utilization of health services. A secondary, yet important, objective of the study is to identify other significant predictors of health utilization for individuals who receive health care via a primary care case management delivery system. In order to accomplish these objectives, the most advanced iteration of Andersen's model of health service utilization, the Emerging Model – Phase Four, will be applied in a manner similar to that employed by LaVeist et al. (2003). However, unlike most of the previous research performed in this area, this study will employ a greater number of control variables and can control for what may well be the most important factor in the health service utilization calculus: health insurance status.

3.2 Research Questions and Hypotheses

The primary research questions that this study addressed were concerned with whether racial and gender concordance between patients and their providers affected the utilization of health services among Medicaid beneficiaries enrolled in a Medicaid primary case management delivery system. The utilization of health services was defined by five different dimensions of health service utilization, each of which constituted a dependent variable in the analysis and each of which were the subject of a separate inquiry (see Chapter 4 for a complete discussion of variable conceptualization and operationalization). These dimensions included the utilization of primary care services, the utilization of specialty care services, the utilization of emergency care services, inpatient care utilization, and the utilization of prescription drug services. Thus, the major research questions that the study addressed include:

- How does racial concordance between enrollee and primary care provider impact the utilization of primary care services?
- How does gender concordance between enrollee and primary care provider impact the utilization of primary care services?
- How does racial concordance between enrollee and primary care provider impact the utilization of specialty care services?
- How does gender concordance between enrollee and primary care provider impact the utilization of specialty care services?

- How does racial concordance between enrollee and primary care provider impact the utilization of emergency care services?
- How does gender concordance between enrollee and primary care provider impact the utilization of emergency care services?
- How does racial concordance between enrollee and primary care provider impact the utilization of inpatient care services?
- How does gender concordance between enrollee and primary care provider impact the utilization of inpatient care services?
- How does racial concordance between enrollee and primary care provider impact the utilization of prescription drugs?
- How does gender concordance between enrollee and primary care provider impact the utilization of prescription drugs?

In addition to these essential questions, several other important questions seek answers. They are:

- How effective is the Andersen model at explaining the various types of health utilization?
- What impact do the other variables in the Andersen framework have on the utilization of health care?
- How prevalent are race concordant relationships among individuals included in the various racial or ethnic subpopulations of this study?"
- What impact does enrollment in a specific care network have on the utilization of health services?
- How do the concordant and discordant groups compare to one another?

Each research question generates the possibility of formulating a research hypothesis. Thus, the research hypotheses that correspond to these research questions include:

- Controlled for all other variables, primary care utilization will increase if the relationship between patient and primary care provider is race concordant.
- Controlled for all other variables, primary care utilization will increase if the relationship between patient and primary care provider is gender concordant.
- Controlled for all other variables, specialty care utilization will increase if the relationship between patient and primary care provider is race concordant.
- Controlled for all other variables, specialty care utilization will increase if the relationship between patient and primary care provider is gender concordant.
- Controlled for all other variables, emergency care utilization will decrease if the relationship between patient and primary care provider is race concordant.

- Controlled for all other variables, emergency care utilization will decrease if the relationship between patient and primary care provider is gender concordant.
- Controlled for all other variables, the predicted odds of using inpatient care will decrease if the relationship between patient and primary care provider is race concordant.
- Controlled for all other variables, the predicted odds of using inpatient care will decrease if the relationship between patient and primary care provider is gender concordant.
- Controlled for all other variables, the predicted odds of using prescription drugs will increase if the relationship between patient and primary care provider is race concordant.
- Controlled for all other variables, the predicted odds of using prescription drugs will increase if the relationship between patient and primary care provider is gender concordant.
- The Andersen framework predicts a large percentage of the variance in the health utilization variables.
- Individuals with poor health status are predicted to use more of each of the five types of health care.
- High levels of trust and satisfaction may result in increased use of primary care, but less use of emergency care and lower predicted odds for using inpatient care.
- Whites use more primary care than non-whites, but less emergency care and have lower predicted odds for using inpatient care than non-whites.
- Older enrollees will use more health services than younger enrollees.
- The longer the length of time that an individual has been seeing a particular provider or been enrolled in a given practice translates to less use of emergency care and lower predicted odds of inpatient care use.
- The enrollee's region of residence and the degree of urbanicity associated with his or her residence has little impact on the use of health services.
- Inclusion in a racial or ethnic subgroup influences the prevalence of race concordance only to the extent of the availability of racially diverse providers.
- Enrollment in a given care network has little impact on the utilization of health services compared to enrollment in a different care network.
- The concordant and discordant groups compare favorably to one another, particularly after invoking the propensity score matching procedures explained in Chapter Four.

3.3 Causal Model

The casual model explaining the utilization of heath services employed by this study is based on Andersen's (1995) *Emerging Model – Phase Four*. The rationale for selecting this model was based on variable availability and the precedent established by the research performed by LaVeist et al. (2003) that used the model as their research template. The causal model appears in Figure 3-4 as *Smith's Adaptation to Andersen's Emerging Model – Phase Four* with this study's variables placed under the major headings depicted by Andersen. The reader should note that the dependent variable, *Use of Health Services*, appears in the third box from the left and that, as is the case in the Andersen framework, there are several feedback loops indicative of some bi-directional relationships. These relationships have the potential to create a dizzying array of complex, path-dependent relationships that could be included in the "ideal" causal model. The focus of this study, however, is to simplify these relationships such that they are

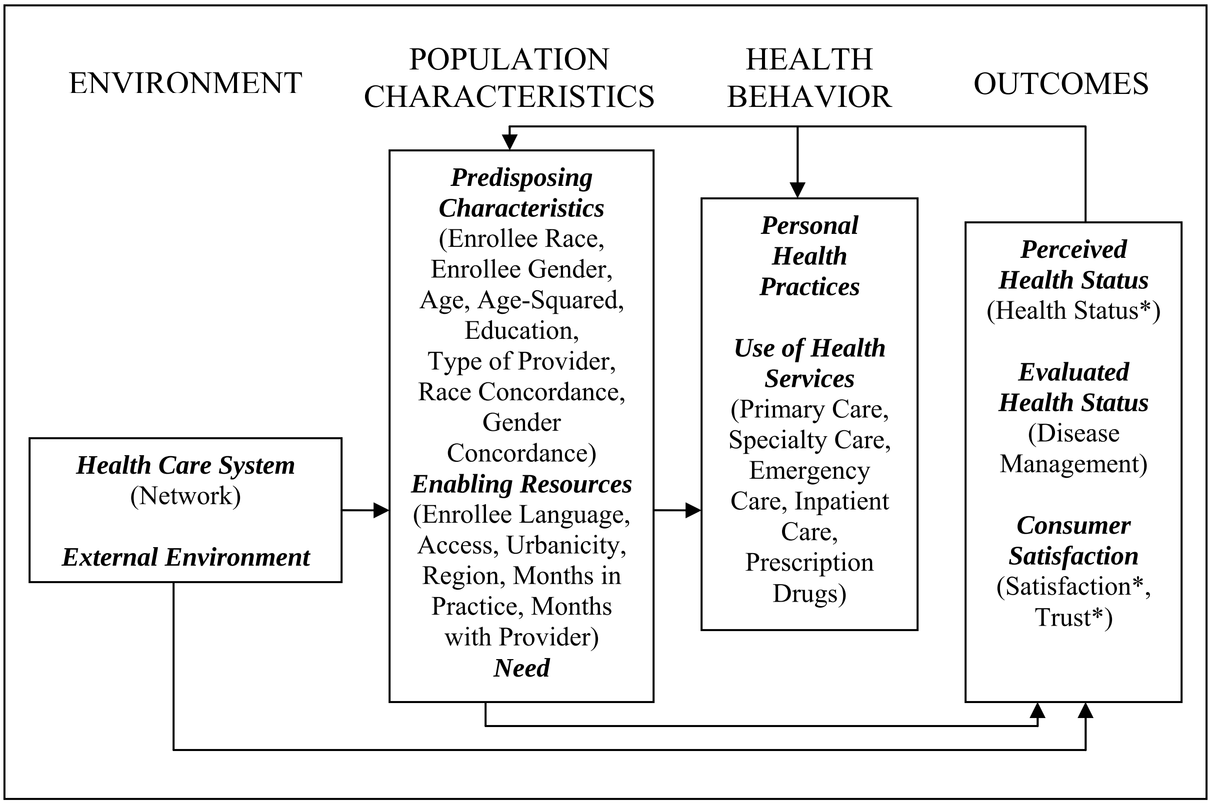

Figure 3-4: Smith's Adaptation of the Andersen Model. (Adapted from Andersen, R. 1995. "Revisiting the Behavioral Model and Access to Medical Care: Does it Matter?" *Journal of Health and Social Behavior*. 36(1): 1-10); * indicates variables created as factor scores via factor analysis.

more readily understood and explained. Therefore, the temptation to include all possible causal relationships in the theoretical model is consciously avoided in order to maintain focus and more effectively manage the research process.

Chapter Three has provided an extensive examination of the utilization theory that guides the dissertation and will be explicitly tested in the analytical phase of the study. The final portions of the chapter were dedicated to an explicit recitation of the research questions and hypotheses as well as a description of the causal model employed by the study. The information provided by this chapter will be recounted in the final chapter of the dissertation when the theory and research questions are paired with the corresponding results as part of the summary discussion and conclusion.

CHAPTER 4. RESEARCH DESIGN AND METHODS

Chapter Four describes the methods used to address the research questions and hypotheses raised in Chapter Three. The chapter begins by summarizing important features of the data, including the requisite inclusion criteria that determined the sampling frame, and the procedures employed to collect the data. The chapter also examines the study's complex sampling methods, which were necessary to accommodate North Carolina Medicaid plan administrators' request to evaluate inter-network variability within the program's primary care case management networks of care delivery. The chapter continues with a description of the study's research design and the conceptualization and operationalization of the variables under study. A discussion of the rationale for propensity score matching follows along with the specific procedures involved in implementing this technique. The final portions of the chapter are devoted to descriptions of the factor analysis and regression methods and to the statistics used to analyze the data.

4.1 Data Characteristics and Collection Considerations

The data analyzed in this study was obtained via the CAHPS 3.0 Health Plan Survey, which "gathers information on enrollees' experiences with their health plans and the providers available through those plans" (U.S. Department of Health and Human Services, Agency for Health Research and Quality, 2002a, p. 5). The data were collected from October 2006 through March 2007 throughout North Carolina from random samples of adults who had been continuously enrolled for at least six months in the network programs of the North Carolina Medicaid's Community Care of North Carolina (CCNC) primary care case management program. Using the eligibility files provided by North Carolina Medicaid administrators, samples were drawn from the population of adults enrolled in CCNC. UNC Charlotte's Urban Institute then conducted the survey in either English or Spanish using computer assisted telephone interview (CATI) methods. The specific eligibility criteria, as well as matters related to the survey response rate, are explained below.

Brandon, Schoeps, Sun, and Smith (2008) described the inclusion criteria that defined the sampling frame (or what the authors referred to as the "study population"). As mentioned above, eligibility was restricted to North Carolina residents who were enrolled in the state Medicaid's CCNC programs for at least six months prior to the cutoff date for which state Medicaid administrators established the sampling frame. Additionally, the study population was limited to those enrolled in any of the following assistance programs: TANF (Temporary Assistance to Needy Families), M-AF (Medicaid to Families with Dependent Children), M-AB (Medicaid to the Blind), M-AD (Medicaid to the Disabled), MSB (Aid to the Blind Medicaid Assistance), SSI (Supplemental Security Income, the federal cash assistance program to the blind, aged, and disabled) under age 65, M-IC (Medicaid to Infants and Children), and SSI (Supplemental Security Income) recipients under age 19.

Medicaid beneficiaries who were enrolled in a number of other assistance programs were specifically excluded from the study population. These exclusions included beneficiaries who were enrolled in the Community Alternatives Program (CAP), disabled adults, persons with mental retardation and/or developmental disabilities and persons with AIDS; MPW (Medicaid for Pregnant Women) enrollees; dual eligibles (individuals who are eligible to receive Medicare and Medicaid benefits); foster kids; QMB (Medicare Qualified Beneficiaries); Medicaid for the Aged; institutionalized enrollees receiving long-term care, nursing home, and Adult Care Home services; enrollees receiving end-stage renal dialysis services; and enrollees in the Health Choice (SCHIP) program.

The resultant sampling frame consisted of 100,014 adults who met the inclusion criteria.[1] This population was relatively diverse in terms of race and age, but less diverse with regard to gender. Just over half (51.1%) of the population was black with whites accounting for 40.3%, but nearly three-fourths (73%) of the population was female. The apparent overrepresentation of females in the study population was attributable to the fact that mandatory and optional Medicaid services and benefits are specifically targeted to low-income women and their children.

Classification of the enrollee's age into age groupings was confounded by the lag in time between the date that the sampling frame was obtained via the state eligibility data and the date that the survey commenced. Fortunately, the age groupings for adult enrollees were relatively broad and, to a great extent, not likely to be affected by the time lag. The convention of using the age of the adult enrollee calculated by the state at the time that the sampling frame was derived and employed by Brandon, Schoeps, Sun, and Smith (2008) was also invoked in this study.

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[1] Eligibility data through March 31, 2006 were used for sampling the adult study population. Thus, Medicaid beneficiaries qualifying under the other criteria were included in the adult population if they were 18 or older on 3/31/06.

The creation of age groupings of adult enrollees for use in a frequency distribution of age was also influenced by Medicaid eligibility standards which require individuals to be at least 18 years of age or older to qualify as an adult recipient. As a result, the youngest age interval begins at 18. The frequency distribution of age among the adult population reflects the fact that there are more adults enrolled in Medicaid at younger ages (less than 45 years of age) than there are in the older ranges. Adults in the 18 to less than 25-year age grouping accounted for 17.6% of all adults in the sampling frame and were followed by 20.5% in the 25 to 34-year old category. Approximately 21% of all adults were distributed in the 35 to 44-year old age grouping, 22.1% in the 45 to 54-year old category, and 19.0% in the 55 years of age or older grouping. The reader may refer to Appendix C: Frequency Distributions of Key Variables, to examine the specific frequencies of age and the other demographic variables as they apply to the study population.

The data also consist of what Brandon, Schoeps, Sun, and Smith (2008) refer to as the “context variables” of urbanicity, region, and care network. “Urbanicity” describes the degree to which enrolled residents live in areas classified as urban, rural, or some “mixed” state lying between urban and rural. The three degrees of urbanicity employed by this study were derived from the nine-level 2003 Rural-Urban Continuum Codes employed by the Economic Research Services (ERS) of the U.S. Department of Agriculture (2004). Brandon, Schoeps, Sun, and Smith (2008) describe how the defining characteristics of population and metropolitan location are used to collapse the nine-level ERS classification scheme to a three-level format that categorizes North Carolina counties as one of the following: a metropolitan county, a non-metropolitan county with a population of 20,000 or more, or a non-metropolitan county with a population less than 20,000. These categories of urbanicity were also used in this study and may be examined more thoroughly in Appendix D where a detailed description of the derivation and classification of the urbanicity variable appears.

“Region” refers to the geographical region within North Carolina where the enrollee resided at the time that the sampling frame was established. The framework established by Diemer and Bobyarchick (2000) in the *North Carolina Atlas* that divides the state into the four distinct land regions of the Appalachian Mountains of western North Carolina, the Piedmont Plateau in the center of the state, the Inner Coastal Plain that lies in eastern North Carolina inland from the Atlantic Ocean and is not directly influenced by the ocean, and the Tidewater region that lies adjacent to the ocean served as the basis for regional classification of each of North Carolina’s 100 counties. Diemer and Bobyarchick acknowledge difficulties that arise when physical boundaries divide certain counties that need to be placed within a single land region for statistical purposes. The conventions that they have adopted for assigning counties to specific land regions are used here and can be viewed graphically in Appendix E.

The care networks (CCNCs) serve as the organizational unit by which medical care is delivered within the primary care case management system. All but one of the fourteen care networks are geographically-based within North Carolina, with the lone exception being the AccessCare Network, which is non-contiguously distributed across the State and which may serve the same population that can enroll in a geographical-based CCNC. Table 4-1 displays the names and network identification numbers of the fourteen care networks. Appendix F provides a geographically oriented representation of the distribution of the CCNCs within North Carolina.

Table 4-1: Community Care of North Carolina Care Networks

AccessCare Network Sites and Counties (#1006)	Community Care Plan of Eastern North Carolina (#2000)
Access II Care of Western North Carolina (#1007)	Community Health Partners (#1003)
Access III of Lower Cape Fear (#2004)	Northern Piedmont Community Care (#1004, #2007 effective January 2007)
Carolina Collaborative Community Care (#1013)	Northwest Community Care Network (#1008, #2006 effective August 2006)
Carolina Community Health Partnership (#1010)	Partnership for Health Management (#1012)
Community Care of Wake/Johnston Counties (#1011)	Sandhills Community Care Network (#2005)
Community Care Partners of Greater Mecklenburg (#1009)	Southern Piedmont Community Care Plans (#2003)

In accordance with best survey research practices, the telephone survey was formulated to contact program enrollees exclusively via landline telephone numbers.[2] This feature of the survey methodology, in combination with difficulties locating potential respondents using telephone-based methods and attaining completed interviews inherent to Medicaid populations (Brown et al., 1999), created challenges contacting individuals in the drawn sample (see Chapter Four, Sec. 4.2, Sampling Considerations for a complete discussion of the rationale and methods employed in obtaining the drawn sample) and calculating the survey response rate (Brandon, Schoeps, Sun, and Smith,

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[2] Keeter, Kennedy, Clark, Tompson, and Mokrzycki (2007) and Krisberg (2009) describe some of the constraints associated with conducting telephone-based survey research that favor the use of landline telephones over wireless telephones. The authors point to the potential safety hazards that wireless telephones may pose to people who may be driving or otherwise distracted, the provision imposed by federal law that requires that cell phones be hand-dialed and prohibits the use of automated dialing devices when calling cell phones, and the disincentive for potential respondents to cooperate that has been created by wireless plans that generate usage charges or loss of pre-paid minutes.

2008) in accordance with the standards and definitions employed by the American Association for Public Opinion Research, or AAPOR (2006).[3] For example, a substantial number of enrollees (n = 6,899) in the drawn sample of adults (n = 29,122) did not have a known telephone number. Additionally, the denominator in the CAHPS-approved formula employed by the AAPOR (2006) that calculates the response rate includes partial interviews, refusals, no answers, busy signals, occurrences where an answering machine picks up, occurrences where the enrollee was not available at the telephone number on file in the Medicaid records, and occurrences where the respondent was not available on callback after completing a portion of the survey.[4] Each of these played a role in depressing the overall response rate, which was calculated at 27.1%. However, recent research suggests that surveys that can only obtain data on a small proportion of subjects included in a sample are still accurate representations of the underlying population so long as there is no systematic bias determining who responds and who does not (Groves, 2006; Keeter et al., 2006; Stag and Jöckel, 2004; Triplett, 2008). Although partial interviews – which must be included in the denominator and excluded from the numerator – were less than 2% in the survey, refusals from phone numbers successfully contacted amounted to 25.9% of the denominator.

4.2 Study Design

The telephone survey of North Carolina Medicaid beneficiaries enrolled in the CCNC networks constitutes an observational study that examined respondents' attitudes

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[3] Although these standards are specifically designed for random-digit dialing surveys, face-to-face household surveys, and surveys of specific individuals, CAHPS 3.0 guidelines allow the AAPOR standards to be adapted to Medicaid telephone surveys

[4] The formula for calculating the response rate considers a number of "dispositions" which are described in the equation: $RR = [I / [(I+P) + (R+NC+O) + (UH+UO)]] \times 100$, where RR = response rate; I = number of completed interviews; P = number of partial interviews; R = number of refusals; NC = number of non-contacts; O = other; UH = wrong numbers, busy signal, no answer, answering machine; UO = callbacks.

concerning their health, health care, and health care providers at a single point in time. The cross-sectional data derived from this survey is subject to nearly all of the potential threats to internal and external validity.[5] However, the application of a propensity score matching technique (which is described in considerable detail in Section 4.5 of this chapter) created a race- or gender-concordant (or "treatment") group and a race- or gender-discordant (or "comparison") group that transformed the study's design to that consistent with a *post-test only comparison group* design. This type of quasi-experimental research design features comparisons between groups, addresses the study's research hypotheses, and conforms to the constraints imposed by cross-sectional data. The post-test only comparison group design is well-suited for this data set because, unlike classic experimental research designs that feature prospective, random assignment of survey respondents into groups, it is impossible to control exposure to the study's primary independent variables (race-or gender-concordance between enrollees and their providers) because respondents self-select into the groups on the basis of the choices that they make.

Despite its simplicity, the posttest-only comparison group research design controls for a number of threats to internal validity. By virtue of the absence of a pretest, the threats of *testing* (where individuals score "better" with each successive administration of the test) and *instrumentation* (when the mode of data collection is altered during administration of a test) are eliminated (Campbell and Stanley, 1963; Cook and Campbell, 1979). Similarly, the absence of a pretest eliminates the threat of

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[5] Campbell and Stanley (1963) and Cook and Campbell (1979) identify at least twelve threats to internal validity: history, maturation, testing, instrumentation, statistical regression, selection biases, experimental mortality, causal time order, diffusion or imitation of treatments, compensation, compensatory rivalry, and demoralization. A number of the threats to internal and external validity are summarized in Appendix G.

regression, where test scores shift up or down in relation to the true population mean (Grembowski, 2001). Although the threat of *history* (events that occur which affect the two groups in different ways) is not entirely eliminated, the posttest-only comparison group design controls for this threat in large measure because most historical events are likely to affect both groups.

The threat of *selection* associated with the study's research design poses the greatest threat to internal validity. Concordance is not randomly assigned, and underlying factors that cause a patient to seek out race or gender concordance may also influence health care utilization. For instance, patients with low health status may be the ones most likely to benefit from having a provider that is racially and/or gender concordant, and they may spend more effort seeking out a provider with the same race and/or gender. If this is the case, the concordant group may have a systematically lower level of health status and systematically higher level of health care at the outset, where the higher level of health care use is driven by health status, not concordance. Although the design's selection bias cannot be eliminated, the propensity score matching techniques described in the following sections help minimize the threat of selection.

In terms of the study's external validity, the study's findings may be readily generalized to non-elderly adult low-income managed care populations and, to some degree, individuals enrolled in case management health delivery systems, but less so for children, the elderly, and those enrolled in traditional fee-for-service or employer-based health insurance plans.

4.3 Sampling Considerations

In the course of the program evaluation conducted by UNC Charlotte researchers, one of the stated goals of the North Carolina Medicaid plan administrators was to survey respondents in each of the fourteen CCNC networks in order to facilitate inter-network comparisons of enrollee satisfaction, access, health status, trust, and utilization (Brandon, Schoeps, Sun, and Smith, 2008). This request by program administrators directed the UNC Charlotte research team to consider stratification of the sampling frame using the enrollee's care network as the stratification variable before the commencement of sample selection. This decision was consistent with Babbie's (2004, p. 205) discussion of stratification that defines stratification as "the grouping of the units composing a population into homogeneous groups (or strata) before sampling" and that states that the technique is often employed to ensure that an adequate number of observations for group comparisons are selected.

Babbie (2004) also discusses the virtues of probability sampling techniques that minimize sampling error, minimize threats to validity, and ensure that derived samples are representative of the population under study. The mainstay of probability sampling is random selection, where each individual in the population "has an equal chance of selection independent of any other event in the selection process" (Babbie, p. 190). The research team at UNC Charlotte opted to employ the "natural" stratification of program enrollees based on network affiliation in combination with the random selection of individuals from the 2006 sampling frame provided by plan administrators to constitute the sampling plan. The procedures and challenges involved in implementing the sampling plan are summarized below.

The stratified random sample of adults in the study population was derived from the 2006 sampling frame of 100,014 Carolina ACCESS-II (CA-II) eligibles provided by the North Carolina Department of Health and Human Services as described by Brandon, Schoeps, Sun, and Smith (2008). An initial target sample of n = 800 enrollees in each of the fourteen networks (total n = 11,200) was selected with the objective of obtaining approximately 200 completed CAHPS surveys for each network, or a total of 2,800 completed surveys. The rationale for the target of n = 200 respondents in each network was consistent with earlier work in this area and is based on the capability of detecting differences of 0.35 points when making direct comparisons between the fourteen CCNC networks, assuming a standard deviation of 2.5 and maximum error of estimate of 0.35 (N. Schoeps, personal communication, 2007).[6]

The initial target sample consisting of n = 800 enrollees in each network was provided to UNC Charlotte's Urban Institute which conducted the telephone survey. During the early stages of the interview process, however, it was determined that the sampling frame included individuals less than 18 years of age, which fell outside the criterion for inclusion as adults. The drawn sample was amended to remove those individuals from consideration. A second amendment to the drawn sample became necessary due to difficulties encountered by the Urban Institute in contacting potential respondents. These difficulties were attributable to inaccurate phone numbers and a high proportion of occurrences where the potential respondent did not answer the telephone. This second amendment to the initial sample added approximately 600 enrollees in each

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[6] Based on the formula $n = [(z^*\sigma)/E]^2$, where $z = 1.96$ (the z-score required for a 95% confidence interval), σ = the standard deviation, and E = the maximum error of estimate (See Chase and Brown (1992) p. 298 for a more complete discussion of maximum error of estimate).

network (total n = 1,400 enrollees in each network). The problem of contacting potential enrollees persisted over time and required a third and fourth amendment to the drawn sample, increasing the sample size in each network to n = 2,000 and n = 2,200, respectively, for a total drawn sample size of 29,122. Care was taken in each amendment of the drawn sample to remove enrollees from the sample who had previously been submitted to the Urban Institute, thereby preventing any duplication of telephone interviews. Ultimately, 2,815 subjects from the drawn sample of 29,122 were actually surveyed.

Utilization of a stratified random sampling strategy ensured that adequate numbers of respondents from each network were surveyed, but the strategy also resulted in a disproportionate percentage of enrollees in each network who were surveyed relative to the percentage of the total population of enrollees in each network. For example, 215 of the 2,815 respondents to the adult survey (approximately 7.6%) were enrolled to receive care in the Community Health Partners network (network #a1003). Yet, only 3,185 of the 100,014 adult beneficiaries who constituted the study population (approximately 3.2%) were enrolled in this care network. The net result was an over-representation of survey respondents from network a1003 relative to the proportion of the total population enrolled in the Community Health Partners network. Similar observations, where the percentage of survey respondents was either over- or under-represented by network relative to the total enrollees by network, occurred in each of the care networks, thereby indicating that the sampling strategy was technically a disproportionate stratified random sampling strategy (Grembowski, 2001).

The final sampling consideration relates to Lipsey's (1990) framework that links sample size, statistical power, and effect size when studying research questions involving comparison groups. These guidelines determine the appropriate sample size to maximize statistical power and minimize the probability of committing a Type II error, which occurs if the null hypothesis is not rejected when, in fact, it should be if the race (or gender) concordant and race (or gender) discordant groups actually differ.

In general, a low tolerance for Type II errors and the ability to detect small effect size (the differences between the means of two groups) requires large sample sizes. Dennis' (1994) work in this area describes the sample sizes required to achieve various effect sizes at an 80% power level and a Type I error (rejecting the null hypothesis when there is no actual difference between the groups) rate, or α, of 5%. Given these parameters, detection of an effect size of 5-10 percentage points requires a sample size of observations of approximately 600-1,550 respondents *in each group*. Examination of the unmatched study data reveals that there were 1,396 respondents in the race-concordant group and 1,133 survey respondents in the race-discordant group. Similarly, there were 1,457 respondents in the gender-concordant group and 1,260 respondents in the gender-discordant group. Furthermore, upon completion of the propensity score matching procedure (see section 4.5), there were 1,126 subjects in each of the race concordant and discordant groups among respondents matched on their probability of inclusion in the race concordant group and 1,241 subjects in each of the gender concordant and gender discordant groups among respondents matched on their probability of inclusion in the gender concordant group. Hence, barring a large number of missing cases that may appear as a result of the LISTWISE (or complete case approach[7]) procedure employed in the analysis, the sample sizes of observations are sufficient in each group to detect relatively small differences in effect size of 5-10% at a power level of 80% and a Type I error rate of 5%. This feature is particularly important in terms of evaluating the bivariate relationships described in Chapter Five.

4.4 Conceptualization and Operationalization of Variables

A list of ten specific research questions appears in Chapter Three that seek to address whether race or gender concordance impact five different types of health utilization: provider office visits (heretofore referred to as primary care visits, or primary care utilization), specialty care visits, emergency room visits, inpatient care, and prescription drugs. Each of these dimensions of health service utilization constitutes a dependent variable for statistical analysis and is conceptualized and operationalized as described below. A similar discussion of the predictor (independent) variables also appears within the course of this section of the chapter.

Primary care utilization is based on survey question #31, which asks respondents, “In the last 6 months (not counting times you went to an emergency room), how many times did you go to a doctor’s office or clinic to get care for yourself?” The original variable, q31, was coded such that “1” represented no visits, “2” represented one visit, “3” represented two visits, “4” represented three visits, “5” represented four visits, “6” represented five-to-nine visits, and “7” represented ten or more visits. The variable was recoded to a new variable (q31rr) that followed a similar pattern. However, the recoded

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[7] The LISTWISE method, or complete case approach, is a method of handling missing values that includes only those observations with complete data. This method may result in sample size reduction because missing data on any variable eliminates the entire case from the analysis (Hair, Black, Babin, Anderson, and Tatham, 2006).

variable compensates for the fact that the data in the original variable is upper-censored because five-to-nine visits are represented with a value of "5" and ten or more visits are represented by a value of "6."[8] The compensatory mechanism employed when recoding the variable entailed assigning a mid-range value of "7" for the five-to-nine visit grouping and assigning a value of "10" for the ten-or-more visits grouping. The primary care utilization variable represents a "health behavior" as specified by the theoretical model adapted from Andersen (1995) and, when constructed to compensate for the upper-censoring in the original variable, can be used as a dependent variable in an ordinary least squares multiple regression model.

Specialty care utilization is based on survey questions #20 and #21, which ask respondents, "In the last 6 months, did you see a specialist?" and "In the last 6 months, how many times did you go to specialists for care for yourself," respectively. Question 20 was structured as a dichotomous variable with possible responses as "Yes" (originally coded as "1") and "No" (originally coded as "2"). Question 21 was structured as an ordinal variable with possible responses of one visit (coded as "1"), two visits (coded as "2"), three visits (coded as "3"), four visits (coded as "4"), five-to-nine visits (coded as "5"), and ten or more visits (coded as "6"). A new variable, q21rr, was created to operationalize specialty care visits that combined the "No" responses from Question 20 with each of the possible responses from Question 21. However, the recoded variable compensates for the fact that the data derived from Question 21 are upper-censored

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[8] A censored dependent variable occurs when "observations of it cannot be seen when it takes on vales in some range. That is, the independent variables are observed for such observations but the dependent variable is not" (Meyer, 2006). In this case, the variable is upper-censored because there is missing data on large values. Jöreskog (2002) explains how estimates of the mean and variance of a censored variable (and the corresponding ordinary least squares regression) will be biased because the censored variable is not observed over its entire range.

because five-to-nine visits are represented with a value of “5” and ten or more visits are represented by a value of “6.” The compensation mechanism employed when recoding the variable entailed assigning a mid-range value of “7” for the five-to-nine visit grouping and assigning a value of “10” for the ten-or-more visits grouping. Thus, the newly created variable was coded such that “0” represented no visits, “1” represented one visit, “2” represented two visits, “3” represented three visits, “4” represented four visits, “7” represented the mid-point of five-to-nine visits, and “10” represented ten or more visits. The revised specialty care utilization variable (q21rr) is specified as a “health behavior” by Andersen’s (1995) theoretical model adapted and can be used as a dependent variable in an ordinary least squares multiple regression model when constructed to compensate for the upper-censoring in the original variable.

Emergency room utilization is based on survey question #30, which asks respondents, “In the last 6 months, how many times did you go to an emergency room to get care for yourself?” The possible responses to the question were set up on an ordinal scale with “0” indicating that no visits occurred, “1” indicating that one visit occurred, “2” indicating that two visits occurred, “3” indicating that three visits occurred, “4” indicating that four visits occurred, “5” indicating that five-to-nine visits occurred, and “6” indicating that ten or more visits occurred. A new variable, q30rr, was created to operationalize emergency care visits that compensates for the fact that the data derived from Question 30 is upper-censored because five-to-nine visits are represented with a value of “5” and ten or more visits are represented by a value of “6.” The compensation mechanism employed when recoding the variable entailed assigning a mid-range value of “7” for the five-to-nine visit grouping and assigning a value of “10” for the ten-or-more visits grouping. Thus, the newly created variable was coded such that “0” represented no visits, “1” represented one visit, “2” represented two visits, “3” represented three visits, “4” represented four visits, “7” represented the mid-point of five-to-nine visits, and “10” represented ten or more visits. The revised emergency room utilization variable is specified as a “health behavior” by the theoretical model adapted from Andersen (1995) and can be used as a dependent variable in an ordinary least squares multiple regression model.

Inpatient care utilization is based on survey question #61, which asks respondents, “In the last 6 months, have you been a patient in a hospital overnight or longer?” Question 61 was originally structured as a dichotomous variable with possible responses as “Yes” (coded as “1”) and “No” (coded as “2”). A new variable (InptUtil) was created that reversed the coding of the original variable so that “No” is now coded as “0” and “Yes” remains coded as “1.” The revised inpatient care utilization variable (InptUtil) is specified as a “health behavior” by the theoretical model adapted from Andersen (1995) and can be used as a dependent variable in a logistic regression model.

Prescription drug utilization is based on survey question #53, which asks respondents, “In the last 6 months, did you get any new prescription medicine or refill a prescription?” Question 53 was originally structured as a dichotomous variable with possible responses as “Yes” (coded as “1”) and “No” (coded as “2”). A new variable (RxUtil) was created that reversed the coding of the original variable so that “No” is now coded as “0” and “Yes” remains coded as “1.” The revised inpatient care utilization variable (InptUtil) is specified as a “health behavior” by the theoretical model adapted from Andersen (1995) and can be used as a dependent variable in a logistic regression model.

A number of variables were used as independent variables in the quest to predict impact on health services utilization. The two major predictor variables are the dichotomous concordance variables, *race concordance* (raceconcord2) and *gender concordance* (genderconcord), which are specified by the theoretical model as "predisposing characteristics" on the basis of two defining characteristics. The first is a link to what Andersen (1995, p. 2) classified as "health beliefs," or the "attitudes, values, and knowledge that people have about health and health services that might influence their subsequent perceptions of need and use of health services." The second feature relates to Andersen's classification of the psychological characteristics considered as predisposing variables, one of which is autonomy, which was extensively analyzed in the context of health care utilization by Davanzo (1994) in her doctoral dissertation research. Therefore, in the context of an individual's attitudes or beliefs about the use of health services, individuals exercise personal autonomy when choosing their health providers.

The concordance variables provide the basis for assignment to the "treatment" and "comparison" groups in the propensity score matching procedure (see Section 4.5 of Chapter Four) and were derived from four different variables: *enrollee race*, *provider race*, *enrollee gender*, and *provider gender*. Aside from their role in determining the race and gender concordance variables, enrollee race and gender are also predictor variables within the causal model and their role in that capacity is discussed shortly.

The formation of the race concordance variable was complex and involved several modifications before a statistically appropriate outcome was achieved. The first modification entailed matching the eight categories of the respondents' race or ethnicity derived from survey question #70 with the same eight categories of respondents' provider race derived from survey question #11. These categories included White, Black, Asian, Pacific Islander/Native Hawaiian, Native American/Alaska Native, Middle Eastern, Latino/Caribbean/South American, and Other Race and were created as a result of considerable data manipulation of the original survey responses to the enrollee race and provider race questions. The specific procedures that were used to collapse data into these eight categories are thoroughly described in the discussion of the enrollee race variable.

Those respondents who offered responses to questions of their race or their providers' race that were eventually categorized in the Other Race category proved to be somewhat more problematic in terms of assigning their race concordance status. This circumstance required a detailed examination of the responses to questions of respondent race (Question #70) and provider race (Question #11). Specifically, fifty-five respondents to the survey issued responses to the question of their race (Question #70) that were eventually classified in the Other Race category. Forty-eight of the 55 responses were originally recorded by surveyors at UNC Charlotte's Urban Institute as "multiracial," two were categorized as "unknown" because the respondents were either orphaned or adopted, four were categorized as "American," and one was classified as "human." On the other hand, the breakdown of provider race (Question #11) from the same fifty-five respondents revealed that twenty-nine indicated that their provider was White, seven said that the provider was Black/African American, one responded Asian, one indicated that the provider was of Pacific Islander or Native Hawaiian origin, three said Indian, two responded Middle Eastern, two reported "multiracial," and ten survey respondents did not respond to this question. The only possible concordant match among these responses was a match between two of the multiracial respondents who also indicated that their providers were multiracial. This, in fact, was the case. However, due to the non-specific nature of the term “multiracial” and the small number of affected respondents (n = 2), all Other Race respondents who indicated that they had Other Race providers were categorized as race-discordant.

A second modification of the race concordance variable was necessary due to the small number of race concordant observations in the Pacific Islander/Native Hawaiian and Middle Eastern groupings. This circumstance confounded the ability to interpret the Chi-square test of statistical significance in several of the preliminary cross-tabulations of race concordance with other variables (see Chapter Five) because of the small number of expected cell counts in cells related to these groupings.[9] The problem was remedied by collapsing the race-concordant observations in the Pacific Islander/Native Hawaiian category into the Asian category and by collapsing the race-concordant observations in the Middle Eastern category into the Other Race category. Thus, the final version of the race concordance variable (raceconcord2) was determined by matching the concordant pairs of observations in the following categories: White, Black, Asian, Native American/Alaska Native, and Latino/Caribbean/South American. A value of 1 was assigned to race concordance if a white enrollee reported that their primary caregiver was also white; a value of 1 was also assigned to race concordance if a black enrollee reported

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[9] Validity of the Chi-square statistic as a measure of statistical significance is compromised when a relatively large proportion (greater than 20%) of the cells in a cross-tabulation contain expected counts less than 5. The Chi-square statistic measures statistical significance by comparing observed frequencies with the frequencies expected if there was no relationship between the two variables. The difference between the observed frequencies and the expected frequencies is exaggerated if the expected frequencies are small. See Meier and Brudney (1993) p. 223-229 for a more complete description of Chi-square.

that their primary caregiver was also black. This process was repeated for each of the other enrollee and provider race categories. A value of 0 was assigned to each discordant pair (i.e., white enrollee with any non-white primary care provider, black enrollee with any non-black primary care provider, etc.) and, due to lack of specificity, to the two concordant matches of multiracial respondents and multiracial providers. In terms of the variable's use in the linear and logistic regression procedures, race concordance is a dichotomous dummy variable with the race discordant group serving as the comparison category.

The gender concordance variable was created in a similar manner but involved considerably less complexity. A value of 1 was assigned to female enrollees who reported a female primary care provider and to male enrollees who reported male primary care providers. All discordant pairs (female respondents with male primary care providers and male respondents with female primary care providers) were assigned a value of 0. In terms of the variable's use in the linear and logistic regression procedures, gender concordance is a dichotomous dummy variable with the gender discordant group serving as the comparison category.

In addition to the primary predictor variables of race concordance and gender concordance, a number of other independent variables were also conceptualized for use in the causal model. The list included demographic variables such as the respondent's race, gender, language, age, and level of education as well as the context variables of care network, region, and urbanicity. The number of months that the enrollee had been seeing the same provider or had been in the same practice, along with the type of provider who extended care to the enrollee, was also included. Additionally, three factor scores representing enrollee health status, enrollee satisfaction with their providers, and enrollee trust in their providers were obtained via factor analysis (see Section 4.6) were integrated into the causal model as was a survey item that functioned as a proxy for access. Each of these independent variables is described below.

Two of the variables employed to construct the concordance variables, *enrollee race* and *enrollee gender*, are specified as “predisposing characteristics” within the Anderson theoretical framework. Conceptualization of the dichotomous gender variable was a relatively unambiguous exercise with enrollees categorized as either male or female. However, an operationalization issue arose when verifying the respondent’s self-reported gender. Additional effort in the form of return calls to respondents was required to reconcile thirty-three discrepancies between the gender as reported by the survey and the gender that was on record with North Carolina Medicaid authorities. The primary source of the discrepancies appeared to be the result of recording errors during the course of the survey. In terms of the variable’s use in the linear and logistic regression procedures, enrollee gender is inherently a dummy variable, with males selected as the comparison category for study purposes.

Conceptualization of the race variable was more difficult due, in part, to constraints imposed by the survey instrument. Barr (2008) describes how the U.S. Census Bureau categorizes the population in terms of both race and ethnicity, thereby allowing distinctions between non-Hispanic whites and whites of Hispanic origin and a person of Hispanic origin to claim any race. The survey instrument included items that made these distinctions among program enrollees but did not capture the ethnicity component (i.e., Hispanic vs. non-Hispanic) for providers. This circumstance stymied the creation of values in the race concordance variable that would faciliate this distinction.[10] As a result, the race category that was created for both enrollees and providers that classifies individuals as "Latino/Caribbean/South American" represents the only avenue to capture Hispanic ethnicity when the discussion turns to race concordance.

Operationalizing the race variable was also complicated by ambiguities associated with reporting one's race. For example, Brandon, Schoeps, Sun, and Smith (2008) reported that survey respondents offered a number of responses beyond those specified by the survey instrument to questions oriented to both the enrollee's race and to the provider's race. Specifically, twenty-four different categories of race were reported for the respondent's race/ethnicity and thirty-six different categories were reported for the primary care provider's race/ethnicity. Although enrollee race is the focus of this discussion, the data for both the enrollee race and the provider race variables were collapsed in a manner that eventually resulted in eight meaningful categories. These categories included white, black or African American, Asian, Pacific Islander/Native Hawaiian, Native American/Alaska Native, Middle Eastern, Latino/Caribbean/South American, and Other Race. In order to achieve consistency with the race concordance variable, the number of race groupings for enrollee race was further reduced by categorizing the Pacific Islander/Native Hawaiian respondents as Asian and by categorizing the Middle Eastern respondents as Other Race. In terms of the variable's use in the linear and logistic regression procedures, enrollee race is a categorical-level

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[10] In terms of creating a concordance variable that consolidates both race and ethnicity, the inability to capture data related to provider ethnicity may have been inconsequential in statistical terms due to the relatively small number of enrollees who claimed that they were Hispanic. For example, only twenty-four (1.6%) of the 1,491 white respondents to the survey claimed that they were Hispanic and only ten (0.9%) of the 1,116 black respondents to the survey claimed that they were Hispanic.

variable where dummy variables were created for each category. White enrollees were selected as the comparison category.

The respondent’s primary *language* spoken in the home is specified by the theoretical model as an “enabling characteristic” because it is a population characteristic that may enable or impede the use of health services. Examination of the data related to this categorical-level variable revealed little variability with 98.7% of respondents claiming that English was the primary language spoken in the home and the remaining 1.3% of respondents reporting ten different language-related responses. Brandon, Schoeps, Sun, and Smith (2008) reduced the original data to three meaningful categories – English, Spanish, and Other – which were also employed by this study. In terms of the variable’s use in the linear and logistic regression procedures, the primary language spoken in the home is a categorical-level variable where dummy variables were created for each of the three categories. English was selected as the comparison category.

The enrollee’s *age* is another control variable specified as a “predisposing characteristic” in the causal model because it is a demographic and biological factor that directs the need for health services. The survey instrument (question #66) and Medicaid plan administrators provided several different age-related variables as options for conveying the enrollee’s age. However, each of these either lacked the optimal level of precision or was subject to the time lag between establishing the sampling frame and commencement of the survey, thereby limiting its use in this study.[11] The shortcomings

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[11] It should be noted that the survey exclusion criteria specifically excluded Medicaid beneficiaries younger than 18 and older than 65 years of age. Also, determination of the respondent’s age was complicated by the lag in time between the date that the sampling frame was obtained (March 31, 2006) and the date that the survey commenced (October 16, 2006). For example, enrollees within a given age grouping at the time the sampling frame was determined might advance into an older age group by the time the enrollee had been surveyed. Brandon, Schoeps, Sun, and Smith (2008) used the ages calculated by the state at the time the

of each option and the ultimate operationalization of an age variable are briefly described below.

Survey question #66 asked respondents to place their age into one of seven possible groupings. This circumstance resulted in an ordinal-level measure that not only lacked the precision that a ratio-level measure could provide but was also inconsistent with the enrollee's age at the time that the sampling frame was established. Additionally, plan administrators provided three different age-related variables, one of which was the enrollee's date of birth. The second variable provided by plan administrators, "age," computed the enrollee's age by subtracting the year of the enrollee's birth from 2006, the year that the sampling frame was established. The result was a ratio-level variable with discrete values expressed in whole numbers of years that lacked the level of precision that could be achieved by a continuous variable. The third variable provided by state plan administrators, "age1", was a continuous, ratio-level measure that was measured in units of years, but expressed the enrollee's age effective April 30, 2006, a full thirty days beyond establishment of the sampling frame. A new variable was created to operationalize the enrollee's age by subtracting a value of 0.082191781 years, or thirty days, from "age1." [12, 13] This new variable, referred to as "agemod," represented a marked improvement by providing a continuous, ratio-level measure that expressed the enrollee's age effective March 31, 2006, the date that the sampling frame was established. With its higher degree of precision and accuracy, this was the variable that

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sample was drawn for reporting age in the adult population, a convention that was also employed by this study.

[12] The value of 0.082191781 is obtained by dividing 30 days by 365, the number of days in a typical year.

[13] The values of the new variable were double-checked by using the FRACYEAR function in Microsoft Excel, which calculates the elapsed time (expressed in fractions of one year) between two dates. In this case, the dates in question were the enrollee date of birth and March 31, 2006.

was used in each of the propensity score matching (see Section 4.5) and regression (see Section 4.7) techniques employed by the study.

A second age-related variable was created by the research team at UNC Charlotte by collapsing the original age variable into five broad groupings: 18-to-24 years, 25-to-34 years, 35-to-44 years, 45-to-54 years, and 55 years and older. This variable is measured at the ordinal level and was used to evaluate the bivariate relationships discussed in Chapter Five.

Age-squared is a special transformation of the ratio-level age variable where the value of age is arithmetically multiplied by itself. The rationale for using age-squared as an independent variable is its ability to identify curvilinear relationships between age and the health service utilization dependent variables. The use of age-squared, therefore, provides a means of identifying a possible relationship between age and the utilization measures in those circumstances when it is clear that there is no linear relationship between these variables.

A valid argument can be constructed for classifying *education* as an "enabling resource" on the premise that education serves as a proxy for health literacy, which may impact the ability of individuals to effectively use the health care system. Andersen's (1995) theoretical model, however, explicitly specifies education as a "predisposing characteristic" because it is often considered a traditional measure to assess social structure, a factor that determines an individual's standing in a community. The respondent's education was recorded during the course of the interview process and measured with an ordinal scale that ranged from an 8th-grade or less education on the low end to more than a 4-year college degree on the high end. Given the fact that education and income are usually positively correlated, the proportion of survey respondents nested within this low-income population who had a high school diploma or less was unsurprisingly high at 76.1%. Only 3.7% of the survey respondents reported that they were 4-year college graduates or more. The variable was recoded to six dummy variables, five of which were used in the linear and logistic regressions with "8th grade or less" serving as the comparison category.

In addition to the demographic variables described above, Brandon, Schoeps, Sun and Smith (2008) employed three "context variables," *urbanicity,* geographic *region*, and care *network*, which may explain some variation in the various utilization-related dependent variables when used as independent control variables. The theoretical model specifies region and urbanicity as "enabling characteristics" because they are population characteristics that may enable or impede the utilization of health services. On the other hand, network is specified by the theoretical model as a "health care system" characteristic and occurs in the greater environmental context.

Urbanicity uses a three-point scale to describe the degree to which residents live in areas classified as *urban*, *rural*, or some *"mixed"* condition lying between the two extremes. Section 4.1, Data Characteristics and Collection Considerations, describes the nature of urbanicity and the criteria employed in its creation. In terms of the variable's use in the linear and logistic regression procedures, urbanicity is a categorical-level variable where dummy variables were created for each of the three categories. The "urban" category was selected as the comparison category.

The second context variable, *geographical region*, uses the land region template established by Diemer and Bobyarchick (2000) in the *North Carolina Atlas* that was described in some detail in Section 4.1. In terms of the variable's use in the linear and logistic regression procedures, region is a categorical-level variable where dummy variables were created for each of the four region categories. The Piedmont category was selected as the comparison category.

The study employed care *network* as an independent variable that was specified by the theoretical model as a "health care system" characteristic within the environment. Variation in care delivery among the fourteen primary care case management networks, or CCNCs, described in Section 4.1 has the potential to explain variation in the utilization of health services, thereby suggesting its inclusion in the causal model. As noted in Section 4.1, all of the care networks are geographically clustered across the state except the *AccessCare Network*. In terms of the variable's use in the linear and logistic regression procedures, care network is a categorical-level variable where dummy variables were created for each of the fourteen categories.[14] Because of its unique standing as the only care network not linked to geography, the AccessCare Network was selected as the comparison category.

Medicaid administrators provided a variable that measured the *number of months in the same practice*, which is specified as an "enabling characteristic" by the theoretical model. This variable provides a measure of the length of time that the enrollee has had a

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[14] The nominal-and ordinal-level analyses performed by Brandon, Schoeps, Sun, and Smith (2008) with the same data revealed that the Chi-square test for statistical significance for the network variable was not valid in a number of cross-tabulated relationships due to the relatively large number of cells in the cross-tabulation that had expected cell counts less than five. The Chi-square statistic measures statistical significance by comparing observed frequencies with the frequencies expected if there was no relationship between the demographic variable and the survey question. The difference between the observed frequencies and the expected frequencies is exaggerated if the expected frequencies are small. In the cross tabulations of care network with a number of survey questions, a large proportion of the cells resulted in expected counts of < 5, thereby challenging the statistical significance of the relationship between the variables. The large number of cells in these relationships was a product of the relatively large number of values of the network variable (n = 14). See Meier and Brudney (1993) pp 223-229 for a more complete description of Chi-square.

relationship with the primary care provider and is a continuous variable measured at the ratio level. There were fifty-six different values of the variable that ranged from a low value of 6 months to a high of 61 months.

Type of provider is a nominal-level variable that originated from survey question #3 which asked respondents if their provider is “a general doctor, a specialist doctor, a physician assistant, or a nurse?” Placement of this variable in the theoretical model is problematic due to the influence of provider supply constraints that may exist in some areas. On one hand, an argument can be made that “enabling resources” is the proper category due to a limited array of providers in some areas that may limit enrollee choice. Conversely, the variable fits nicely into the “predisposing characteristics” classification if enrollee choice is not constrained by provider supply issues or organizational arrangements that may limit choices and is more a function of individual autonomy or health beliefs. For the purposes of this study, type of provider was categorized as a “predisposing characteristic.” The variable was recoded to include the “No” responses to survey question #2, which asked respondents if they had “one person you think of as your personal doctor or nurse?” The resultant variable had five categories: no one person considered as personal provider, general doctor, specialist doctor, physician assistant, and nurse. Dummy variables for each of the five categories were created for use in the linear and logistic regression procedures with the “no one person considered as personal provider” category chosen for the comparison category.

Disease management status is a variable that indicates whether or not the beneficiary is formally enrolled in a disease state management program nested within North Carolina Medicaid’s case management care model. The data that constituted this variable came from enrollment files provided by N.C. Medicaid administrators, suggesting that the diagnosis was based on claims or provider recommendations as opposed to the respondent's memory. The variable is measured at the nominal-level and operationalizes the respondent's "evaluated health status," one of the outcomes specified by the theoretical model that impacts health service utilization. Three formal disease state management programs existed at the time that the sampling frame was determined: diabetes, asthma, and a combination diabetes/asthma program. The variable included these categories, plus a fourth category indicating that the beneficiary was enrolled in no program. Dummy variables were created for each category and the "no program" category was chosen for comparison purposes in the regression procedures.

Chronicity is a variable that indicates whether or not the enrollee suffers from a chronic condition and was constructed by combining positive responses to the survey items asking respondents if they have a physical or medical condition that interferes with their independence, participation in the community, or quality of life (question #60) and if these conditions (excluding pregnancy) have persisted for at least three months (question #62). The chronicity variable contributes to operationalization of the enrollee's "perceived health status" in the theoretical model. However, its use in a regression model was precluded by the fact that question #60 and question #62 were used to create the enrollee's health status factor in the factor analysis model (see section 4.6). Use of the chronicity variable in a regression model that also includes the health status factor score would result in inappropriate duplication of predictor variables. An appropriate use of the chronicity variable appears in Chapter Five, where bivariate relationships associated with the concordant and discordant groups are discussed.

The primary purpose of the CAHPS survey of North Carolina Medicaid beneficiaries was to assess the enrollee's *health status* and to evaluate *access* to and *satisfaction* with health services, *communication* with providers and administrators associated with the health plan, and *trus*t in their providers. Each of these factors is likely to impact the enrollee's utilization of health services, some rather profoundly. However, there are few instances where a single measure captures all dimensions of these concepts. Therefore, an exploratory factor analysis was performed to derive factor scores that reduce and simplify these concepts into a relatively small number of summary measures. The procedures and outcomes of the factor analysis are discussed in great detail in Section 4.6 of this chapter, but it will be noted here that three factor scores representing *health status*, *satisfaction*, and *trust* were created for incorporation into the regression models. It should also be noted that a number of factor models were attempted to include the concept of *access*, but these models failed to satisfy the criteria specified in Section 4.6. Consequently, access to health services was conceptualized by a single survey item, question #19, and is discussed in more detail shortly. The variables used to generate the factors that ultimately appear as factor scores were derived from questions that appeared in the CAHPS survey of North Carolina Medicaid beneficiaries and require some explanation as to how they were manipulated for use in the factor analysis. The discussion of each of these concepts appears below.

The *health status* factor score measures "perceived health status," one of the outcomes specified by the theoretical model that impacts health service utilization. The factor specified by the factor analysis that represents health status was derived from the following five survey questions:

- Q57: In general, how would you rate your overall health now?
- Q60: Do you have a physical or medical condition that seriously interferes with your independence, participation in the community, or quality of life?
- Q62: Do you now have any physical or medical conditions that have lasted for at least 3 months? (Women: Do not include pregnancy)
- Q63: In the last 6 months, have you seen a doctor or health provider more than twice for any of these conditions?
- Q64: Have you been taking prescription medicine for at least 3 months for any of these conditions?

Two forms of data manipulation were required to prepare the variables for the factor analysis. The most important of these was to align the measurement scales in the same direction so that a low value for each of the five questions indicated poor health status and that a high value represented good health status. The responses to each of these questions in their original state were oriented in this direction except for Q57: "In general, how would you rate your overall health now?" The responses to this question were reverse-coded to facilitate interpretation. Additionally, questions #63 and #64 were modified to accommodate the survey's skip pattern. For example, respondents who answered "No" to question #62 that they did not have any physical or medical conditions that have lasted for at least 3 months were instructed to skip questions #63 and #64. The recoded forms of questions #63 and #64 incorporated the "No" responses to question #62 into the new variables such that the "No" responses to the original question #63 are now qualified as "No, either the respondent does not have a physical or medical condition OR has not seen a doctor or heath provider more than twice for any of these conditions," and that the "No" responses to the original question #64 are now qualified as "No, either the respondent does not have a physical or medical condition OR has not been taking prescription medicine for any of these conditions."

The *satisfaction* factor score measures "consumer satisfaction," a third outcome specified by the theoretical model that impacts health service utilization. The factor specified by the factor analysis that represents satisfaction was derived from the following four survey questions:

- Q25: In the last 6 months, when you called during regular office hours, how often did you get the help or advice you needed?
- Q29: In the last 6 months, not counting times you needed health care right away, how often did you get an appointment for health care as soon as you wanted?
- Q44: What number would you rate all your health care in the last 6 months?
- Q56: What number would you use to rate Carolina Access or Medicaid now?

Two features of the data were examined to ensure that the variables were suitable for the factor analysis. The most important intervention was to ensure that the measurement scales were aligned in the same direction so that a low value for each of the seven questions indicated poor satisfaction and that a high value represented good satisfaction. Each of the seven variables met this criterion. Additionally, the survey skip pattern was examined resulting in the modification of questions #25 and #29. For example, respondents who answered "No" to question #24, "In the last 6 months, did you call a doctor's office or clinic during regular office hours to get help or advice for yourself?" were instructed to skip question #25. The recoded form of the variable pertaining to question #25 incorporated the "No" responses to question #24 into the new variable such that the "Always" responses to the original question #25 were qualified to include these "No" responses. The basis for this action was that if the respondents were not actively seeking help, then the respondents were always getting the help or advice they needed. Similarly, respondents who answered "No" to question #28, "In the last 6 months, not counting the times you needed health care right away, did you make any appointments with a doctor or other health provider for health care?" were instructed to skip question #29. The recoded form of the variable pertaining to question #29 incorporated the “No” responses to question #28 into the new variable such that the “Always” responses to the original question #29 were qualified to include these “No” responses. The rationale for this action was that if the respondents were not actively making appointments with a doctor or other health provider, then they were always getting appointments for health care as soon as they wanted.

The *trust* factor score also measures “consumer satisfaction,” an outcome specified by the theoretical model that impacts health service utilization. The factor specified by the factor analysis that represents trust was derived from the following three survey questions:

- Q12: I think my doctor or nurse may not refer me to a specialist when needed.
- Q15: I sometimes think that my doctor or nurse might perform unnecessary tests or procedures.
- Q16: My doctor’s or nurse’s medical skills are not as good as they should be.

Two features of the data were examined to ensure that the variables were suitable for the factor analysis. The most important intervention was to ensure that the measurement scales were aligned in the same direction so that a low value for each of the three questions indicated poor trust and that a high value represented high levels of trust. Each of the three variables met this criterion. The second feature examined was the survey skip pattern to determine if any special data manipulations were necessary. None of the three survey items were subject to a skip pattern.

As mentioned previously, a number of attempts were made to include *access* to health services in a factor model, but each attempt strayed from the established criteria deemed appropriate for factor analysis. Survey question #19, “In the last 6 months, how much of a problem, if any, was it to see a specialist that you needed to see,” was identified as a suitable proxy to measure access. The set of possible responses to this question included a “big problem,” a “small problem,” and “not a problem.” The original variable was transformed to accommodate the survey skip pattern by categorizing survey respondents who did not think that they needed to see a specialist (i.e., the “No” responses to question #18, “In the last 6 months, did you or a doctor think you needed to see a specialist?”) with those who indicated that they did not have problem seeing a specialist. The variable was recoded to dummy variables using “big problem” (i.e. poor access) as the comparison category. Access is specified as an “enabling resource” by the theoretical model because of its relevance to the proximity of health personnel and facilities to individuals that may need health services and to what Andersen (1995, p.3) states as the “means and know-how to get to those services and make use of them.”

4.5 Propensity Score Matching

The data used to address the research questions posed by this study were obtained via a survey-oriented cross-sectional study design. A number of authors have described the difficulties associated with inferring causality from observational studies and other types of quasi-experimental research designs that fail to randomly assign research subjects to a treatment or comparison group (O’Sullivan and Rassel, 1995; Rossi, Freeman, and Lipsey, 1999; Bowling, 2002). The inability of observational studies to control subject selection results in selection bias, which may be the most problematic of the threats to internal validity.

The problem of selection bias related to observational studies is especially pernicious in the context of this work because the ideal way to test the race (or gender) concordance hypothesis is to compare health utilization between race (or gender) concordant subjects and those who are race (gender) discordant.[15] The optimal research design randomly assigns subjects to each of these groups, thereby minimizing selection bias. However, random assignment to each of the groups is impossible because the study participants chose (i.e., self-selected) their providers. The inability to randomly assign subjects to each group compromised the ability to control for differences on a number of covariates common to both groups and raised the prospect that direct comparisons of the outcomes between the two groups may be misleading.

Bowling (2002), Rossi et al. (1999), and Moser and Kalton (1971) suggest methods that control for non-randomly assigned treatment and control groups that may be especially appropriate in terms of addressing this problem. One method is *precision control matching* (or *individual matching*), which refers to matching each member of one group with a member of the other group that demonstrates the same combination of extraneous variables (e.g., age, gender, education, etc.). The second method is *frequency distribution matching* (or *aggregate matching*), whereby “the overall distributions in the treatment and control groups on each matching variable are made to correspond” (Rossi et al., 1999, p 317). Unfortunately, both methods have problems that may limit their usefulness. For instance, both techniques violate the assumption that the samples are independent and that subjects are matched before the start of a trial (i.e., ex ante assignment). Precision matching may also be plagued by a dramatic loss of cases that stems from difficulties finding matched pairs when controlling for a large number of matched variables. Precision matching procedures are also time consuming and generally more expensive.

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[15] See King, Keohane and Verba (1994) for a complete discussion regarding assignment to comparison groups based on one of the study’s independent variables.

Moser and Kalton (1971) suggest that an alternative to matching is to make adjustments for the extraneous variables in the course of the analysis via *control through measurement* (or *statistical controls*). The techniques employed by this approach include cross-tabulations, standardization, and regression. The major problems with the statistical controls are that they control for a limited number of covariates and that the researcher must know in advance which variables are the potential confounders (Moser and Kalton; Rossi et al, 1999; D'Agostino, 1998).

Robins, Mark, and Newey (1992) describe *structural marginal modeling* methods, which are a broad class of statistical methods used to manage selection bias caused by non-random treatment assignment in observational studies. One type of structural marginal modeling methodology, the *propensity score*, is a scalar summary of the covariate information shared by both treatment and control groups and used to control for differences in the background variables of subjects in these groups (Rosenbaum and Rubin, 1983). Weitzen, Lapane, Toledano, Hume, and Mor (2004, p. 841) define the propensity score as "the conditional probability of being assigned to a treatment group, given a set of pre-treatment characteristics." In the context of this study, propensity scores refer to the likelihood that a person is in the race or gender concordant group using only their covariate scores and these propensity scores are used as the basis for matching individuals in the concordant groups with individuals in the discordant groups.

The first step in the matching process involved calculation of the propensity score in the context of what Rossi et al. (p. 327) refer to as the *selection modeling stage*, whereby the selection bias is modeled by "identifying and measuring the variables related to the process by which individuals select themselves or are selected into the intervention versus the comparison group in a quasi-experiment." In essence, these variables function as independent variables in a logistic regression model that predicts membership in either the treatment (concordant) or control (discordant) group. The variables selected as the independent variables in the logistic regression include the enrollee's:

- gender,
- age,
- education,
- race,
- care network,
- region of residence,
- degree of urbanicity of county residence,
- number of months enrolled in the current practice.

The dependent variable in the logisitic regression, group membership, is a dichotomous variable with a value of 1 indicating that the subject is in the race (or gender) concordant group and a value of 0 indicating that the subject is a member of the race (or gender) discordant group. The regression procedures were performed with the predicted probability of group membership derived from the regression serving as the propensity score.[16] The regressions were performed two different times, the first using race concordance as the dependent variable and the second using gender concordance as the dependent variable.[17]

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[16] The propensity score matching procedures were performed using SPSS syntax and macros that were initially created by Raynald Levesque, a renowned SPSS programmer who has published SPSS text related to SPSS programming and data management, and adapted for use for propensity score matching by John Painter, PhD, clinical assistant professor and a data and information management expert at the UNC Chapel Hill School of Social Work. The SPSS syntax used to create the propensity scores and matched data sets appears in Appendix H (matching based on race concordance) and Appendix I (matching based on gender concordance).

[17] Weitzen, Lapane, Toledano, Hume, and Mor (2004) summarize the criteria employed by various researchers to determine the independent variables selected for the logistic regression stage of the propensity score matching process and to evaluate the precision and accuracy of the predicted probabilities in the logistic regression model. The independent variables for the logistic regression in this study were selected based on their inclusion as items in the administered survey or data obtained from plan administrators and their intuitive potential to predict membership in either a concordant or discordant group. The precision and accuracy of the predicted probabilities are evaluated by the events per variable

The next stage of the process was oriented toward matching propensity scores of individuals in the concordant groups with individuals in the discordant groups. D’Agostino (1998) and Rosenbaum and Rubin (1983) describe several matching strategies that may be utilized once the propensity scores have been obtained. The overarching goal is to find two subjects, one in the race (gender) concordant group and one in the race (gender) discordant group, with the same propensity scores, and “imagine that these two subjects were ‘randomly’ assigned to each group in the sense of being equally likely to be treated or control” (D’Agostino, p. 2267). The technique used in this study is a modification of *nearest available matching on the estimated propensity score* method, which was determined by Rosenbaum and Rubin (1985) to be the simplest technique in terms of computational aptitude.[18]

The matching process was performed in SPSS and involves the following steps:

1. Cases are sorted by treatment group (concordance), propensity score, and a random variable. The random variable has the effect of placing propensity score ties in a random order.
2. A match is found by selecting one treatment case (case #1) and all eligible comparison cases. A temporary variable is created that is the difference (delta) between the propensity score for case #1 and each remaining record. The record with the smallest delta is output to a results file.
3. The record output to the results file is located in the original data file and deleted so that it cannot be used again.

It is important to note that the SPSS program finds the best match for every concordant case from the pool of possible discordant cases. Once matched, the discordant case is

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(EPV) statistic, where an event is defined as an observation in the less frequent of the two groups (or the smaller number of binary outcomes [i.e., concordant versus discordant]). The unmatched data set contained 1,133 observations in the race discordant group and 1,260 observations in the gender discordant group (the groups with the less frequent observations). The EPV for the race discordant group was 141.6 (1,133/8) and 157.5 (1,260/8) for the gender discordant group, both of which were well above the threshold of at least 10 EPV for precision and accuracy reported by Peduzzi, Concato, Kemper, Holford, and Feinstien (1996).

[18] Rosenbaum and Rubin (1985) describe three techniques for constructing a matched sample using propensity scores. These include: nearest available matching on the estimated propensity score, Mahalanobis metric matching including the propensity score, and nearest available Mahalanobis metric matching within calipers defined by the propensity score.

removed and not reconsidered for subsequent matches. Given that the breakdown of race concordant-to-race discordant respondents from the original survey data was 1,396 to 1,133 and that the breakdown of gender concordant-to-gender discordant respondents was 1,457 to 1,260, and given the feature that once matched, discordant cases are not reconsidered for subsequent matches, the number of concordant cases to be matched was set in the SPSS syntax at 1,133 and 1,260, respectively, for race and gender. The processes resulted in a group of 1,126 subjects matched on their propensity for race concordance paired with 1,126 race discordant subjects and a group of 1,241 subjects matched on their propensity for gender concordance paired with 1,241 gender discordant subjects.

The propensity score matching processes generated two new samples, one matched on the basis of race concordance and the other matched on the basis of gender concordance (see Figure 4-1). Each of the new data samples were analyzed in terms of important bivariate relationships that are described in Chapter Five in order to address the secondary research questions raised in Chapter Three. Additionally, the analytical methods described in the ensuing sections of this chapter (factor analysis, ordinary least squares linear regression, and logistic regression) were applied, where appropriate, to address the study’s overarching research questions that are concerned with whether race or gender concordance affects the utilization of health services among Medicaid beneficiaries enrolled in a primary care case management delivery system. This line of inquiry is directly addressed in Chapter Six.

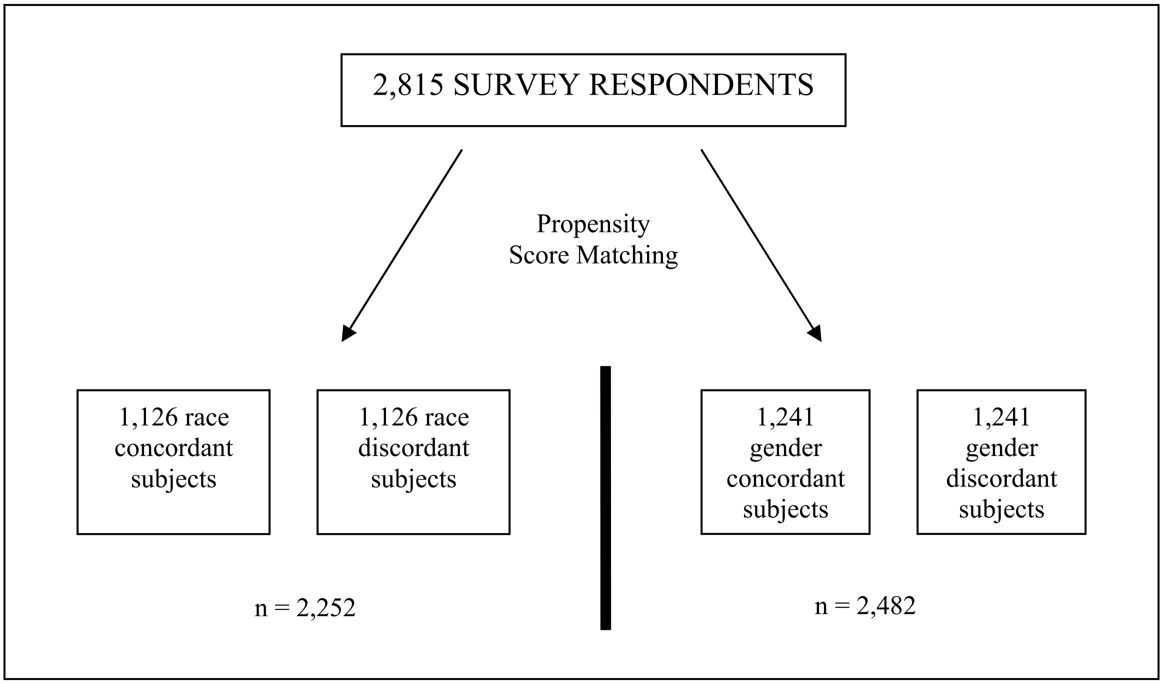

Figure 4-1: Matching of Survey Respondents on Their Propensity for Race and Gender Concordance.

4.6 Factor Analysis

Section 4.4 of this chapter described the conceptualization and operationalization of the variables under study in this dissertation and included a brief discussion of the factor scores that were created for inclusion in the causal model. Section 4.6 of the chapter provides a richer description of the factor analysis framework and the specific procedures involved in conducting the factor analysis. The first portion of section 4.6 is devoted to discussing the background and theory of factor analysis in general terms while the latter portion of the section describes specific features as they applied to this study's factor analysis and the resultant outcomes of the analysis.

Hair, Black, Babin, Anderson, and Tatham (2006, p. 17) describe factor analysis as a method that "condenses the information contained in a number of variables into a smaller set of variates (factors) with a minimal loss of information." The procedural guidelines presented by the authors that govern the performance of factor analysis also serve as the template for use in this study. This entails a seven-step process that is summarized in the following paragraphs.

The first stage of the Hair et al. (2006) framework focuses on the research problem. The primary objectives of this stage are concerned with determining whether the factor analysis is exploratory or confirmatory, specifying the unit of analysis, and selecting the objectives of the factor analysis. Exploratory factor analysis explores the data and provides information as to how many factors are required to represent the data compared to confirmatory factor analysis, which tests how well measured variables represent a smaller number of constructs (Hair et al., 2006). The factor analysis associated with this study is an exploratory analysis with the primary aim of data reduction, whereby a new set of variables is created that partially or completely replaces the original variables.

The second stage of the Hair et al. (2006) framework is concerned with designing the factor analysis. This stage involves calculating a correlation matrix, determining the number and measurement properties of the variables, and evaluating the sample size. The correlation matrix for data input is an *R*-type factor analysis that groups variables (as opposed to cases) together to calculate the correlation matrix. Hair et al. suggest that the factor analysis should include a sufficient number of variables so that five or more variables load on each factor and that non-metric variables are avoided.[19] In terms of sample size, the number of observations should be at least 50 and there should be at least five times as many observations as the number of variables to be analyzed.

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[19] Kim and Mueller (1978) describe Thurstone's (1947) criteria for simple structure in factor analysis which indicate that at least three variables should clearly load on each factor.

Stage Three of the Hair et al. (2006) framework is concerned with the assumptions that underlie the factor analysis. Unlike the assumptions associated with linear regression, the statistical considerations of normality, linearity, and homoskedasticity are not critical issues for factor analysis. The assumptions deemed most critical to factor analysis are more conceptual and include the assumption that there is some underlying structure in the set of selected variables and that the sample is homogeneous. A statistical assumption that is important to factor analysis is ensuring that the data matrix has sufficient correlations to justify application of factor analysis. Three measures that confirm this assumption include visual inspection of the correlation matrix for at least one correlation of 0.30 or greater, a statistically significant Bartlett test of sphericity to determine if any correlation is significantly different from zero, and a value of the Kaiser – Meyer – Olkin Measure of Sampling Adequacy (KMO – MSA) in excess of 0.5 and ideally approaching 0.8.[20,21]

Step Four entails selecting the factor method and specifying the factor matrix. Principal axis factoring, a form of *common factor analysis* that considers only the *common* or shared variance in a variable that is shared with all other variables in the analysis, was selected as the factor method for factor extraction. When factors are estimated in terms of common variance, the communality of a variable or "the estimate of its shared variance among the variables as represented by the derived factors" (Hair et al, 2006, p. 117) is inserted in the diagonal of the correlation matrix. Common factor analysis is most appropriate for use if there is little prior knowledge of the specific or

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[20] A KMO-MSA value of 1.0 indicates that "each variable is perfectly predicted without error by the other variables" (Hair et al., p. 114).

[21] The criteria of at least one correlation ≥ 0.3, a significant Bartlett's Test of Sphericity, and a KMO-MSA value ≥ 0.6 establish the factorizability of the correlation matrix.

error variance. Specifying the factor matrix involves determining the number of factors to be retained with the goal being to obtain the best linear combination of the original variables that accounts for more of the variance in the data as a whole than any other linear combination of variables. The number of factors to be retained was determined by the latent root criterion, whereby only the factors having latent roots or eigenvalues greater than 1.0 are considered significant.[22] The scree test criterion, a plot of the eigenvalues against the number of factors in their order of extraction whereby a cutoff point is determined by evaluating the shape of the curve, was used as a check on the latent root criterion.

The fifth stage of the Hair et al. (2006) framework for performing factor analysis is concerned with interpreting the factors. Factor interpretation is a multi-phase process that involves computing the initial unrotated factor matrix containing factor loadings for each variable on each factor,[23] evaluating the factor loadings, selecting a rotation method, if necessary, to achieve a simpler and more meaningful factor solution, and respecifying the factor model, if necessary. Interpretation of the unrotated factor matrix is often improved with an orthogonal rotation, where the factors are uncorrelated, or an oblique rotation where the "theoretically important dimensions are not assumed to be uncorrelated with each other" (Hair et al., 2006, p. 125). The VARIMAX method of factor rotation is an orthogonal rotation method that was applied in this study's factor analysis.[24, 25]

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[22] The numerical value of the eigenvalue for the last factor in the Total Variance Explained output is also important with respect to identifying the presence of multicollinearity, with an eigenvalue near zero indicating the presence of multicollinearity.

[23] Factor loadings are defined as the "correlation between the original variables and the factors, and the key to understanding the nature of a particular factor" (Hair et al., 2006, p. 102).

[24] The VARIMAX rotation simplifies the columns in a factor matrix (columns in the factor matrix represent factors whereas rows in the factor matrix represent variables). Simplification of the columns means that

After the factor matrix has been rotated, the next phase involves interpreting the rotated factor matrix. The first step in interpreting the factor matrix is to examine the factor loadings. Factor loadings in the range of +/- 0.30 to +/- 0.40 meet the minimal level for interpretation of structure. Next, the significant loadings for each variable are identified, including any variables that load on more than one factor (cross-loading). After significant loadings have been identified, the communalities of the variables are examined and evaluated.[26] Once the significant factor loadings have been identified and the communalities examined, the factor model is often respecified by deleting variables with no significant loadings or with exceptionally low (less than 0.1) or high (greater than 0.8) communalities[27], or those with cross-loadings on more than one factor. Other forms of respecification include employing a different rotation method or changing the number of factors to be extracted. The final phase of this stage focuses on assigning meaning to the pattern of factor loadings and naming and labeling the factors.

Stage Six of the Hair et al. (2006) framework for conducting factor analysis is concerned with validating the factor analysis and evaluating the degree of generalizability of the results to the population. From this perspective, two important measures in determining factor stability are the sample size and the number of cases per variable. Another important concern for validating the factor analysis is identifying outliers.[28]

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there are only 1s and 0s in a column of the factor matrix thereby resulting in a clearer separation of the factors.

[25] An orthogonal rotation is the simplest form of rotation and results when axes are maintained at 90 degrees.

[26] Communalities are defined as the “total amount variance an original variable shares with all other variables included in the analysis” (Hair et al., 2006, p. 102).

[27] Initial communality values < 0.1 indicate the presence of an outlier variable; initial communality values > 0.8 indicate the presence of multicollinearity (see footnote #30). In either case, the variable should probably be deleted and the factor model respecified.

[28] See footnote #27.

The final stage of the Hair et al. (2006) framework for conducting factor analysis is oriented to application of the factor analysis results. The most relevant aspects of the discussion of this stage to the dissertation research are the calculation of Cronbach's alpha reliability coefficient and the computation of the factor scores. Cronbach's alpha evaluates the consistency of the entire model (Cronbach, 1951) and should achieve a value of at least 0.7, although a lower limit of 0.6 may be acceptable for exploratory research (Robinson, Shaver, and Wrightsman, 1991). Factor scores are "composite measures of each factor computed for each subject" and represent "the degree to which each individual scores high on the group of items with high loadings on a factor. Thus, high values on the variables with high loadings on a factor will result in a higher factor score" (Hair et al., 2006, p. 139). The primary objective for using factor scores was to create a composite measure that numerically represents concepts such as health status, satisfaction, and trust and to use these scores as predictors and control variables in subsequent regression analyses.

A number of exploratory, *R*-type factor analysis trials were performed on both the propensity-score-matched race and matched gender subsamples in an attempt to condense the CAHPS survey items to a manageable number of meaningful factors. Most of these attempts failed in at least one aspect to meet the performance standards established by the Hair et al. (2006) framework for conducting factor analysis. However, one solution for each subsample was achieved that used a number of the survey items and also satisfied most of the Hair et al. criteria. A summary of this outcome appears below.

An exploratory principal axis factoring (PAF) analysis was performed on both of the race-matched and gender-matched subsamples. The factor model for the propensity-score-matched race sample consisted of 1,823 valid observations (429 observations were excluded due to listwise deletion based on all variables in the procedure) and twelve variables. A sample size of 1,823 and an observation-to-variable ratio of 151.9-to-1 comfortably satisfy the requisite criteria suggested by Hair et al. (2006). The factor model for the propensity-score-matched gender sample consisted of 2,036 observations (456 observations were excluded due to listwise deletion based on all variables in the procedure) with the same twelve variables. A sample size of 2,036 and an observation-to-variable ratio of 169.7-to-1 also satisfy the requisite criteria.

The initial unrotated factor solution for the race-matched sample resulted in a three-factor solution that explained approximately 58% of the total variance as measured by the latent root criterion.[29] The eigenvalue for the last factor in the Total Variance Explained output was 0.134, indicating that multicollinearity was probably not a concern. The solution generated a ratio of four variables per factor. Forty-two percent (15 of 36) of the factor loadings for the unrotated factor matrix were significant (factor loadings of 0.300 or greater) with three variables cross-loading on more than one factor. All of the initial communalities landed in the acceptable range of 0.1 through 0.8 with a low value of 0.145 to a high value of 0.779, indicating that the presence of outlier variables and multicollinearity[30] are probably not matters of concern. In terms of the factorizability of the correlation matrix, fifteen of the 66 possible correlated pairs (22.7%) met or exceeded an absolute value of 0.3 with forty-one pairs (62.1%) achieving statistical significance at $p \leq 0.01$. The KMO Measure of Sampling Adequacy was 0.787 and the Bartlett's Test of

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[29] The scree plot supported the extraction of at least three and possibly a fourth factor.

[30] Multicollinearity refers to the "extent to which a variable can be explained by the other variables in the analysis. As multicollinearity increases, it complicates the interpretation of the variate because it is more difficult to ascertain the effect of any single variable" (Hair et al., 2006, p. 2).

Sphericity was significant with a p value of 0.000. The fact that variables cross-loaded on multiple factors (lack of separation among the factors) prompted an orthogonal VARIMAX rotation of the factor matrix to respecify the model and create a simpler factor pattern by redistributing the variance from earlier factors to later ones.

Rotation of the factor matrix for the race-matched sample markedly improved the factor solution. As expected, the three-factor rotated solution was identical to the unrotated solution in terms of the number of valid observations, the observation-to-variable ratio, the proportion of explained total variance by the factors, the variable-per-factor ratio, the initial communalities, the number of correlated pairs with an absolute value of 0.3 or greater, the number of correlated pairs statistically significant at $p \leq 0.01$, the KMO Measure of Sampling Adequacy, and Bartlett's Test of Sphericity. However, rotation of the factor matrix reduced the number of factor loadings of 0.300 or greater to 33% (12 of 36) with no variables cross-loading on more than one factor. Factor 1 was specified as *health status* and was characterized by five significant factor loadings. Factor 2 was specified as *satisfaction* and was characterized by four significant factor loadings. Factor 3 was specified as *trust* and was characterized by three significant factor loadings. The measure of scale reliability, Cronbach's alpha, was 0.638. The rotated factor matrix appears below in Table 4-2.

The initial unrotated factor solution for the gender-matched sample resulted in a three-factor solution that explained approximately 58% of the total variance as measured by the latent root criterion. The eigenvalue for the last factor in the Total Variance Explained output was 0.132, indicating that multicollinearity was probably not a concern. The solution generated a ratio of four variables per factor. Forty-two percent (15 of 36) of

Table 4-2: Rotated Factor Solution for Matched Sample Based on Race

Variable	F1	F2	F3
(q57rev) In general, how would you rate your overall health now?	0.555		
(q60) Do you have a physical or medical condition that seriously interferes with your independence, participation in the community, or quality of life?	0.553		
(q62) Do you now have any physical or medical conditions that have lasted for at least months? (Women: do not include pregnancy)	0.905		
(q63f) In the last 6 months, have you seen a health provider > 2 times for any physical or medical condition that has lasted at least 3 months (includes respondents who stated that they have had no physical or medical conditions lasting at least 3 months)?	0.804		
(q64f) Have you been taking prescription medicine for at least 3 months for any physical or medical condition that has lasted 3 months (includes respondents who stated that they have no physical or medical conditions lasting at least 3 months)?	0.902		
(q25r) In the last 6 months, when you called during regular office hours, how often did you get the help or advice you needed?		0.505	
(q29r) In the last 6 months, not counting times you needed health care right away, how often did you get an appointment for health care as soon as you wanted?		0.441	
(q44) What number would you rate all your health care in the last 6 months?		0.682	
(q56) What number would you use to rate Carolina Access or Medicaid now?		0.521	
(q12) I think my doctor or nurse may not refer me to specialist when needed.			0.441
(q15) I sometimes think that my doctor or nurse might perform unnecessary tests or procedures.			0.558
(q16) My doctor's or nurse's medical skills are not as good as they should be.			0.727
F1 = Health Status; F2 = Satisfaction; F3 = Trust; Cronbach's alpha = 0.638			

the factor loadings for the unrotated factor matrix were significant (factor loadings of 0.300 or greater) with three variables cross-loading on more than one factor. All of the initial communalities landed in the acceptable range of 0.1 through 0.8 with a low value of 0.147 to a high value of 0.785, indicating that the presence of outlier variables and multicollinearity are probably not matters of concern. In terms of the factorizability of the correlation matrix, fifteen of the 66 possible correlated pairs (22.7%) met or exceeded an absolute value of 0.3 with forty-three pairs (65.2%) achieving statistical significance at $p \leq 0.01$. The KMO Measure of Sampling Adequacy was 0.784 and the Bartlett's Test of

Sphericity was significant with a p value of 0.000. The fact that variables cross-loaded on multiple factors (lack of separation among the factors) prompted an orthogonal VARIMAX rotation of the factor matrix to respecify the model and create a simpler factor pattern by redistributing the variance from earlier factors to later ones.

Rotation of the factor matrix for the race-matched sample markedly improved the factor solution. As expected, the three-factor rotated solution was identical to the unrotated solution in terms of the number of valid observations, the observation-to-variable ratio, the proportion of explained total variance by the factors, the variable-per-factor ratio, the initial communalities, the number of correlated pairs with an absolute value of 0.3 or greater, the number of correlated pairs statistically significant at $p \leq 0.01$, the KMO Measure of Sampling Adequacy, and Bartlett's Test of Sphericity. However, rotation of the factor matrix reduced the number of factor loadings of 0.300 or greater to 33% (12 of 36) with no variables cross-loading on more than one factor. Factor 1 was specified as *health status* and was characterized by five significant factor loadings. Factor 2 was specified as *satisfaction* and was characterized by four significant factor loadings. Factor 3 was specified as *trust* and was characterized by three significant factor loadings. The measure of scale reliability, Cronbach's alpha, was 0.635. The rotated factor matrix appears below in Table 4-3.

4.7 Regression Methods

Regression analysis is a dependence technique that is used to solve research problems by linking factors to a specific outcome. This study employed two kinds of regression techniques that analyze the relationship between a single dependent variable and a number of independent predictors: ordinary least squares multiple regression and

Table 4-3: Rotated Factor Solution for Matched Sample Based on Gender

Variable	F1	F2	F3
(q57rev) In general, how would you rate your overall health now?	0.553		
(q60) Do you have a physical or medical condition that seriously interferes with your independence, participation in the community, or quality of life?	0.561		
(q62) Do you now have any physical or medical conditions that have lasted for at least months? (Women: do not include pregnancy)	0.905		
(q63f) In the last 6 months, have you seen a health provider > 2 times for any physical or medical condition that has lasted at least 3 months (includes respondents who stated that they have had no physical or medical conditions lasting at least 3 months)?	0.807		
(q64f) Have you been taking prescription medicine for at least 3 months for any physical or medical condition that has lasted 3 months (includes respondents who stated that they have no physical or medical conditions lasting at least 3 months)?	0.895		
(q25r) In the last 6 months, when you called during regular office hours, how often did you get the help or advice you needed?		0.507	
(q29r) In the last 6 months, not counting times you needed health care right away, how often did you get an appointment for health care as soon as you wanted?		0.464	
(q44) What number would you rate all your health care in the last 6 months?		0.689	
(q56) What number would you use to rate Carolina Access or Medicaid now?		0.497	
(q12) I think my doctor or nurse may not refer me to specialist when needed.			0.431
(q15) I sometimes think that my doctor or nurse might perform unnecessary tests or procedures.			0.567
(q16) My doctor's or nurse's medical skills are not as good as they should be.			0.722
F1 = Health Status; F2 = Satisfaction; F3 = Trust; Cronbach's alpha = 0.635			

logistic regression. Ordinary least squares regression involves estimating regression coefficients, which represent the change in the outcome for a one-unit change in the predictive factor, so as to minimize the total sum of squared residuals. Logistic regression is a special form of regression in which the dependent variable is a dichotomous, binary variable.

The regression models were established to address research questions involving five different forms of health service utilization among Medicaid beneficiaries enrolled in a primary care case management delivery system. Each of the five forms of health service utilization – primary care, specialty care, emergency care, inpatient care, and prescription drugs – constitute a dependent variable in the regression models. Three forms of health service utilization – primary care, specialty care, and emergency care – were quantified as censored, ratio-level variables. These forms of health service utilization were analyzed as dependent variables in three distinct linear regression models. The remaining two forms of health service utilization – inpatient care and prescription drugs – were quantified using a dichotomous measure. Therefore, the analysis of these dependent variables was conducted using logistic regression techniques. A regression analysis for each of the five dependent variables was performed for both the propensity-score-matched race and gender samples, thereby resulting in ten separate regression analyses. The list of independent variables employed by each of the regression procedures was the same and included:

- Race concordance (a dummy variable using “race discordance” as the comparison category),
- Gender concordance (a dummy variable using “gender discordance” as the comparison category),
- General physician (a type of provider dummy variable using “no one person considered as personal provider” as the comparison category),
- Specialist physician (a type of provider dummy variable using “no one person considered as personal provider” as the comparison category),
- Physician assistant (a type of provider dummy variable using “no one person considered as personal provider” as the comparison category),
- Nurse (a type of provider dummy variable using “no one person considered as personal provider” as the comparison category),
- Black (enrollee race dummy variable using “white” as the comparison category),
- Asian (enrollee race dummy variable using “white” as the comparison category),
- Native American (enrollee race dummy variable using “white” as the comparison category),
- Latino (enrollee race dummy variable using “white” as the comparison category),
- Other Race (enrollee race dummy variable using “white” as the comparison category),
- Female (enrollee gender dummy variable using “male” as the comparison category),

- Spanish (enrollee language dummy variable using “English” as the comparison category),
- Other language (enrollee language dummy variable using “English” as the comparison category),
- Age (enrollee age),
- Age-squared,
- Some high school without graduation (enrollee’s level of education dummy variable using “8th grade or less” as the comparison category),
- High school graduate or GED (enrollee’s level of education dummy variable using “8th grade or less” as the comparison category),
- Some college or 2-year degree (enrollee’s level of education dummy variable using “8th grade or less” as the comparison category),
- Four-year college degree (enrollee’s level of education dummy variable using “8th grade or less” as the comparison category),
- Greater than a 4-year degree (enrollee’s level of education dummy variable using “8th grade or less” as the comparison category),
- Mixed (enrollee urbanicity dummy variable using “urban” as the comparison category),
- Rural (enrollee urbanicity dummy variable using “urban” as the comparison category),
- Mountains (enrollee’s region of residence dummy variable using “Piedmont” as the comparison category),
- Coastal Plain (enrollee’s region of residence dummy variable using “Piedmont” as the comparison category),
- Tidal (enrollee’s region of residence dummy variable using “Piedmont” as the comparison category),
- Community Health Partners – 1003 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),
- Northern Piedmont Community Care – 1004 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),
- Access II Care of Western North Carolina – 1007 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),
- Northwest Community Care Network – 1008 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),
- Community Care Partners of Greater Mecklenburg – 1009 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),
- Carolina Community Health Partnership – 1010 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),
- Community Care of Wake/Johnston Counties – 1011 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),
- Partnership for Health Management – 1012 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),
- Carolina Collaborative Community Care – 1013 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),

- Community Care Plan of Eastern North Carolina – 2000 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),
- Southern Piedmont Community Care Plans – 2003 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),
- Access III of Lower Cape Fear – 2004 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),
- Sandhills Community Care Network – 2005 (care network dummy variable using “AccessCare Network – 1006” as the comparison category),
- Number of months in same practice,
- Asthma (disease management dummy variable using “not enrolled in DM program” as the comparison category),
- Diabetes (disease management dummy variable using “not enrolled in DM program” as the comparison category),
- Asthma and diabetes (disease management dummy variable using “not enrolled in DM program” as the comparison category),
- Health Status (factor score derived from factor analysis),
- Satisfaction (factor score derived from factor analysis),
- Trust (factor score derived from factor analysis),
- Small problem seeing a specialist – proxy for Access (how much of a problem was it to see a specialist you needed to see dummy variable using “big problem” [i.e., poor access] as the comparison category),
- No problem seeing a specialist – proxy for Access (how much of a problem was it to see a specialist you needed to see dummy variable using “big problem” [i.e., poor access] as the comparison category).

A detailed discussion as to how each variable was conceptualized and operationalized for use in this study appears in Section 4.4 of this chapter. A discussion of the statistics that were used to interpret the regression operations appears in Section 4.8.

The regression analyses were governed by three important guidelines. The first of these involved the use of *indicator coding* of the dummy variables where the reference, or comparison, categories of the dummy variables were assigned a value of zero. Thus, the regression coefficients are interpreted as group deviations on the dependent variable from the comparison group. Next, the *backward elimination* method of selecting variables for inclusion in the regression was used. When using this method, all of the independent variables in the model are initially included in the regression. Subsequently, the independent variables that fail to make statistical contributions to prediction (i.e., those that fail to achieve statistical significance) are eliminated one-by-one until the final model consists of independent variables statistically significant at the $p < 0.05$ level. In the case of the age-squared term, age was retained in the regression model if it failed to achieve statistical significance and the age-squared term was statistically significant. Similarly, if age and age-squared were both statistically insignificant, then age-squared was eliminated and the regression was re-run with the age term included in the model. Missing values were handled using the complete case approach, or LISTWISE method, where only those observations with complete data were included in the regression analyses.

Finally, a series of diagnostic tests conforming to the best linear unbiased estimator (BLUE) regression criteria were performed to ensure that the data used in the ordinary least squares regression operations met the assumptions that govern this technique. Adherence to these criteria assured that statistically valid inferences about the population parameters were advanced (Bohrnstedt and Knoke, 1994). The assumptions that were tested included:

- the relationship between the dependent variable and the independent variables is linear,
- no irrelevant variables are included in the regression equation,
- no relevant variables are excluded from the regression equation,
- the variables are normally distributed,
- the error terms are normally distributed,
- the error terms have a mean of zero,
- the error terms have a constant variance (i.e., the error terms demonstrate homoskedasticity),
- the presence of outlier values in the variables that can potentially skew the distribution is minimized,
- multicollinearity among the independent variables is not present.

In terms of the model’s specifications, some of the diagnostic screening procedures (i.e., tests designated to assess linearity, normality, homoskedasticity, and outlier variables) were conducted before running the regressions while other procedures (i.e., tests evaluating multicollinearity and the exclusion of relevant variables) were determined during the regression runs.

Linearity between each of the three OLS dependent variables (primary care visits, specialty care visits, and emergency care visits) and the complete set of independent variables was evaluated in each subsample (subjects matched on their propensity for race concordance and gender concordance, respectively) by generating partial plots in SPSS. Given that most of the variables in the regression models are binary variables, the typical pattern observed in the partial plots was a clustering of observations about the discrete values of the independent variable. However, there were no curvilinear relationships observed for any of the continuous independent variables (age, age-squared, number of months in practice, and the three factor scores representing health status, satisfaction, and trust), thereby supporting the assumption that the relationship between dependent and independent variables is linear.

The normality of the model's continuous independent variables was assessed by examining the magnitude of the skewness and kurtosis statistics, which measure the dispersion and height of the distribution of the variables and by examining histograms of the distribution of each variable. The values of the skewness and kurtosis statistics were generally within the acceptable range for all continuous variables in each of the care utilization – concordance combinations. One exception was the kurtosis statistic for the trust factor score for specialty care utilization among respondents matched on their propensity for race concordance, which was slightly elevated. Examination of the histograms for the health status factor scores revealed a distribution that appeared to be more bimodal than normal.

The error term assumptions for the entire regression model were evaluated by comparing the model's distribution to a normal probability plot. The diagnostic output indicated that, for the most part, the error terms were aligned with the straight line sloping upward at a 45-degree angle appearing in the normal probability plot. This signified that the error terms were normally distributed. However, there appeared to be more variability in the normal probability plots associated with specialty care use and emergency care use as compared to primary care use. Homoskedasticity was appraised by examining the shape of the distribution output generated in the partial plots that were previously employed to evaluate the linearity between the independent and dependent variables. The shape of the distribution was not consistent with the typical fan-shaped appearance that indicates the presence of heteroskedasticity.

Outliers, or extreme values in the variables, influence the slope of the regression line and the variance in each of the dependent variables that is explained by the independent variables. SPSS identifies the presence of outlier cases by invoking the casewise diagnostics feature and measuring the standardized residuals, with a standardized residual value in excess of ± 3 standard deviations identified as an outlier case. No outlier cases were identified for the use of primary care in either the subsample matched on the propensity for race concordance or the subsample matched on the propensity for gender concordance. A relatively small number of outlier cases were identified by the software for specialty care use and emergency care use in both of the subsamples matched on the propensity for race concordance and gender concordance, respectively. However, when other data elements of the cases were examined, there was no readily identified reason (e.g., recording or other systematic error) to exclude these cases from the analysis.

The exclusion of relevant variables and inclusion of irrelevant variables in the regression models was determined retrospectively after the regression runs. Exclusion of relevant variables was determined by evaluating the value of the model's adjusted coefficient of determination, or adjusted R^2. The adjusted R^2 measures the "proportion of the variance of the dependent variable about its mean that is explained by the independent, or predictor, variables" by accounting for the number of independent variables included in the regression equation (Hair et al., 2006, p. 170). Low values of the adjusted R^2 statistic indicated that relevant variables were omitted. The subject of excluded variables and the role of the adjusted R^2 statistic in measuring the extent of excluded variables is discussed in greater detail in the text of Chapter Seven: Discussion and Conclusions. The presence of irrelevant variables was determined by examining the standard errors of the regression coefficients for inflated values.

The tolerance and variance inflation factor (VIF) statistics were used to evaluate the presence of multicollinearity in the multiple regression models by invoking the collinearity diagnostics feature in SPSS after the regression runs. The tolerance of a variable is defined as $1 – R^2i$, where "R^2i is the coefficient of determination for the prediction of variable *i* by the other independent variables in the regression variate" (Hair et al., 2006, p. 176). Values of tolerance range from 0 to 1 and low values of tolerance (0.3 or less) indicate the presence of multicollinearity. The variance inflation factor (VIF) is the reciprocal of tolerance and indicates "the effect that the other independent variables have on the standard error of the regression coefficient" (Hair et al., p. 176). High values of the VIF statistic (3.0 or more) indicate the presence of multicollinearity. The tolerance and VIF statistics that were used to evaluate multicollinearity appear in the summaries of the regression models that are discussed in Chapter Six: Causal Analysis of Health Utilization.

4.8 Statistics Used in the Analysis

The various forms of analytical tools used in this study require a diverse array of statistics that describe, summarize, and, where appropriate, make inference as to association or causality. The statistics employed to analyze the bivariate relationships described in Chapter Five, where cross-tabulations of the two variables are the analytical tool-of-choice, are quite different from those that were discussed in the Factor Analysis subsection of this chapter and those that appear in Chapter Six, where the linear and logistic regression techniques are employed. With the exception of the statistics that pertain to factor analysis that were discussed in some detail in section 4.6, section 4.8 presents an overview of the statistics relevant to the cross-tabulation and regression techniques used in Chapters Five and Six.

Four statistics were employed to analyze the bivariate relationships described in Chapter Five. These include the Chi-square statistic, Fisher's exact test, the adjusted standardized residual, and percentages (or percentage differences). The *Chi-square* test measures the independence of two variables by comparing observed counts to expected counts within each cell of the cross-tabulation and summing the difference between the two for each cell in the table. The summed value for all the cells in the table is compared to a critical point on the theoretical chi-square distribution that depends on the number of rows and columns in the table. The associated probability, or p-value, is compared to the study threshold of 0.05 [31] and deemed statistically significant if $p < 0.05$. In order to minimize distortion in interpretation, guidelines indicate that no cell in the table must have an expected value less than 1.0 and not more than 20% of the cells have expected values less than 5 (SPSS Inc., 1999). In the case of cross-tabulations that result in 2 x 2 tables, Fisher's exact test of significance is used in place of the Chi-square test.

The adjusted standardized residual measure is analogous to the cell Chi-square statistic because it "identif[ies] cells [in a cross-tabulated table] that depart markedly from the model of independence" (SPSS Inc., 1999). Values of the adjusted standardized residual that are below -2 or above +2 point to a statistically significant relationship (at the $p < 0.05$ level) between the variables. In practical terms, the measure identifies statistically significant relationships between cells within a cross-tabulation. Although the individual cells that achieve statistical significance in the cross-tabulations that appear in Chapter Five are highlighted as statistically significant, the values of the adjusted standardized residual do not appear in those cross-tabulations.

Percentage differences are perhaps the simplest and most straightforward way to evaluate the difference in magnitude between cells in a cross-tabulation. However, percentage differences lack the ability to convey statistical inference and should be interpreted in conjunction with a test of statistical significance.

Nine important statistics were used to evaluate the linear regression techniques. The adjusted coefficient of determination, or adjusted R^2 measures the goodness-of-fit of the linear model and was introduced in Section 4.7. The unstandardized regression

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[31] A significance level of 0.05 represents a 5% chance of rejecting the hypothesis that there is no difference between two variables when, in fact, there is no difference between the variables.

coefficients, b, represent the amount of change in the dependent variable for a one-unit change in an independent variable and, within the context of a multiple linear regression model, are expressed in terms of units of the associated variable. The regression coefficients that appear in this study, which involves a number of independent variables, are partial coefficients because they not only consider the relationship between the independent variable under consideration and the dependent variable, but also account for relationships between the independent variable and the other independent variables. The standardized regression coefficients, or beta coefficients (β^*), are standardized[32] versions of the regression coefficients that "allow direct comparisons between coefficients as to their relative explanatory power of the dependent variable" (Hair et al., 2006, p. 170). Beta coefficients indicate the amount of net change, in standard deviation units, in the dependent variable resulting for an independent variable change of one standard deviation (Bohrnstedt and Knoke, 1994). The standard error is the expected distribution of an estimated regression coefficient that designates the expected range of the regression coefficient across multiple samples of the data (Hair et al., 2006). The standard error is a critical component in determining the statistical significance of the regression coefficient.[33] The probability, or *p*-value, associated with the *t*-statistic is another important measure evaluated in the course of determining the statistical significance of the independent variable's effect on the dependent variable. The standardized residuals statistic that facilitates the identification of outlier cases and the tolerance and variance inflation factor statistics used to evaluate the presence of multicollinearity were

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[32] Standardization involves rescaling both the dependent and independent variables in terms of their standard deviations.

[33] In fact, the mathematical computation of the *t*-statistic used to evaluate statistical significance is obtained by dividing the value of the regression coefficient by the standard error.

introduced in Section 4.7 (Regression Methods) and are mentioned here to ensure their inclusion in this group.

A number of statistics were also used in the logistic regression operation. Some of these statistics closely resemble those used in the multiple linear regressions while others are markedly different. Each is summarized below.

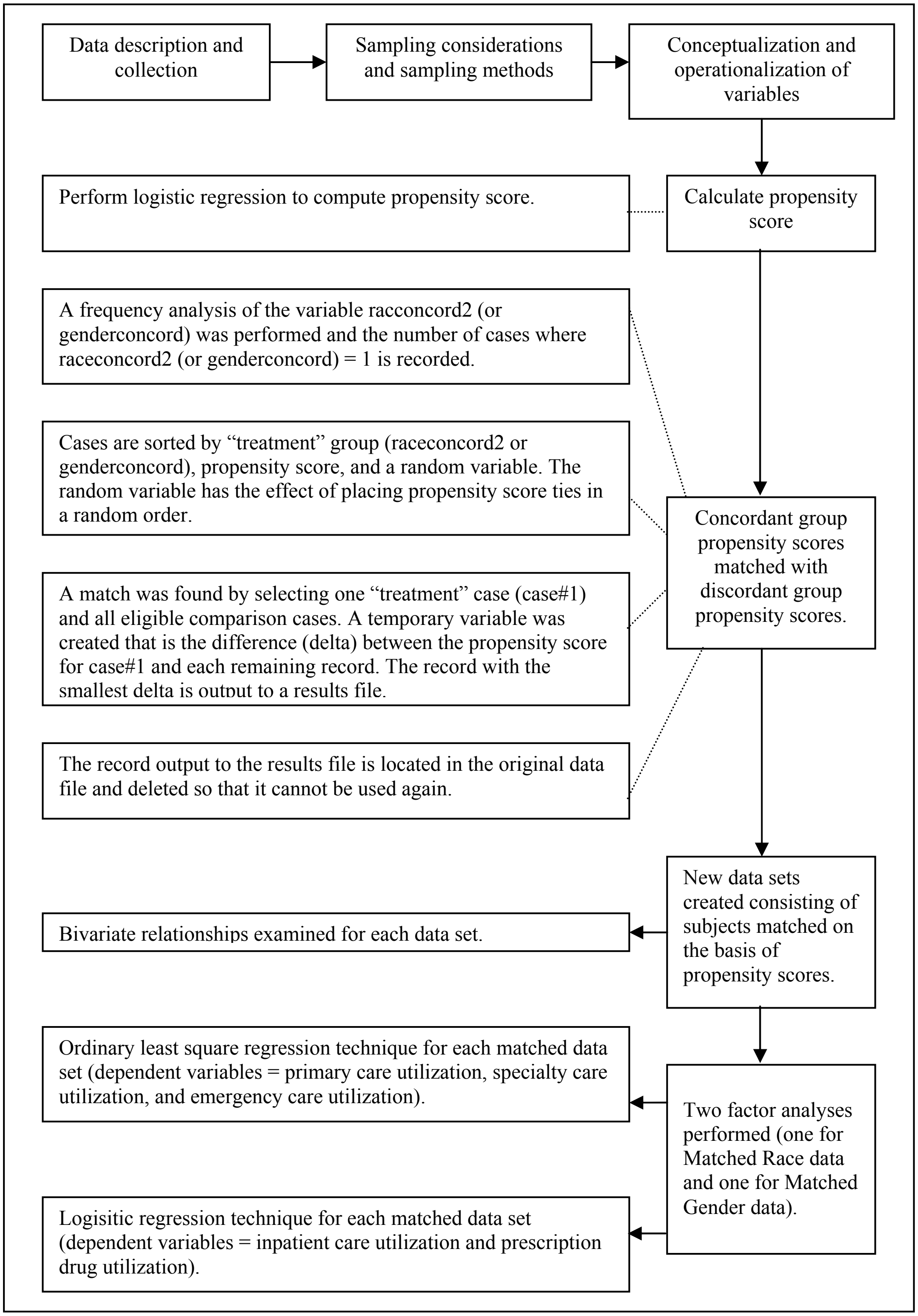
The logistic coefficients function “as the weighting factor for the independent variables in relation to their discriminatory power” (Hair et al., 2006, p. 272). The logistic coefficients are expressed in terms of “logged odds,” which makes their interpretation somewhat awkward and cumbersome. The exponentiated coefficients are easier to interpret and represent the statistic-of-choice to link the independent variables to the dependent variable. Exponentiated coefficients represent the most direct method of assessing the magnitude of the change in probability due to each independent variable. Mathematically, subtracting 1.0 from the exponentiated coefficient is equal to the percentage change in predicted odds for each unit-change in the independent variable. Exponentiated coefficients less than 1.0 represent a decreased percentage change in the predicted odds; exponentiated coefficients greater than 1.0 indicate increases in the percentage change in predicted odds; exponentiated coefficients equal to 1.0 represents no change in the predicted odds.

The Wald statistic tests the statistical significance of the logistic coefficient and is similar in its interpretation to the t-statistic that appears in linear regression models. A probability, or p-value, associated with Wald statistic also quantifies the coefficient’s statistical significance.

The classification matrix generated with the logistic regression output consists of a cross-tabulation of “actual group membership with predicted group membership with numbers on the diagonal representing correct classifications and off-diagonal numbers representing incorrect classifications” (Hair et al., 2006, p. 270). The value of the classification matrix lies in its predictive ability as to whether or not the variables in the logistic regression model improved the model that contained no independent variables.

The Nagelkerke R^2 is similar to the R^2 (coefficient of determination) that appears in linear regression models in that it represents a value of overall model fit, but it differs in a one fundamental aspect. Unlike other types of variables, the notion of the percent of explained variance for a dichotomous dependent variable is linked to the frequency distribution of that variable. This circumstance makes the Nagelkerke R^2 an approximation of the OLS R^2 and limits the ability to directly compare it to other similar measures of goodness-of-fit. The Nagelkerke R^2 value appears in the study’s summary statistics primarily as a historical artifact, but may provide some explanatory benefits when interpreted concurrently with the classification matrix, which may be a more appropriate measure of the goodness-of-fit (Garson, 2009).

Chapter Four has provided a comprehensive description of the methods used to collect data, explained the conceptualization and operationalization of the variables, and established the roadmap for performing the analysis. These methods and techniques are summarized in Figure 4-1. Chapter Five initiates the process of addressing the research questions posed in Chapter Three by comparing the concordant and discordant groups in each of the matched subsamples.



Data description and collection

Sampling considerations and sampling methods

Conceptualization and operationalization of variables

Calculate propensity score

Perform logistic regression to compute propensity score.

Concordant group propensity scores matched with discordant group propensity scores.

A frequency analysis of the variable racconcord2 (or genderconcord) was performed and the number of cases where raceconcord2 (or genderconcord) = 1 is recorded.

Cases are sorted by “treatment” group (raceconcord2 or genderconcord), propensity score, and a random variable. The random variable has the effect of placing propensity score ties in a random order.

A match was found by selecting one “treatment” case (case#1) and all eligible comparison cases. A temporary variable was created that is the difference (delta) between the propensity score for case#1 and each remaining record. The record with the smallest delta is output to a results file.

The record output to the results file is located in the original data file and deleted so that it cannot be used again.

New data sets created consisting of subjects matched on the basis of propensity scores.

Bivariate relationships examined for each data set.

Two factor analyses performed (one for Matched Race data and one for Matched Gender data).

Ordinary least square regression technique for each matched data set (dependent variables = primary care utilization, specialty care utilization, and emergency care utilization).

Logisitic regression technique for each matched data set (dependent variables = inpatient care utilization and prescription drug utilization).

Figure 4-2: Summary of Study Methods

CHAPTER 5: COMPARISON OF CONCORDANT AND DISCORDANT GROUPS

Chapter Five compares the concordant groups with their respective discordant groups for both the matched race and gender sub-samples. The primary device used for making these comparisons is the bivariate cross-tabulation, which functions primarily to facilitate examination and comparison of the data in terms of the specific categories or groupings of the variables. In addition to making these relationships more transparent, the cross-tabulations play another important role with respect to displaying the data prior to and after the propensity score matching procedures were conducted (see Chapter Four for a complete discussion of propensity score matching). Thus, the cross-tabulations provide insight into the effectiveness of the propensity-score matching procedures by highlighting relationships that may have been statistically significant prior to propensity score matching and rendered statistically insignificant after the matching process. Additionally, the cross-tabulations authenticate those relationships that achieved statistical significance prior to matching and that remained significant after matching.

Three statistics govern the interpretation of the cross-tabulations. The percentages appearing in each table reflect a given cell's contribution to the sum total in either the concordant or discordant group. In most cases, the percentage that applies to one group can be readily compared to the percentage appearing in the same row for the other group, thus establishing a percentage difference between the two groups. Additionally, the p-value of the Chi-square statistic is used as the measure of the relationship's statistical significance due to the categorical-level measurement of the race and gender concordance variables. The adjusted standardized residual statistic functions in a manner similar to the cell Chi-square statistic and identifies the statistically significant relationships at the $p \leq 0.05$ level between cells located within the same table. Although the actual value of the adjusted standardized residual statistic does not appear in the cross-tabulations, the cells within each cross-tabulation are marked with an asterisk (*) if the relationship is statistically significant at the $p < 0.05$ level, a double asterisk (**) if the relationship is significant at the $p < 0.01$ level, and a triple asterisk (***) if significant at the $p < 0.001$ level. The same conventions are also used to designate the statistical significance for the Chi-square and Fisher's Exact Test statistics.

Chapter Five is organized into three major sections. The first, section 5.1, examines the bivariate relationships observed in the sub-sample of survey respondents matched on their probability of being in the race concordant group. Section 5.2 is organized in a similar manner, but examines the bivariate relationships associated with the sub-sample of respondents matched on the probability of being in the gender concordant group. The bivariate relationships described in sections 5.1 and 5.2 are consequently organized into subsections that coincide with the major categories of Andersen's theoretical model of health care utilization, the Emerging Model – Phase 4. These include the *health care system*, *predisposing characteristics*, *enabling resources*, *perceived health status*, *evaluated health status*, and the *use of health services*. Section 5.3 provides a recap of the significant findings revealed in Sections 5.1 and 5.2.

5.1 Bivariate Relationships Among Survey Respondents Matched for Race Concordance

Andersen's Emerging Model of Health Service Utilization (Phase 4) initially considers the environmental factors that influence the utilization of health services. The *health care system* is the primary component of this category and is represented by the enrollee's care network in Smith's adaptation to the Andersen model.

There was considerable inter-network variation in terms of race concordance status in both the unmatched data and in the sub-sample of survey respondents matched on their probability of being in the race concordant group. However, the unmatched and matched data sets differed markedly in terms of the specific care networks exhibiting the greatest degrees of variation. For example, the variation between the proportions of race concordant and race discordant respondents in the Northern Piedmont Community Care (a1004), Northwest Community Care (a1008), Community Care Partners of Greater Mecklenburg (a1009), Partnership for Health Management (a1012), and Sandhills Community Care (a2005) networks was statistically significant in the unmatched data set and not in the matched data sub-sample. On the other hand, significant variation in race concordance status was observed in the Community Health Partners care network (a1003) in the matched data sub-sample but not in the unmatched data set. Overall, the bivariate relationship between the enrollee's care network and their race concordance status was statistically significant in both the matched sub-sample and the unmatched group.

Given the fact that the focus of the study's data analysis is oriented to the matched race and gender sub-samples, it is important to note that three care networks within the race-matched sub-sample were characterized by significantly higher proportions of race concordance. These included the Community Health Partners (a1003), Carolina

Table 5-1: Enrollee's Care Network by Race Concordance Status

Network	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
a1003	124	8.9%	84	7.4%	124**	11.0%	83**	7.4%
a1004	80*	5.7%	88*	7.8%	80	7.1%	88	7.8%
a1006	102	7.3%	79	7.0%	85	7.5%	79	7.0%
a1007	172***	12.3%	33***	2.9%	2***	0.2%	33***	2.9%
a1008	112*	8.0%	68*	6.0%	78	6.9%	66	5.9%
a1009	75**	5.4%	95**	8.4%	75	6.7%	95	8.4%
a1010	138***	9.9%	55***	4.9%	93**	8.3%	55**	4.9%
a1011	71***	5.1%	97***	8.6%	70*	6.2%	97*	8.6%
a1012	71*	5.1%	83*	7.3%	71	6.3%	82	7.3%
a1013	62***	4.4%	107***	9.4%	62***	5.5%	107***	9.5%
a2000	72***	5.2%	100***	8.8%	72*	6.4%	98*	8.7%
a2003	128**	9.2%	66**	5.8%	127***	11.3%	66***	5.9%
a2004	102	7.3%	80	7.1%	101	9.0%	79	7.0%
a2005	87*	6.2%	98*	8.6%	86	7.6%	98	8.7%
	1396		1133		1126		1126	
p-value for Chi-square	0.000***				0.000***			

Community Health Partnership (a1010), and the Southern Piedmont Community Care Plans (a2003) networks. Conversely, four networks in this subsample, Access II Care of Western North Carolina (a1007), Community Care of Wake/Johnston Counties (a1011), Carolina Collaborative Community Care (a1013), and the Community Care Plan of Eastern North Carolina (a2000), featured significantly higher proportions of race discordance. The most striking observation in Table 5-1 is that a number of the race concordant respondents from the Access II Care of Western North Carolina (a1007) care network in the unmatched data were not matched by the propensity score methodology, resulting in a marked drop-off in the proportion of race concordant respondents in that network.

The second major heading in Andersen's Emerging Model of Health Service Utilization (Phase 4) considers the role of population characteristics in the utilization of health services. The first major component within this category considered here is *predisposing characteristics*. This component is represented in Smith's adaptation to the Andersen model by the enrollee's race/ethnicity, gender, gender concordance, age, and education,

Several important points are brought to light by examining the relationship between the Medicaid beneficiary's race/ethnicity and membership in the race concordant or race discordant group. From a macro perspective, Table 5-2 reveals that the relationship between enrollee race/ethnicity and race concordance was statistically significant both before and after the propensity score matching process was invoked. From a statistical perspective, the matching process also solidified the authenticity of the relationship by reducing the number of cells with an expected count of less than 5. Matching reduced the number of these cells from one to zero.

In terms of the specific characteristics of this relationship, the most striking feature is the large proportion of white enrollees in race concordant relationships compared to enrollees in each of the other race/ethnicity categories. Nearly 74% of the race concordant group in the matched subsample was composed of white enrollees while whites constituted only 25% of the race discordant group. Conversely, blacks represented only 25% of the race concordant group, but over 62% of the race discordant group. It is also interesting to note that although the total number of enrollees in the Asian/Native Hawaiian/Pacific Islander categories for both the concordant and discordant groups was small, the proportional representation in each group was identical at 0.4%. Somewhat

Table 5-2: Enrollee Race/Ethnicity by Race Concordance Status

Race/Ethnicity, enrollee	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
White	1100***	78.8%	286***	25.2%	832***	73.9%	285***	25.3%
Black/African-American	278***	19.9%	707***	62.4%	276***	24.5%	701***	62.3%
Asian/Native Hawaiian/Pacific Islander	5	0.4%	5	0.4%	5	0.4%	5	0.4%
American Indian/Alaska Native	11***	0.8%	66***	5.8%	11***	1.0%	66***	5.9%
Latino/Caribbean/South American	2***	0.1%	24***	2.1%	2***	0.2%	24***	2.1%
Other	0***	0.0%	45***	4.0%	0***	0.0%	45***	4.0%
	1396		1133		1126		1126	
	1 cell (8.3%) has expected counts < 5				*0 cells have expected counts < 5*			
p-value for Chi-square	0.000***				0.000***			

surprisingly, only two of 26 survey respondents in the Latino/Caribbean/South American category indicated that they were race concordant with their providers.

In terms of the enrollee's gender, the proportion of male and female enrollees within the race concordant and race discordant groups was nearly identical. As a result, the relationship between the variables was not significant as measured by the Chi-square statistic. It is also important to note that this observation occurred before and after the

Table 5-3: Enrollee Gender by Race Concordance Status

Gender, enrollee	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
Male	348	24.9%	283	25.0%	282	25.0%	279	24.8%
Female	1048	75.1%	850	75.0%	844	75.0%	847	75.2%
	1396		1133		1126		1126	
p-value for Chi-square	0.977				0.884			
p-value for Fisher's Exact Test =	1.000 (2-tailed)				0.922 (2-tailed)			

propensity score matching procedures were initiated. The relationship between the gender of the enrollee and membership in the concordant or discordant group is summarized in Table 5-3.

Table 5-4 reveals that the proportion of respondents who were gender concordant was approximately 52% in the race concordant group and about 55% in the race discordant group. However, the percentage differences between the race concordant and race discordant groups in both the matched subsample and the unmatched data were not statistically significant.

Table 5-4: Gender Concordance Status by Race Concordance Status

Gender Concordance	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
No	655	47.1%	506	44.9%	540	48.1%	503	44.9%
Yes	735	52.9%	622	55.1%	583	51.9%	618	55.1%
	1389		1129		1123		1121	
p-value for Chi-square	0.257				0.127			
p-value for Fisher's Exact Test	0.261 (2-tailed)				0.128 (2-tailed)			

The relationship between the enrollee's age and race concordance status is examined in Table 5-5. Overall, the relationship between these variables failed to achieve statistical significance in either the matched or unmatched data sets. One age grouping, subjects who were 55 years of age or older, featured statistically significant higher proportions of race discordance in both the matched and unmatched data sets.

The education of the Medicaid beneficiary and the beneficiary's race concordance status were also examined with the results appearing in Table 5-6. The relationship between the variables was statistically significant in the unmatched data set prior to

Table 5-5: Enrollee Age Group by Race Concordance Status

Age	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
< or = 18 – 24 yrs.	261	18.7%	192	16.9%	217	19.3%	192	17.1%
25 – 34 yrs.	299	21.4%	222	19.6%	231	20.5%	222	19.7%
35 – 44 yrs.	290	20.8%	242	21.4%	232	20.6%	239	21.2%
45 – 54 yrs.	306	21.9%	240	21.2%	249	22.1%	239	21.2%
> or = 55 yrs.	240*	17.2%	237*	20.9%	197*	17.5%	234	20.8%
	1396		1133		1126		1126	
p-value for Chi-square	0.139				0.268			

conducting the propensity score matching procedures. The source of variation in this group was in the “some college or 2-year degree” and “4-year college degree” groupings, where the proportion of race concordant subjects was higher in the “some college or 2-year degree” category (22.0% vs. 18.7%) and lower in the “4-year college degree”

Table 5-6: Enrollee Education by Race Concordance Status

Education	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
8th grade or less	174	12.5%	120	10.7%	127	11.3%	120	10.7%
Some high school without graduation	381	27.4%	315	28.0%	311	27.6%	315	28.0%
High school graduate or GED	487	35.0%	433	38.5%	394	35.0%	433	38.5%
Some college or 2-year degree	306*	22.0%	210*	18.7%	259*	23.0%	210*	18.7%
4-year college degree*	34*	2.4%	43*	3.8%	29	2.6%	43	3.8%
> 4-year college degree	8	0.6%	5	0.4%	6	0.5%	5	0.4%
	1390		1126		1126		1126	
p-value for Chi-square	0.044*				0.075			

category (2.4% vs. 3.8%). After matching, the statistical significance of the relationship between the variables disappeared; however, the proportion of race concordant subjects in the "some college or 2-year degree" category remained greater than those in the race concordant group (23.0% vs. 18.7%) and this difference was statistically significant at the $p < 0.05$ level as measured by the adjusted standardized residual.

The second major component within the population characteristics category of Andersen's Emerging Model of Health Service Utilization (Phase 4) is *enabling resources*. This component is represented in Smith's adaptation to the Andersen model by the enrollee's language, region of residence, degree of urbanicity of the enrollee's county of residence, the length of time that the enrollee has been with the same provider, and the number of months that the beneficiary has been enrolled in the provider's practice.

At first glance, the relationship between the respondent's primary language spoken at home and his or her race concordance status was statistically significant in both the matched and unmatched data sets. However, the Chi-square measure of statistical significance is compromised by the fact that two cells (33%) in each cross-tabulation had expected cell counts of less than five. This circumstance casts doubt on any assertion claiming that the variance between the two variables was statistically significant. Despite the inability to stake any claim of significance, it does appear from Table 5-7 that among race concordant subjects, English was the primary language spoken in the home in slightly higher proportions than among subjects who were race discordant.

Table 5-8 examines the relationship between region, a context variable, and the beneficiary's race concordance status. Although this relationship was statistically

Table 5-7: Enrollee Primary Language Spoken at Home by Race Concordance Status

Primary language spoken at home	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
English	1387**	99.4%	1109**	97.9%	1118**	99.3%	1102**	97.9%
Spanish	5***	0.4%	20***	1.8%	5**	0.4%	20**	1.8%
Other	4	0.3%	4	0.4%	3	0.3%	4	0.4%
	1396		1133		1126		1126	
	2 cells (33.3%) have expected count < 5				*2 cells (33.3%) have expected count < 5*			
p-value for Chi-square	0.002**				0.010**			

significant for both the matched and unmatched groups, there was a remarkable difference in the occurrence of race concordance among enrollees living in the Mountain region between the matched and unmatched groups. Specifically, among unmatched respondents, 21.8% of enrollees in the race concordant group lived in the Mountain region. By contrast, only 3.6% of the enrollees in the race concordant group within the matched subsample resided in the Mountain region. Clearly, a number of Mountain residents were not matched by the propensity scoring methods. As a result, a larger proportion of residents in the Piedmont region (67.5%) and in the Tidewater region

Table 5-8: Enrollee's Region of Residence by Race Concordance Status

Region	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
Mountains	305***	21.8%	58***	5.1%	40	3.6%	58	5.2%
Piedmont	763	54.7%	656	57.9%	760***	67.5%	652***	57.9%
Coastal	241***	17.3%	365***	32.2%	240***	21.3%	362***	32.1%
Tidal	87	6.2%	54	4.8%	86**	7.6%	54**	4.8%
	1396		1133		1126		1126	
p-value for Chi-square	0.000***				0.000***			

(7.6%) were race concordant among subjects in the matched subsample compared to unmatched subjects (54.7% and 6.2%, respectively). Another distinct observation from Table 5-8 was the relatively large proportion of race discordant subjects compared to race concordant subjects that occurred among residents of the Coastal Plain.

The relationship between the enrollee's degree of residential urbanicity and his or her membership in the race concordant group is summarized in Table 5-9. The relationship between these variables was statistically significant among subjects in the unmatched data but this was not the case among respondents in the matched subsample. The difference in the proportion of respondents living in urban areas between the concordant (58.5%) and discordant (64.1%) groups among the unmatched subjects accounted for the statistical significance between the variables. The proportions of respondents in each of the categories of urbanicity after matching were remarkably similar in both the concordant and discordant groups.

Table 5-9: Enrollee's Degree of Urbanicity by Race Concordance Status

Urbanicity	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
Urban	817**	58.5%	726**	64.1%	692	61.5%	720	63.9%
Mixed	369	26.4%	266	23.5%	293	26.0%	266	23.6%
Rural	210	15.0%	141	12.4%	141	12.5%	140	12.4%
	1396		1133		1126		1126	
p-value for Chi-square	0.015*				0.394			

Table 5-10 describes the relationship between the number of months that the beneficiary had been enrolled in the provider practice and the beneficiary's race concordance status. One grouping in the matched data subsample, beneficiaries who had

Table 5-10: Number of Months in Practice by Race Concordance Status

Number of months in practice	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
0-12 months	145	10.4%	100	8.8%	122	10.8%	100	8.9%
13-24 months	248	17.8%	212	18.7%	197	17.5%	211	18.7%
25-36 months	226	16.2%	163	14.4%	199*	17.7%	163*	14.5%
37-48 months	181	13.0%	134	11.8%	141	12.5%	134	11.9%
49-60 months	251	18.0%	218	19.2%	185	16.4%	217	19.3%
> 60 months	345	24.7%	306	27.0%	282	25.0%	301	26.7%
	1396		1133		1126		1126	
p-value for Chi-square	0.340				0.088			

been enrolled in the practice for 25 to 36 months, had a significantly greater proportion of race concordant respondents (17.7%) compared to race discordant respondents (14.5%). As was the case in the previous discussion of the length of time that the beneficiary had been going to the provider, nearly three-fourths of respondents in both the race concordant and race discordant groups had been enrolled in the practice for two years or longer.

A third major heading in Andersen's Emerging Model of Health Service Utilization (Phase 4) considers the role of health-related outcomes in the utilization of health services. The first component within this category considered here is *perceived health status*. This component is represented in Smith's adaptation to the Andersen model by chronicity, a dichotomous variable that was created explicitly for use in discussing comparisons between concordant and discordant groups and that resulted from the consolidation of survey questions #60 and #62 (see section 4.4).

Table 5-11 describes the relationship between chronicity, a simple, self-reported measure that ascertains whether the enrollee had a chronic condition that interfered with his or her quality of life, and the enrollee's race concordance status. The relationship was statistically significant in both the matched subsample and the unmatched data set and was characterized by greater proportions of subjects in the race concordant group (approximately 44%) who reported that they had a chronic condition that impaired their quality of life compared to subjects in the race discordant group (approximately 38%).

Table 5-11: Enrollee Chronicity by Race Concordance Status

Chronicity	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
Yes	623***	44.9%	422***	37.5%	488**	43.6%	419**	37.5%
No	764***	55.1%	703***	62.5%	631**	56.4%	699**	62.5%
	1387		1125		1119		1118	
p-value for Chi-square	0.000***				0.003**			
p-value for Fisher's Exact Test	0.000*** (2-tailed)				0.003** (2-tailed)			

A second major component within the health-related outcomes section of Andersen's Emerging Model of Health Service Utilization (Phase 4) is *evaluated health status*. This component is represented in Smith's adaptation to the Andersen model by the beneficiary's disease management program enrollment status.

Table 5-12 summarizes the relationship between disease management status and race concordance and reveals no significant variation between the variables in both the matched and unmatched samples. The proportion of enrollees in one disease management program category, the asthma category, was significantly greater in the race discordant group of matched subjects than it was in the race concordant group (3.0% vs. 1.6%).

Table 5-12: Enrollee Disease Management Status by Race Concordance Status

Disease Management Status	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
Asthma	31	2.2%	34	3.0%	18*	1.6%	34*	3.0%
Asthma and Diabetes	12	0.9%	9	0.8%	12	1.1%	8	0.7%
Diabetes	206	14.8%	162	14.3%	168	14.9%	162	14.4%
None	1147	82.2%	928	81.9%	928	82.4%	922	81.9%
	1396		1133		1126		1126	
p-value for Chi-square	0.657				0.119			

The final major heading in Andersen's Emerging Model of Health Service Utilization (Phase 4) considers the role of health behaviors in the utilization of health services. The primary component within this category considered here is *the use of health services*. This component is represented in Smith's adaptation to the Andersen model by the aforementioned five forms of health service utilization: primary care, specialty care, emergency care, inpatient care, and prescription drugs.

The first form of health utilization, primary care, is summarized in Table 5-13. This relationship was not statistically significant in the data set of unmatched respondents, but attained significance in the matched subsample. The areas of significant variation occurred among those subjects who visited their primary care provider on one occasion and among those who had ten or more visits. The proportion of enrollees in the matched subsample who visited their primary care provider once was greater among enrollees in the race discordant group (15.3%) compared to the race concordant group (11.4%). By contrast, the proportion of enrollees in the matched subjects who visited

Table 5-13: Primary Care Utilization by Race Concordance Status

Primary care utilization (visits)	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
0	187	13.6%	173	15.5%	162	14.5%	169	15.2%
1	174*	12.6%	172*	15.4%	127**	11.4%	170**	15.3%
2	249	18.1%	201	18.0%	208	18.7%	201	18.1%
3	184	13.3%	149	13.3%	146	13.1%	149	13.4%
4	115	8.3%	96	8.6%	88	7.9%	96	8.6%
5 to 9	266	19.3%	197	17.6%	215	19.3%	197	17.7%
10 or more	204*	14.8%	129*	11.5%	168*	15.1%	128*	11.5%
	1379		1117		1114		1110	
p-value for Chi-square	0.093				0.042*			

their primary care provider ten or more times was greater among enrollees in the race concordant group (15.1%) compared to those in the race discordant group (11.5%).

The relationship between specialty care utilization and race concordance is described in Table 5-14. The relationship between these variables was not significant at $p < 0.05$ for both the matched and unmatched data sets. However, there was statistically significant variation between the race concordant and discordant groups among enrollees with no specialty care visits and those with 5-to-9 visits. Specifically, the proportion of subjects who had no specialty care visits was approximately 57% in the race discordant group compared to approximately 52% in the race concordant group. On the other hand, the proportion of subjects who had 5-to-9 specialty care visits was higher in the race concordant group (approximately 9%) compared to the race discordant group (6.5%).

Table 5-15 describes the bivariate relationship between emergency care utilization and race concordance status and reveals no statistically significant variation in the proportion of emergency room visits between the race concordant and race discordant groups for both the matched and unmatched data sets. In fact, when comparing the

Table 5-14: Specialty Care Utilization by Race Concordance Status

Specialty care utilization (visits)	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
0	718**	51.9%	646**	57.5%	587*	52.6%	640	57.3%
1	158	11.4%	118	10.5%	128	11.5%	118	10.6%
2	159	11.5%	122	10.9%	121	10.8%	122	10.9%
3	85	6.1%	75	6.7%	62	5.3%	75	6.7%
4	71	5.1%	47	4.2%	60	5.4%	46	4.1%
5 to 9	123*	8.9%	73*	6.5%	98*	8.8%	73*	6.5%
10 or more	69	5.0%	43	3.8%	60	5.4%	43	3.8%
	1383		1124		1116		1117	
p-value for Chi-square	0.059				0.057			

percentages in each of the visit categories of the matched data set to the unmatched data set throughout the table, the values are remarkably similar. The proportion of enrollees who did not visit the emergency room was higher in the race concordant group compared to the race discordant group (63.1% vs. 59.4% in the matched data set) and also among enrollees who made three emergency room visits (5.1% vs. 3.9% in the unmatched data set). For all other number of visit categories, the proportion of enrollees was higher in the

Table 5-15: Emergency Care Utilization by Race Concordance Status

Emergency care utilization (visits)	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
0	871	62.8%	671	59.4%	705	63.1%	667	59.4%
1	238	17.2%	215	19.0%	188	16.8%	212	18.9%
2	136	9.8%	122	10.8%	108	9.7%	122	10.9%
3	67	4.8%	44	3.9%	57	5.1%	44	3.9%
4	33	2.4%	39	3.5%	30	2.7%	39	3.5%
5 to 9	30	2.2%	28	2.5%	21	1.9%	28	2.5%
10 or more	11	0.8%	11	1.0%	9	0.8%	11	1.0%
	1386		1130		1118		1123	
p-value for Chi-square	0.300				0.287			

race discordant group than in the race concordant group.

Unlike the primary care, specialty care, and emergency care utilization variables, the inpatient care and prescription drug utilization variables are dichotomous measures that do not quantify the number of visits or prescriptions. Table 5-16 examines the first of these, inpatient care utilization, and its relationship to race concordance status.

The initial observation from Table 5-16 is that there is no significant variation between inpatient care utilization and race concordance and that this observation is consistent in both the matched and unmatched data sets. In fact, when comparing the matched and unmatched data sets, the proportion of enrollees in each of the individual cells representing the unmatched subjects is identical to the proportion appearing in the corresponding cell representing the matched subjects. It is also worth noting that nearly one in five of all subjects (17.0% of enrollees in the race concordant group and 19.1% in the race discordant group) had at least one inpatient visit.

Table 5-16: Inpatient Utilization by Race Concordance Status

Inpatient utilization	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
None	1159	83.0%	915	80.9%	935	83.0%	909	80.9%
One or more visits	237	17.0%	216	19.1%	191	17.0%	215	19.1%
	1396		1131		1126		1124	
p-value for Chi-square	0.167				0.182			
p-value for Fisher's Exact Test	0.175 (2-tailed)				0.188 (2-tailed)			

Table 5-17 demonstrates that the relationship between prescription drug utilization and race concordance was statistically significant among survey respondents in the unmatched data set, but matching respondents on the basis of propensity scores caused the significance to disappear. This observation was due to the relatively large number of race concordant enrollees representing both categories of prescription drug utilization (no prescriptions filled and one or more prescriptions filled) who were eliminated by the propensity score matching technique. The proportion of enrollees in the matched subsample who had at least one prescription filled was slightly greater in the race concordant group (78.8%) compared to the race discordant group (76.4%).

Table 5-17: Enrollee Prescription Drug Utilization by Race Concordance Status

Prescription drug utilization	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
None	267**	19.2%	269**	23.7%	238	21.2%	266	23.6%
One or more new or refilled prescription	1124**	80.8%	864**	76.3%	885	78.8%	860	76.4%
	1391		1133		1123		1126	
p-value for Chi-square	0.005**				0.167			
p-value for Fisher's Exact Test	0.006 (2-tailed)**				0.172 (2-tailed)			

The final cluster of bivariate relationships among survey respondents matched on the basis of race concordance involves the relationship between race concordance and three provider-related characteristics not included in the Andersen theoretical framework: provider race, provider gender, and provider continuity status before and after enrollment in Medicaid. These variables were selected for examination because of their relevance to race and gender concordance and to the patient-physician relationship.

A discussion of provider race and ethnicity among the race concordant and discordant groups broadens our understanding of race concordance. Table 5-18 summarizes this relationship, which was statistically significant both before and after the matching process. Although white providers represented the greatest proportion of providers in both the concordant and discordant groups (73.9% and 58.0%, respectively), the proportion of black providers in the concordant group was also greater than that in the discordant group (24.5% vs. 14.9%). Conversely, the proportion of providers in all of the other race/ethnicity categories was greater in the race discordant group of respondents. One of the more noteworthy aspects of this relationship was the large proportion (16.9%) of providers in the Asian/Native Hawaiian/Pacific Islander category within the discordant group.

Table 5-18: Provider Race/Ethnicity by Race Concordance Status

Race/Ethnicity, Provider	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
White	1100***	78.8%	658***	58.1%	832***	73.9%	653***	58.0%
Black/African-American	278***	19.9%	169***	14.9%	276***	24.5%	168***	14.9%
Asian/Native Hawaiian/Pacific Islander	5***	0.4%	191***	16.9%	5***	0.4%	190***	16.9%
American Indian/Alaska Native	11***	0.8%	38***	3.4%	11***	1.0%	38***	3.4%
Latino/Carribean/South American	2***	0.1%	21***	1.9%	2***	0.2%	21***	1.9%
Other	0***	0.0%	56***	4.9%	0***	0.0%	56***	5.0%
	1396		1133		1126		1126	
p-value for Chi-square	0.000***				0.000***			

The relationship between the provider's gender and the enrollee's race concordance status is unique because the relationship is statistically significant in the matched data subsample but insignificant among the unmatched survey respondents. Specifically, male providers outnumbered female providers in both the concordant and discordant groups in the unmatched set of respondents with males representing 57.8% of providers in the race concordant group and 54.3% in the race discordant group. The proportion of male providers among the race concordant group for the matched data was only slightly higher at 58.8%, but this small increase provided sufficient variation to achieve statistical significance. Table 5-19 summarizes this relationship.

Table 5-19: Provider Gender by the Race Concordance Status

Gender, provider	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
Male	803	57.8%	613	54.3%	660*	58.8%	610*	54.4%
Female	587	42.2%	515	45.7%	463*	41.2%	511*	45.6%
	1390		1128		1123		1121	
p-value for Chi-square	0.085				0.037*			
p-value for Fisher's Exact Test	0.090 (2-tailed)				0.041* (2-tailed)			

The nature of the patient-physician relationship may also be enriched by examining the survey question that asks respondents if they had been going to their current provider before their enrollment in Medicaid or Carolina Access. Table 5-20 describes this relationship in terms of the respondent's race concordance status. The relationship between the variables failed to achieve statistical significance in both the matched subsample and the unmatched survey data. Approximately 60% of respondents in the race concordant and race discordant groups did not have the same provider before enrollment in Medicaid or Carolina Access as they did at the time that they were surveyed.

Table 5-20: Same Provider Before Medicaid by Race Concordance Status

Same provider before Carolina Access or Medicaid	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Race Concordant		Race Discordant		Race Concordant		Race Discordant	
No	701	59.9%	534	61.0%	564	59.8%	531	60.9%
Yes	469	40.1%	342	39.0%	379	40.2%	341	39.1%
	1170		876		943		872	
p-value for Chi-square	0.633				0.637			
p-value for Fisher's Exact Test	0.648 (2-tailed)				0.666 (2-tailed)			

5.2 Bivariate Relationships Among Respondents Matched for Gender Concordance

Section 5.2 extends the discussion of the comparison of concordant and discordant groups by examining the bivariate relationships associated with the sub-sample of respondents matched on the probability of being in the gender concordant group. The same variables that improved our understanding of race concordance are employed here to gain greater insight into the phenomenon of gender concordance. The theoretical underpinnings of the Anderson Emerging Model of Health Service Utilization (Phase 4) are also applied in a manner consistent with the previous study of race concordance

The first relationship examined among individuals based on their probability of being in the gender concordant group is the enrollee's care network, a variable that represents the health care system in Smith's adaptation of the Andersen model. Although the overall relationship between the enrollee's care network and gender concordance status was statistically insignificant, two individual networks demonstrated significant variation in the unmatched data set. This variation, however, disappeared after the subjects were matched in accordance with the propensity scoring procedures. When comparing the gender concordant group to the gender discordant group in the matched subsample, the proportions of respondents in each network were remarkably similar across the board. This relationship is described in Table 5-21.

The next component studied within the Andersen framework is the predisposing characteristics category, which involves examination of the enrollee's race/ethnicity, gender, gender concordance, age, and education. The relationship between the first of these, enrollee race/ethnicity, and gender concordance status appears in Table 5-22.

Table 5-21: Enrollee Care Network by Gender Concordance Status

Network	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
a1003	109	7.5%	104	8.3%	100	8.1%	103	8.3%
a1004	97	6.7%	85	6.7%	89	7.2%	84	6.8%
a1006	100	6.9%	96	7.6%	88	7.1%	94	7.6%
a1007	131**	9.0%	76**	6.0%	101	8.1%	76	6.1%
a1008	108	7.4%	86	6.8%	75	6.0%	83	6.7%
a1009	98	6.7%	86	6.8%	91	7.3%	86	6.9%
a1010	98*	6.7%	114*	9.0%	97	7.8%	112	9.0%
a1011	111*	7.6%	72*	5.7%	81	6.5%	72	5.8%
a1012	91	6.2%	76	6.0%	75	6.0%	73	5.9%
a1013	97	6.7%	93	7.4%	89	7.2%	92	7.4%
a2000	104	7.1%	87	6.9%	83	6.7%	86	6.9%
a2003	115	7.9%	92	7.3%	94	7.6%	91	7.3%
a2004	102	7.0%	93	7.4%	89	7.2%	92	7.4%
a2005	96	6.6%	100	7.9%	89	7.2%	97	7.8%
	1457		1260		1241		1241	
p-value for Chi-square	0.090				0.920			

Table 5-22: Enrollee Race/Ethnicity by Gender Concordance Status

Race/Ethnicity, enrollee	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
White	770	53.3%	693	55.2%	671	54.1%	689	55.5%
Black/African-American	579	40.0%	490	39.0%	498	40.1%	487	39.2%
Asian/Native Hawaiian/Pacific Islander	3	0.2%	8	0.6%	3	0.2%	2	0.2%
American Indian/Alaska Native	49	3.4%	32	2.5%	31	2.5%	32	2.6%
Latino/Caribbean/South American	19	1.3%	10	0.8%	14	1.1%	10	0.8%
Other	26	1.8%	23	1.8%	24	1.9%	21	1.7%
	1446		1256		1241		1241	
p-value for Chi-square	0.224				0.919			

The composition of the gender concordant and discordant groups was remarkably consistent for both groups in terms of enrollee race or ethnicity, with the majority of enrollees in both groups being white while blacks accounted for approximately 40% in each group. As a result, the variation between the variables failed to achieve statistical significance.

In terms of the enrollee's gender, the proportion of male and female enrollees within the gender concordant and gender discordant groups was statistically different as measured by the Chi-square statistic. In the matched subsample, the proportion of male enrollees who were gender concordant was higher (22.6%) than the proportion that was gender discordant (15.4%). By contrast, a greater share of female enrollees constituted the gender discordant group (84.6%) than the gender concordant group (77.4%). It is also important to note that the relationship was statistically significant in both the matched and unmatched subsamples. The relationship between the gender of the enrollee and membership in the gender concordant or discordant group is summarized in Table 5-23.

Table 5-23: Enrollee Gender by Gender Concordance Status

Gender, enrollee	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
Male	486***	33.4%	197***	15.6%	281***	22.6%	191***	15.4%
Female	971***	66.6%	1063***	84.4%	960***	77.4%	1050***	84.6%
	1457		1260		1241		1241	
p-value for Chi-square	0.000***				0.000***			
p-value for Fisher's Exact Test	0.000 (2-tailed)***				0.000 (2-tailed)***			

Table 5-24 reveals that the proportion of respondents who were race concordant was approximately 54% in the gender concordant group and about 57% in the gender discordant group. However, the percentage differences between the race concordant and race discordant groups in both the matched subsample and the unmatched data were not statistically significant.

Table 5-24: Race Concordance Status by Gender Concordance Status

Race Concordance	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
No	622	45.8%	506	43.6%	531	45.7%	499	43.5%
Yes	735	54.2%	655	56.4%	631	54.1%	649	56.5%
	1357		1161		1162		1148	
p-value for Chi-square	0.257				0.281			
p-value for Fisher's Exact Test	0.261 (2-tailed)				0.295 (2-tailed)			

The relationship between the enrollee's age and his or her gender concordance status is examined in Table 5-25. Overall, this relationship was statistically significant in the unmatched data set, but failed to achieve significance in the matched data subsample. The proportion of enrollees in the various age groupings was remarkably similar when comparing the gender concordant and discordant groups in the matched data subsample.

Table 5-25: Enrollee Age by Gender Concordance Status

Age	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
< or = 18 – 24 yrs.	278**	19.1%	193**	15.3%	208	16.8%	192	15.5%
25 – 34 yrs.	309	21.2%	245	19.4%	262	21.1%	243	19.6%
35 – 44 yrs.	279*	19.1%	286*	22.7%	249	20.1%	281	22.6%
45 – 54 yrs.	315	21.6%	291	23.1%	280	22.6%	286	23.0%
> or = 55 yrs.	276	18.9%	245	19.4%	242	19.5%	239	19.3%
	1457		1260		1241		1241	
p-value for Chi-square	0.023*				0.498			

The education of the Medicaid beneficiary and the beneficiary's gender concordance status were also examined with the results appearing in Table 5-26. The relationship between these variables failed to attain statistical significance in either the matched or unmatched data sets. Enrollees who graduated high school or earned a GED constituted the greatest proportion of enrollees in both the gender concordant and gender discordant groups.

The second major component within the population characteristics category of Andersen's Emerging Model of Health Service Utilization (Phase 4) is *enabling resources*. This component is represented in Smith's adaptation to the Andersen model by the enrollee's language, region of residence, degree of urbanicity of the enrollee's

Table 5-26: Enrollee Education by Gender Concordance Status

Education	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
8th grade or less	186	12.8%	133	10.6%	160	12.9%	131	10.6%
Some high school without graduation	385	26.6%	366	29.2%	330	26.6%	363	29.3%
High school graduate or GED	539	37.2%	446	35.6%	450	36.3%	441	35.5%
Some college or 2-year degree	289	19.9%	262	20.9%	262	21.1%	259	20.9%
4-year college degree	41	2.8%	42	3.3%	32	2.6%	42	3.4%
> 4-year college degree	9	0.6%	5	0.4%	7	0.6%	5	0.4%
	1449		1254		1241		1241	
p-value for Chi-square	0.260				0.282			

county of residence, the length of time that the enrollee has been with the same provider, and the number of months that the beneficiary has been enrolled in the provider's practice.

The relationship between the primary language spoken in the home of the enrollee and gender concordance is summarized in Table 5-27. English was, by far, the primary language spoken in the home in both the gender concordant and gender discordant

Table 5-27: Enrollee Primary Language Spoken at Home by Gender Concordance Status

Primary language spoken at home	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
English	1438	98.7%	1245	98.8%	1225	98.7%	1227	98.9%
Spanish	15	1.0%	10	0.8%	12	1.0%	10	0.8%
Other	4	0.3%	5	0.4%	4	0.3%	4	0.3%
	1457		1260		1241		1241	
	2 cells (33%) have expected count < 5				*2 cells (33%) have expected count < 5*			
p-value for Chi-square	0.700				0.912			

groups. What little variation existed between the two groups was not sufficient to be statistically significant for either the matched or unmatched data subsamples. It is also interesting to note that any finding of statistical significance would have been disqualified by the fact that two cells, or 33% of the cells in the entire table, had expected counts less than 5.

Unlike the relationship between the enrollee's region of residence and his or her race concordance status, the relationship between region and gender concordance was not statistically significant. The proportion of respondents in the concordant and discordant groups was comparable in each of the region categories. This finding was observed in both the matched and unmatched data and appears in Table 5-28.

Table 5-28: Enrollee Region of Residence by Gender Concordance Status

Region	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
Mountains	205	14.1%	165	13.1%	174	14.0%	160	12.9%
Piedmont	823	56.5%	705	56.0%	695	56.0%	697	56.2%
Coastal	355	24.4%	314	24.9%	303	24.4%	309	24.9%
Tidal	74	5.1%	76	6.0%	69	5.6%	75	6.0%
	1457		1260		1241		1241	
p-value for Chi-square	0.637				0.826			

The relationship between the beneficiary's degree of residential urbanicity and his or her membership in the gender concordant group is summarized in Table 5-29. The relationship between these variables was statistically significant among subjects in the unmatched data set but not in the matched subsample. The likely explanation for this finding is the relatively large number of urban residents who were not included in the matched subsample that resulted in a decrease in the proportion of beneficiaries in the urban category among the matched subjects compared to the unmatched subjects. The difference in the proportion of respondents living in urban areas between the concordant (61.2%) and discordant (58.5%) groups among the matched subjects was a modest 2.7%. By contrast, the difference was statistically significant at 4.9% (63.3% vs. 58.4%) among unmatched survey respondents.

Table 5-29: Enrollee Degree of Urbanicity by Gender Concordance Status

Urbanicity	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
Urban	922**	63.3%	736**	58.4%	760	61.2%	726	58.5%
Mixed	341*	23.4%	348*	27.6%	314	25.3%	340	27.4%
Rural	194	13.3%	176	14.0%	167	13.5%	175	14.1%
	1457		1260		1241		1241	
p-value for Chi-square	0.023*				0.368			

Table 5-30 describes the relationship between the number of months that the beneficiary had been enrolled in the provider practice and the beneficiary's gender concordance status. The relationship between the variables failed to achieve statistical significance in either the matched or unmatched data sets. As was the case in the previous

Table 5-30: Number of Months in Practice by Gender Concordance Status

Number of months in practice	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
0-12 months	144	9.9%	118	9.4%	124	10.0%	116	9.3%
13-24 months	268	18.4%	220	17.5%	224	18.0%	219	17.6%
25-36 months	220	15.1%	195	15.5%	188	15.1%	194	15.6%
37-48 months	175	12.0%	162	12.9%	161	13.0%	160	12.9%
49-60 months	256	17.6%	244	19.4%	218	17.6%	240	19.3%
> 60 months	394	27.0%	321	25.5%	326	26.3%	312	25.1%
	1457		1260		1241		1241	
p-value for Chi-square	0.734				0.878			

discussion of the length of time that the beneficiary had been going to the provider, nearly three-fourths of respondents in both the gender concordant and gender discordant groups had been enrolled in the practice for longer than two years.

The relationship between gender concordance and chronicity, a variable that represents perceived health status in the Andersen framework, is considered next and summarized in Table 5-31. Chronicity is a self-reported measure that determines if the enrollee had a chronic condition that interfered with his or her quality of life. The relationship was not statistically significant in either the matched subsample or the unmatched data set. The proportion of subjects in both the concordant and discordant group who reported that they had a chronic condition that impaired their quality of life was approximately 40%.

Table 5-31: Enrollee Chronicity by Gender Concordance Status

Chronicity	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
Yes	591	40.8%	534	42.7%	488	39.6%	529	42.9%
No	856	59.2%	717	57.3%	744	60.4%	704	57.1%
	1447		1251		1232		1233	
p-value for Chi-square	0.333				0.097			
p-value for Fisher's Exact Test	0.347 (2-tailed)				0.102 (2-tailed)			

Similar to the discussion that appeared in Section 5.1, the enrollee's evaluated health status can be described in terms of his or her gender concordance by examining the enrollee's disease management program enrollment status. Table 5-32 summarizes this relationship and reveals that the variation between the variables in both the matched and unmatched samples is statistically significant. Although the difference was small, the proportion of enrollees in one disease management program category, the asthma category, was significantly greater in the gender discordant group of matched subjects than it was in the gender concordant group (3.7% vs. 1.9%). By contrast, the proportion of enrollees who were not enrolled in a disease management program was greater in the gender concordant group (82.3%) compared to the gender discordant group (79.7%).

Table 5-32: Enrollee Disease Management Status by Gender Concordance Status

Disease Management Status	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
Asthma	30**	2.1%	48**	3.8%	23**	1.9%	46**	3.7%
Asthma and Diabetes	11	0.8%	10	0.8%	10	0.8%	9	0.7%
Diabetes	204	14.0%	201	16.0%	187	15.1%	197	15.9%
None	1212*	83.2%	1001*	79.4%	1021	82.3%	989	79.7%
	1457		1260		1241		1241	
p-value for Chi-square	0.018*				0.037*			

Table 5-33 examines the relationship between gender concordance and primary care utilization, the first of the five types of health services that represent use of health services in Smith’s adaptation of Andersen’s theoretical framework. This relationship was statistically significant in the data set of unmatched respondents, but not in the matched subsample. The one area of significant variation that occurred among those subjects in the matched subsample was among those who had ten or more visits. The proportion of enrollees in this group who visited their primary care provider ten or more times was greater among enrollees in the gender discordant group (15.2%) compared to those in the gender concordant group (12.4%).

Table 5-33: Primary Care Utilization by Gender Concordance Status

Primary care utilization (visits)	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
0	231*	16.1%	161*	12.9%	181	14.8%	155	12.6%
1	207	14.4%	154	12.4%	175	14.3%	153	12.5%
2	256	17.9%	221	17.7%	218	17.8%	217	17.7%
3	196	13.7%	162	13.0%	164	13.4%	160	13.0%
4	116	8.1%	113	9.1%	99	8.1%	112	9.1%
5 to 9	258	18.0%	247	19.8%	233	19.1%	243	19.8%
10 or more	170*	11.9%	188*	15.1%	152*	12.4%	187*	15.2%
	1434		1246		1222		1227	
p-value for Chi-square	0.028*				0.227			

The relationship between specialty care utilization and gender concordance is described in Table 5-34. The relationship between these variables was significant at the $p < 0.05$ level for the unmatched data set but not the matched data. Thus, the various categories depicting the number of specialty care visits exhibited little difference when comparing the gender concordant and discordant groups.

Table 5-34: Specialty Care Utilization by Gender Concordance Status

Specialty care utilization (visits)	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
0	795	55.1%	664	53.2%	670	54.5%	651	53.0%
1	161	11.1%	138	11.1%	134	10.9%	137	11.1%
2	161	11.1%	144	11.5%	134	10.9%	144	11.7%
3	102	7.1%	74	5.9%	86	7.0%	72	5.9%
4	73	5.1%	50	4.0%	63	5.1%	49	4.0%
5 to 9	92**	6.4%	121**	9.7%	84**	6.8%	119**	9.7%
10 or more	60	4.2%	57	4.6%	58	4.7%	57	4.6%
	1444		1248		1229		1229	
p-value for Chi-square	0.042*				0.138			

Table 5-35 describes the bivariate relationship between emergency care utilization and gender concordance and reveals statistically significant variation in the proportion of emergency room visits between the gender concordant and gender discordant groups for the unmatched data set but not the matched subsample. Despite the absence of statistical significance in the matched subsample, the proportion of enrollees who did not use emergency care was significantly greater in the gender concordant group (63.3%) compared to the gender discordant group (57.5%). By contrast, the proportion of enrollees who used emergency care on only one occasion was significantly higher in the gender discordant group (20.3%) compared to the concordant group (16.5%).

Table 5-35: Emergency Care Utilization by Gender Concordance Status

Emergency care utilization (visits)	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
0	924***	63.9%	722***	57.6%	780**	63.3%	710**	57.5%
1	236**	16.3%	254**	20.3%	203*	16.5%	250*	20.3%
2	146	10.1%	134	10.7%	122	9.9%	132	10.7%
3	57	3.9%	64	5.1%	54	4.4%	64	5.2%
4	36	2.5%	40	3.2%	30	2.4%	39	3.2%
5 to 9	33	2.3%	28	2.2%	31	2.5%	28	2.3%
10 or more	14	1.0%	11	0.9%	12	1.0%	11	0.9%
	1446		1253		1232		1234	
p-value for Chi-square	0.034*				0.096			

Table 5-36 examines inpatient care utilization, a dichotomous variable, and its relationship to gender concordance and reveals that there is no significant variation between inpatient care utilization and gender concordance in both the matched and unmatched data sets. In fact, when comparing the matched and unmatched data sets, the proportion of enrollees in each of the individual cells representing the unmatched subjects is virtually identical to the proportion appearing in the corresponding cell representing the matched subjects. It is also worth noting that nearly one in five of all subjects (19.0% of enrollees in the gender concordant group and 18.7% in the gender discordant group) had at least one inpatient visit.

Table 5-36: Inpatient Care Utilization by Gender Concordance Status

Inpatient utilization	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
None	1192	81.9%	1025	81.5%	1005	81.0%	1006	81.3%
One or more visits	264	18.1%	232	18.5%	235	19.0%	232	18.7%
	1456		1257		1240		1238	
p-value for Chi-square	0.827				0.893			
p-value for Fisher's Exact Test	0.842 (2-tailed)				0.918 (2-tailed)			

The relationship between prescription drug utilization and gender concordance was statistically significant among survey respondents in the unmatched data set, but matching respondents on the basis of propensity scores caused the significance to disappear. This observation was due to the relatively large number of gender concordant enrollees representing both categories of prescription drug utilization (no prescriptions filled and one or more prescriptions filled) who were eliminated by the propensity score matching technique. The proportion of enrollees in the matched subsample who had at least one prescription filled was greater in the gender discordant group (81.0%) compared to the gender concordant group (78.0%). The relationship between prescription drug utilization and gender concordance in this matched subsample is described in Table 5-37.

Table 5-37: Prescription Drug Utilization by Gender Concordance Status

Prescription drug utilization	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
None	331*	22.8%	239*	19.0%	272	22.0%	235	19.0%
One or more new or refilled prescriptions	1123*	77.2%	1019*	81.0%	967	78.0%	1004	81.0%
	1454		1258		1239		1239	
p-value for Chi-square	0.016*				0.065			
p-value for Fisher’s Exact Test	0.018 (2-tailed)*				0.073 (2-tailed)			

Despite their exclusion from the Andersen framework, three variables – provider race/ethnicity, provider gender, and whether the respondent had the same provider after enrolling in Carolina Access or Medicaid as before – may broaden our overall understanding of the patient-physician relationship and the role that gender concordance plays in that relationship. Table 5-38 summarizes the relationship between provider race/ethnicity and gender concordance. This relationship was similar in many aspects to the relationship between enrollee race/ethnicity and gender concordance. Approximately two-thirds of respondents in both the gender concordant and discordant groups indicated that they had white providers and almost one in five in each group reported that their provider was black. Just over 7% of respondents in the gender concordant group and 9% in the gender discordant group reported that their provider was Asian/Native Hawaiian/Pacific Islander while the remaining 5% consisted of the Native American/Alaska Native, Latino/Caribbean/South American, and Other race categories. From a global perspective, the relationship failed to attain statistical significance in either the matched subsample or unmatched data set.

Table 5-38: Provider Race/Ethnicity by Gender Concordance Status

Race/Ethnicity, Provider	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
White	959	70.3%	799	68.7%	799	68.8%	789	68.7%
Black/African-American	249	18.3%	199	17.1%	223	19.2%	197	17.2%
Asian/Native Hawaiian/Pacific Islander	88*	6.5%	106*	9.1%	82	7.1%	103	9.0%
American Indian/Alaska Native	27	2.0%	22	1.9%	23	2.0%	22	1.9%
Latino/Caribbean/South American	13	1.0%	10	0.9%	12	1.0%	10	0.9%
Other	28	2.1%	27	2.3%	23	2.0%	27	2.4%
	1364		1163		1162		1148	
p-value for Chi-square	0.237				0.480			

The relationship between provider gender and gender concordance provides an example where the variation in the variables is not only highly significant in both the matched and unmatched data sets, but is strikingly different between the concordant and discordant groups. For example, in the matched data set, 77.4% of gender concordant respondents had female providers while 22.6% had male providers. The situation was essentially reversed in the gender discordant group, where only 15.4% of respondents had

Table 5-39: Provider Gender by Gender Concordance Status

Gender, provider	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
Male	486***	33.4%	1063***	84.4%	281***	22.6%	1050***	84.6%
Female	971***	66.6%	197***	15.6%	960***	77.4%	191***	15.4%
	1457		1260		1241		1241	
p-value for Chi-square	0.000***				0.000***			
p-value for Fisher's Exact Test	0.000 (2-tailed)***				0.000 (2-tailed)***			

female providers and 84.6% had male providers. This finding was likely attributable to the fact that 81% of all respondents in the matched data set were female while 54% of all providers in this data set were male (see Appendix C).

The patient-physician relationship may also be examined by the survey question that asks respondents if they had been going to their current provider before their enrollment in Medicaid or Carolina Access. Table 5-40 describes this relationship in the context of gender concordance and indicates that the variables failed to achieve statistical significance in both the matched subsample and the unmatched survey data. Approximately 60% of respondents in the gender concordant and gender discordant groups did not have the same provider before enrollment in Medicaid or Carolina Access as they did at the time that they were surveyed.

Table 5-40: Same Provider Before Medicaid by Gender Concordance Status

Same provider before Carolina Access or Medicaid	Pre-Propensity Score Matching				Post-Propensity Score Matching			
	Gender Concordant		Gender Discordant		Gender Concordant		Gender Discordant	
No	704	62.2%	636	59.8%	616	63.7%	628	59.8%
Yes	428	37.8%	428	40.2%	351	36.3%	423	40.2%
	1132		1064		967		1051	
p-value for Chi-square	0.246				0.068			
p-value for Fisher's Exact Test	0.255 (2-tailed)				0.074 (2-tailed)			

5.3 Recap of Significant Findings

A total of forty bivariate relationships were depicted as cross-tabulations. The first half of the cross-tabulations were descriptive of the subsample of enrollees who were matched on their probability of being race concordant, while the remainder involved enrollees matched on their probability of being gender concordant. Of the forty cross-tabulations, nineteen (47.5%) involved relationships that were statistically insignificant prior to propensity score matching and remained insignificant after propensity score matching. Two of the cross-tabulations (5.0%) involved relationships that were initially insignificant in the unmatched data, but became significant after propensity score matching and an additional two bivariate relationships (5.0%) exceeded the acceptable limit of cells with expected counts < 5. Eight cross-tabulations (20.0%) involved relationships that were significant prior to matching and remained significant after matching. By contrast, the remaining nine cross-tabulations (22.5%) that were significant prior to matching became insignificant after matching. This last finding may be most important because variability that existed between the concordant and discordant groups on a number of covariates prior to matching is minimized after matching, thereby supporting the primary rationale for conducting propensity score matching. A summary of the bivariate relationships described in Chapter Five that denotes statistical significance before and after propensity score matching for the data matched on race concordance and gender concordance, respectively, appears in Table 5-41.

Among the bivariate relationships that included race concordance as one of the study variables, eight achieved statistical significance among the subsample of subjects matched on their probability of inclusion in the race concordant group. However, one was disqualified because greater than 20% of its cells had expected counts less than 5.

The first of the valid relationships to be described was the enrollee's race/ethnicity as it related to race concordance, where white enrollees constituted 74% of the race concordant group, but only 25% of the discordant group (see Table 5-2). By

Table 5-41: Summary of Bivariate Relationships Appearing in Chapter Five

	Race Concordance			Gender Concordance		
Variable	Original Table #	Pre-PSM Signif	Post-PSM Signif	Original Table #	Pre-PSM Signif	Post-PSM Signif
Care Network	5-1	***	***	5-21	NS	NS
Enrollee Race	5-2	***	***	5-22	NS	NS
Enrollee Gender	5-3	NS	NS	5-23	***	***
Gender Concordance	5-4	NS	NS			
Race Concordance				5-24	NS	NS
Age Group	5-5	NS	NS	5-25	*	NS
Education	5-6	*	NS	5-26	NS	NS
Primary Language	5-7	**(DQ)	**(DQ)	5-27	NS(DQ)	NS(DQ)
Region	5-8	***	***	5-28	NS	NS
Urbanicity	5-9	*	NS	5-29	*	NS
Number of Months in Practice	5-10	NS	NS	5-30	NS	NS
Chronicity	5-11	***	**	5-31	NS	NS
DM Status	5-12	NS	NS	5-32	*	*
Primary Care Utilization	5-13	NS	*	5-33	*	NS
Specialty Care Utilization	5-14	NS	NS	5-34	*	NS
Emergency Care Utilization	5-15	NS	NS	5-35	*	NS
Inpatient Care Utilization	5-16	NS	NS	5-36	NS	NS
Prescription Drug Utilization	5-17	**	NS	5-37	*	NS
Provider Race/Ethnicity	5-18	***	***	5-38	NS	NS
Provider Gender	5-19	NS	*	5-39	***	***
Same Provider Before Medicaid	5-20	NS	NS	5-40	NS	NS

* denotes statistical significance at $p < 0.05$; ** denotes statistical significance at $p < 0.01$; *** denotes statistical significance at $p < 0.001$; NS = not significant; PSM = propensity score matching; DQ = disqualified.

contrast, black enrollees represented only 25% of the race concordant group, but 62% of the discordant group. With the exception of the small number of Asian enrollees who were equally represented in both the concordant and discordant groups, the proportion of enrollees in each of the remaining race/ethnicity categories was greater in the race discordant group compared to the concordant group. These observations may be explained by examining Table 5-42 and Table 5-43, which demonstrate that nearly one-half (49.6%) of the respondents in the race concordance matched data set were white while 43.4% of this group was black. Meanwhile, almost two-thirds of the providers for this group were white, 19.7% were black, and 8.7% were Asian/Pacific Islander/Native

Table 5-42: Frequency Distribution of Enrollee Race/Ethnicity in the Race Concordant Matched Group.

Race/ethnicity (enrollee)	Respondents Matched for Race Concordance	
White	1,117	49.6%
Black	977	43.4%
Asian/ Pacific Islander/Native Hawaiian	10	0.4%
Native American/Alaska Native	77	3.4%
Latino/Caribbean/South American	26	1.2%
Other	45	2.0%
n =	2,252	

Table 5-43: Frequency Distribution of Provider Race/Ethnicity in the Race Concordant Matched Group.

Race/ethnicity (provider)	Respondents Matched for Race Concordance	
White	1,485	65.9%
Black	444	19.7%
Asian/ Pacific Islander/Native Hawaiian	195	8.7%
Native American/Alaska Native	49	2.2%
Latino/Caribbean/South American	23	1.0%
Other	56	2.5%
n =	2,252	

Hawaiian. The large proportion of white providers in this set of data likely accounts for the large proportion of race concordant whites among respondents. However, it should be noted that it is unclear from the available data as to whether or not the racial mix of providers that appears in Table 5-43 is representative of the at-large CCNC provider community.

A second cross-tabulation in this group that was statistically significant was the relationship between the provider's race/ethnicity and race concordance (see Table 5-18). The proportion of both black and white providers in the race concordant group was greater than that in the race discordant group (74% vs. 58% for white providers and 25% vs. 15% for black providers), but the situation was reversed for each of the other categories of race/ethnicity. This, too, is probably attributable to the combination of large proportions of white and black enrollees and providers relative to the other types of race/ethnicity in the data set.

A third significant relationship in this group involved the relationship between provider gender and race concordance (see Table 5-19). The proportion of male providers among the race concordant group in the matched subsample was slightly higher at 58.8% compared to 54.5% in the discordant group, but this small difference provided sufficient variation to achieve statistical significance. The likely explanation for the high proportion of male providers in both the race concordant and race discordant groups is the relatively large proportion overall of male providers in the matched data subsample. Table 5-44 demonstrates that there were 338 more male providers than female providers in the data set, a difference that translates to 13.2 percentage points.

Table 5-44: Frequency Distribution of Provider Gender in the Race Concordant Matched Group.

Gender, provider	Respondents Matched for Race Concordance	
Female	974	43.4%
Male	1,270	56.6%
n =	2,244	

feature of this relationship was the large proportion of enrollees in the Piedmont region (67.5%) and in the Tidewater region (7.6%) who were race concordant compared to 57.9% and 4.8%, respectively, in the race discordant group. This observation may be explained by Table 5-45, which tabulates the breakdown of enrollees and their providers in each region by their race/ethnicity.[34] For example, the Tidal region is characterized by a larger proportion of white enrollees compared to the other regions and also featured one of the largest proportions of white providers for respondents among all regions. Additionally, the Piedmont region had relatively large proportions of black enrollees and black providers who may have been race concordant. Another distinct feature of the relationship between region and race concordance was the relatively large proportion of race discordant subjects compared to race concordant subjects that occurred among enrollees of the Coastal Plain. This appears to be explained by the relatively small proportions of white enrollees and minority providers juxtaposed with large proportions of white providers and minority enrollees. However, it should be noted that it is unclear from the available data as to whether or not the racial mix of providers that appears in Table 5-45 is representative of the entire body of providers in the various regions.

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[34] Due to the large proportion of cells with expected counts less than 5, Table 5-45 must be interpreted strictly as an adjunct source of useful information that enhances the reader's understanding of the relationship between region and race concordance. It cannot legitimately be cited as an independent source of statistical variation between the variables (region and enrollee (provider) race/ethnicity).

Table 5-45: Frequency Distributions of Enrollees and Providers by Region and Race/Ethnicity in the Race Concordant Matched Group.

Region	White	Black	Asian/ Pacific Islander/ Native Hawaiian	Native American	Latino/ Caribbean/ South American	Other	Total
Mount enrollee	56	24	1	5	2	10	98
	57.1%	24.5%	1.0%	5.1%	2.0%	10.2%	100%
Mount provider	*77*	*5*	*10*	*0*	*2*	*4*	*98*
	78.6%	*5.1%*	*10.2%*	*0.0%*	*2.0%*	*4.1%*	*100%*
Pied enrollee	745	613	4	9	20	21	1,412
	52.8%	43.4%	0.3%	0.6%	1.4%	1.5%	100%
Pied provider	*962*	*282*	*114*	*16*	*12*	*26*	*1,412*
	68.1%	*20.0%*	*8.1%*	*1.1%*	*0.8%*	*1.8%*	*100%*
Coast enrollee	232	293	4	59	4	10	602
	38.5%	48.7%	0.7%	9.8%	0.7%	1.7%	100%
Coast provider	*342*	*139*	*59*	*32*	*8*	*22*	*602*
	56.8%	*23.1%*	*9.8%*	*5.3%*	*1.3%*	*3.7%*	*100%*
Tidal enrollee	84	47	1	4	0	4	140
	60.0%	33.6%	0.7%	2.9%	0.0%	2.9%	100%
Tidal provider	*104*	*18*	*12*	*1*	*1*	*4*	*140*
	74.3%	*12.9%*	*8.6%*	*0.7%*	*0.7%*	*2.9%*	*100%*
total enrollee	1,117	977	10	77	26	45	2,252
	49.6%	43.4%	0.4%	3.4%	1.2%	2.0%	100%
total provider	*1,485*	*444*	*195*	*49*	*23*	*56*	*2,252*
	65.9%	*19.7%*	*8.7%*	*2.2%*	*1.0%*	*2.5%*	*100%*

The fifth significant bivariate relationship involving individuals matched on their probability of being race concordant is the relationship between the enrollee's care network and race concordance (see Table 5-1). Three care networks, Community Health Partners (a1003), Carolina Community Health Partnership (a1010), and the Southern Piedmont Community Care Plans (a2003) networks, had significantly higher proportions of enrollees who were race concordant. Conversely, four networks in this subsample, Access II Care of Western North Carolina (a1007), Community Care of Wake/Johnston Counties (a1011), Carolina Collaborative Community Care (a1013), and the Community

Table 5-46: Percentage Distribution of Enrollees and Providers by Care Network and Race/Ethnicity in the Race Concordant Matched Group

Network	White	Black	Asian/ Pacific Islander/ Native Hawaiian	Native American	Latino/ Caribbean/ South American	Other	Total (n)
a1003 enrollee	77.3%	19.8%	0.0%	0.5%	0.5%	1.9%	207
a1003 provider	*63.8%*	*26.6%*	*6.3%*	*1.0%*	*0.5%*	*1.9%*	*207*
a1004 enrollee	29.8%	68.5%	0.6%	0.0%	0.0%	1.2%	168
a1004 provider	*56.5%*	*29.2%*	*12.5%*	*0.6%*	*0.6%*	*0.6%*	*168*
a1006 enrollee	54.9%	25.0%	0.6%	15.9%	2.4%	1.2%	164
a1006 provider	*69.5%*	*6.1%*	*12.8%*	*7.9%*	*1.2%*	*2.4%*	*164*
a1007 enrollee	28.6%	37.1%	0.0%	11.4%	5.7%	17.1%	35
a1007 provider	*74.3%*	*8.6%*	*8.6%*	*0.0%*	*2.9%*	*5.7%*	*35*
a1008 enrollee	50.7%	44.4%	0.7%	1.4%	0.0%	2.8%	144
a1008 provider	*81.9%*	*10.4%*	*4.9%*	*0.7%*	*0.0%*	*2.1%*	*144*
a1009 enrollee	27.6%	65.9%	1.2%	1.2%	2.9%	1.2%	170
a1009 provider	*48.2%*	*35.3%*	*10.6%*	*1.2%*	*1.8%*	*2.9%*	*170*
a1010 enrollee	63.5%	32.4%	0.0%	1.4%	0.7%	2.0%	148
a1010 provider	*78.4%*	*13.5%*	*6.1%*	*0.0%*	*0.7%*	*1.4%*	*148*
a1011 enrollee	44.3%	50.9%	0.0%	0.0%	2.4%	2.4%	167
a1011 provider	*56.9%*	*21.0%*	*13.2%*	*2.4%*	*1.2%*	*5.4%*	*167*
a1012 enrollee	50.3%	45.8%	0.7%	0.0%	1.3%	2.0%	153
a1012 provider	*75.8%*	*9.2%*	*10.5%*	*2.0%*	*1.3%*	*1.3%*	*153*
a1013 enrollee	41.4%	47.9%	1.2%	5.3%	1.2%	3.0%	169
a1013 provider	*37.3%*	*30.8%*	*18.9%*	*6.5%*	*3.6%*	*3.0%*	*169*
a2000 enrollee	32.8%	62.9%	0.0%	1.8%	0.0%	2.4%	170
a2000 provider	*75.3%*	*17.6%*	*2.4%*	*0.0%*	*0.6%*	*4.1%*	*170*
a2003 enrollee	67.4%	30.6%	0.0%	0.0%	2.1%	0.0%	193
a2003 provider	*78.8%*	*16.6%*	*4.1%*	*0.0%*	*0.0%*	*0.5%*	*193*
a2004 enrollee	56.1%	38.9%	0.6%	2.2%	0.0%	2.2%	180
a2004 provider	*70.0%*	*15.0%*	*8.9%*	*1.7%*	*1.1%*	*3.3%*	*180*
a2005 enrollee	46.2%	38.6%	0.5%	13.0%	0.5%	1.1%	184
a2005 provider	*66.3%*	*22.8%*	*2.7%*	*4.9%*	*0.5%*	*2.7%*	*184*
total enrollee	49.6%	43.4%	0.4%	3.4%	1.2%	2.0%	2,252
total provider	*65.9%*	*19.7%*	*8.7%*	*2.2%*	*1.0%*	*2.5%*	*2,252*

Care Plan of Eastern North Carolina (a2000), had significantly higher proportions of enrollees who were race discordant. One component of this relationship, race concordance, may be partially explained by Table 5-46, which examines the percentage distribution of enrollee and provider race when cross-tabulated with care network.[35] The three care networks with significantly higher proportions of enrollees who were race concordant shared the common characteristic of threshold proportions of 70% and 60% in one category or the other among white enrollees and white providers. For example, whites constituted 77.3% of the enrollees and 63.8% of the providers in the Community Health Partners (a1003) network, 63.5% of the enrollees and 78.4% of the providers in the Carolina Community Health Partnership (a1010), and 67.4% of the enrollees and 78.8% of the providers in the Southern Piedmont Community Care Plans (a2003) networks. Again, it is unclear from the available data as to whether or not the racial mix of providers that appears in Table 5-46 is representative of the all providers in the various care networks.

The bivariate relationship between race concordance and the enrollee's chronic disease status, which was measured by the chronicity variable, was also statistically significant (see table 5-11). A larger proportion of enrollees in the race concordant group (approximately 44%) reported that they had a chronic condition that impaired their quality of life compared to enrollees in the race discordant group (approximately 38%). By contrast, a smaller proportion of enrollees in the race discordant group (56%) reported having such a condition compared to enrollees in the race discordant group (62%). Table 5-47 interestingly reveals that only 41.5% of non-white enrollees claimed that they had a chronic condition, whereas 58.5% of white enrollees made this claim. Coupled with the

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[35] Due to the large proportion of cells with expected counts less than 5, Table 5-46 must be interpreted strictly as an adjunct source of useful information that enhances the reader's understanding of the relationship between region and race concordance. It cannot legitimately be cited as an independent source of statistical variation between the variables (care network and enrollee (provider) race/ethnicity).

fact that whites were more race-concordant in this subsample, it may not be surprising that a chronic condition was reported in larger numbers in the race concordant group.

Table 5-47: Enrollee Chronicity by Enrollee Race/Ethnicity

Chronicity	White	Black	Asian/ Pacific Islander/ Native Hawaiian	Native American	Latino/ Caribbean/ South American	Other	Total
Yes	531 *58.5%*	307 *33.8%*	3 *0.3%*	34 *3.7%*	10 *1.1%*	22 *2.4%*	907
No	579 *43.5%*	662 *49.8%*	7 *0.5%*	43 *3.2%*	16 *1.2%*	23 *1.7%*	1,330
n =	1,110	969	10	77	26	45	2,237

The final significant bivariate relationship among enrollees matched on their probability of being race concordant was the relationship between primary care utilization and race concordance (see Table 5-13). The distinguishing features of this relationship consisted of a higher proportion of enrollees who visited their primary care provider one time in the race discordant group (15.3%) compared to the race concordant group (11.4%) and, conversely, the proportion of enrollees who visited their primary care provider ten or more times was greater among enrollees in the race concordant group (15.1%) compared to those in the race discordant group (11.5%). This latter observation may be related to the larger percentages of enrollees in the race concordant group who claim that they had a chronic condition.

Among the bivariate relationships that included gender concordance as one of the study variables, three achieved statistical significance among the subsample of subjects matched on their probability of inclusion in the gender concordant group. The first of these was summarized in Table 5-23 that involves the relationship between the enrollee's gender and gender concordance. This relationship was characterized by a larger proportion of male enrollees who were gender concordant (22.6%) compared to those males who were gender discordant (15.4%). By contrast, a greater share of female enrollees was gender discordant (84.6%) than was gender concordant (77.4%). This is probably a function of the patient-provider gender mismatch where 81.0% of the respondents were female, but only 46.4% of the providers associated with these respondents were female (see Table 5-48 and Table 5-49).

Table 5-48: Frequency Distribution of Enrollee Gender in the Gender Concordant Matched Group

Gender, enrollee	Respondents Matched for Gender Concordance	
Female	2,010	81.0%
Male	472	19.0%
n =	2,482	

Table 5-49: Frequency Distribution of Provider Gender in the Gender Concordant Matched Group

Gender, provider	Respondents Matched for Gender Concordance	
Female	1,151	46.4%
Male	1,331	53.6%
n =	2,482	

The second significant bivariate relationship involving enrollees matched on their probability of being gender concordant was the relationship between provider gender and gender concordance (see Table 5-39). Among gender concordant respondents, 77.4% of enrollees had female providers while 22.6% had male providers. The situation was reversed in the gender discordant group, where only 15.4% of enrollees had female providers and 84.6% had male providers. A possible explanation for this finding was the disproportionate number of female enrollees in the subsample of matched subjects coupled with the relatively large percentage of male providers (see Table 5-48 and Table 5-49).

The third and final significant bivariate relationship in this group is the relationship between the enrollee's disease management status and gender concordance (see Table 5-32). This relationship's distinguishing characteristic was the relatively large proportion of enrollees in the asthma disease management program who were gender discordant (3.7%) compared to those who were gender concordant (1.9%). By contrast, the proportion of enrollees who were not enrolled in a disease management program was greater in the gender concordant group (82.3%) compared to the gender discordant group (79.7%). An examination of Table 5-50 reveals that females were enrolled in the asthma disease management program in greater numbers than males. When this observation is combined with the previously reported finding that females were represented in the gender discordant group in large numbers, one can make the connection between enrollment in the asthma program and gender discordance.

Table 5-50: Enrollee Disease Management Program Status by Enrollee Gender

Enrollee Disease Management Program Status	Male		Female	
Asthma	9	1.9%	60	3.0%
Asthma and Diabetes	4	0.8%	15	0.7%
Diabetes	71	15.0%	313	15.6%
None	388	82.2%	1,622	80.7%
n =	472		2,010	

Chapter Five clarified race and gender concordance by summarizing a number of important bivariate relationships that were analyzed using two subsamples of data. The first subsample consisted of individuals enrolled in North Carolina Medicaid's primary care case management who were matched on their probability of being race concordant; the second consisted of enrollees who were matched on their probability of being gender concordant. Chapter Six will analyze the same matched subsamples of data, but the focus will turn to using regression techniques to make causal inferences.

CHAPTER 6. CAUSAL ANALYSIS OF HEALTH UTILIZATION

Chapter Six explores the causal analysis of health utilization by examining the regression models associated with each of the five utilization measures functioning as dependent variables that were introduced in Chapter Four. The chapter is organized in a manner similar to Chapter Five, with the regression models associated with the subsample of subjects matched on their propensity for inclusion in the race concordant group appearing first followed by regression models relating to subjects matched on their propensity for inclusion in the gender concordant group. Two regression models appear for each of the utilization measures in the form of summary tables. In the case of the OLS regression models, the first table displays all of the independent variables included in the initial regression run with their respective regression coefficients, standard errors, standardized regression coefficients (or betas), t-test scores, significance levels, tolerance, and variance inflation factor statistics. In the case of the logistic regression models, this table displays all independent variables, the regression coefficients, standard errors, Wald statistic, significance levels, exponentiated coefficients, and the 95% confidence interval for the exponentiated coefficients. The rationale for presenting this initial table is to give the reader a sense of how each variable within the total pool of independent variables impacted the dependent variable in terms of the direction and magnitude of the relationship and its statistical significance. By contrast, the second table displays the same collection of analytical statistics, but the statistics are coupled with only those independent variables in the final regression run that achieved statistical significance at the $p \leq 0.05$ level after invoking the backward elimination method of selecting variables (see section 4.7 of Chapter Four).

At this juncture, it is important to reiterate the qualifications associated with use of the term “causal.” To claim that one variable causes another requires that there is a theoretical basis for such a relationship and that the variables covary with each other. Additionally, there must be a time order of the variables such that the independent variable precedes the dependent variable and other variables must be ruled out as possible causes of the dependent variable (O’Sullivan and Rassel, 1995).

The study’s design and the underlying theoretical model present several challenges with respect to complying with the established criteria for asserting causal inference. Typically, most cross-sectional studies identify associations between variables that warrant additional study, but fail to meet the threshold criteria for asserting causality. However, some cross-sectional studies are designed to incorporate sophisticated techniques that provide strong evidence of causal links between the variables. In this study, the propensity score matching methodology introduced in section 4.5 of Chapter Four is an attempt to fortify the cross-sectional design and to facilitate the expression of causal inference. Another possible pitfall is the bidirectional nature of some of the relationships described by Andersen’s model of health utilization, which may compromise the time order relationship between the variables in some circumstances.

Before examining the regression models, it is valuable to recall that the goal of the research is to use the Andersen framework to address the research questions established in Chapter Three. The variables analyzed in the dissertation fall into one of six major categories specified by Andersen's Emerging Model – Phase Four. These categories include the health care system, the predisposing characteristics, the enabling resources, perceived health status, evaluated health status, and the use of health service. Also, recall that the research questions formulated in Chapter Three included:

- How does racial concordance between enrollee and primary care provider impact the utilization of primary care services?
- How does gender concordance between enrollee and primary care provider impact the utilization of primary care services?
- How does racial concordance between enrollee and primary care provider impact the utilization of specialty care services?
- How does gender concordance between enrollee and primary care provider impact the utilization of specialty care services?
- How does racial concordance between enrollee and primary care provider impact the utilization of emergency care services?
- How does gender concordance between enrollee and primary care provider impact the utilization of emergency care services?
- How does racial concordance between enrollee and primary care provider impact the utilization of inpatient care services?
- How does gender concordance between enrollee and primary care provider impact the utilization of inpatient care services?
- How does racial concordance between enrollee and primary care provider impact the utilization of prescription drugs?
- How does gender concordance between enrollee and primary care provider impact the utilization of prescription drugs?
- How effective is the Andersen model at explaining the various types of health utilization?
- What impact do the other variables in the Andersen framework have on the utilization of health care?
- Does membership in a racial or ethnic subpopulation affect the prevalence of patient-provider concordance?
- What impact does enrollment in a specific care network have on the utilization of health services?
- How do the concordant and discordant groups compare to one another?

This momentary reorientation to the central task offers vital pretext to the causal analysis that appears in the remaining sections of Chapter Six.

6.1 Regression Models Associated with Subjects Matched for Race Concordance

Section 6.1 consists of the regression models for each of the five utilization measures depicted by Smith's adaptation to Andersen's model of health service utilization – primary care, specialty care, emergency care, inpatient care, and prescription drugs – for those survey respondents matched on their propensity to be included in the race concordant group. Table 6-1 presents the results of the impact of all model predictors on the number of primary care visits respondents made in the 6 months prior to being surveyed. This "first-pass" at explaining primary care utilization had an adjusted $R^2 = 0.128$ and was characterized by a number of predictor variables with VIF values in excess of 3.0, likely pointing to the presence of multicollinearity.

Table 6-2 displays a more streamlined regression model for the utilization of primary care services among race-concordant matched subjects, consisting only of the predictor variables that achieved statistical significance. There was no evidence of multicollinearity in the final regression model and the model explained approximately13% of the variation in primary care utilization.

Three independent variables categorized as predisposing characteristics by Smith's adaptation to Andersen's model of health utilization – race, gender, and gender concordance – achieved statistical significance in this model. When controlled for other variables, blacks and Asians had significantly fewer primary care visits compared to whites. The difference was particularly pronounced among Asians, with inclusion in this group associated with 2.4 fewer primary care visits per enrollee compared to whites. Gender concordance was also associated with fewer primary care visits as gender concordant beneficiaries had about 0.29 fewer visits compared to gender discordant enrollees. On the other hand, females had approximately 0.75 more primary care visits

Table 6-1: Initial Regression Model for Primary Care Utilization in Race Concordance-Matched Subsample

Predictor	B	SE	B	T	Sig	Tol	VIF	*Predictor*	B	SE	β	t	Sig	Tol	VIF
Race concordance	0.161	0.163	0.026	0.986	0.324	0.716	1.396	*Coastal Pl*	0.679	0.333	0.096	2.037	0.042	0.220	4.548
Gender concordance	-0.246	0.144	-0.039	-1.703	0.089	0.918	1.089	*Tidal*	0.146	0.520	0.011	0.282	0.778	0.306	3.271
General MD	0.101	0.211	0.016	0.480	0.631	0.470	2.127	*A1003*	0.212	0.416	0.020	0.510	0.610	0.322	3.102
Specialist MD	0.571	0.294	0.055	1.943	0.052	0.612	1.635	*A1004*	-0.150	0.427	-0.013	-0.351	0.725	0.376	2.656
Physician Assistant	0.482	0.331	0.040	1.456	0.146	0.659	1.517	*A1007*	0.039	0.733	0.001	0.053	0.958	0.613	1.630
Nurse	0.318	0.435	0.018	0.731	0.465	0.795	1.258	*A1008*	-0.418	0.439	-0.033	-0.952	0.341	0.421	2.373
Black	-0.365	0.176	-0.058	-2.075	0.038	0.637	1.571	*A1009*	-0.230	0.444	-0.019	-0.518	0.605	0.358	2.793
Asian	-1.867	1.028	-0.043	-1.816	0.070	0.892	1.121	*A1010*	0.102	0.441	0.008	0.231	0.818	0.417	2.396
Native American	0.019	0.427	0.001	0.045	0.964	0.774	1.292	*A1011*	-0.777	0.413	-0.066	-1.880	0.060	0.403	2.484
Latino	0.737	0.989	0.025	0.745	0.456	0.437	2.290	*A1012*	-0.295	0.443	-0.024	-0.666	0.505	0.378	2.643
Other Race	0.499	0.496	0.024	1.006	0.314	0.877	1.140	*A1013*	-1.021	0.434	-0.085	-2.353	0.019	0.375	2.665
Female	0.753	0.172	0.103	4.391	0.000	0.901	1.110	*A2000*	-0.426	0.425	-0.036	-1.002	0.317	0.378	2.648
Spanish	-1.379	1.032	-0.044	-1.336	0.182	0.445	2.248	*A2003*	-0.157	0.410	-0.014	-0.384	0.701	0.357	2.803
Other Language	-0.847	1.257	-0.016	-0.674	0.500	0.894	1.119	*A2004*	0.259	0.477	0.023	0.544	0.587	0.264	3.789
Age	0.023	0.035	0.101	0.656	0.512	0.021	48.261	*A2005*	-0.115	0.384	-0.010	-0.298	0.766	0.468	2.139
Age-squared	0.000	0.000	-0.113	-0.737	0.461	0.021	47.409	*Mnth pract*	-0.002	0.004	-0.011	-0.450	0.653	0.899	1.112
Some high school	-0.113	0.253	-0.016	-0.446	0.656	0.376	2.657	*Asthma*	0.361	0.458	0.018	0.788	0.431	0.961	1.041
High school grad/GED	-0.098	0.250	-0.015	-0.392	0.695	0.332	3.009	*Diabetes*	0.267	0.198	0.032	1.345	0.179	0.893	1.120
Some college	-0.169	0.272	-0.022	-0.621	0.534	0.377	2.653	*A & D*	1.763	0.684	0.058	2.578	0.010	0.960	1.041
4-yr college degree	-0.321	0.445	-0.019	-0.721	0.471	0.736	1.360	*Health*	-0.903	0.086	-0.277	-10.494	0.000	0.705	1.418
> 4-yr college degree	-0.869	0.967	-0.021	-0.898	0.369	0.907	1.102	*Satisfaction*	0.029	0.093	0.007	0.307	0.759	0.871	1.148
Mixed	0.041	0.221	0.006	0.187	0.851	0.524	1.909	*Trust*	-0.036	0.095	-0.009	-0.378	0.705	0.829	1.207
Rural	-0.173	0.261	-0.019	-0.663	0.507	0.604	1.656	*Small*	0.001	0.393	0.000	0.002	0.998	0.589	1.697
Mountains	-0.501	0.512	-0.032	-0.979	0.328	0.455	2.197	*No problem*	-0.662	0.276	-0.072	-2.395	0.017	0.545	1.836
								Constant	4.373	0.870		5.028	0.000		
Adjusted R^2	0.128														

Table 6-2: Final Regression Model for Primary Care Utilization in Race Concordance-Matched Subsample

Predictor	B	S.E.	Beta	T	Sig.	Tolerance	VIF
Constant	4.839	0.261		18.545	0.000		
Gender concordance	-0.287	0.140	-0.046	-2.043	0.041	0.965	1.037
Black	-0.537	0.144	-0.085	-3.724	0.000	0.939	1.064
Asian	-2.399	0.971	-0.055	-2.471	0.014	0.994	1.006
Female	0.753	0.166	0.103	4.536	0.000	0.957	1.045
Coastal Plain	0.636	0.177	0.090	3.599	0.000	0.778	1.286
A1011	-0.689	0.263	-0.058	-2.622	0.009	0.989	1.011
A1013	-0.834	0.301	-0.070	-2.773	0.006	0.776	1.288
Asthma and Diabetes	1.641	0.671	0.054	2.446	0.015	0.993	1.007
Health Status	-0.930	0.075	-0.286	-12.357	0.000	0.916	1.091
Not a problem	-0.666	0.206	-0.072	-3.227	0.001	0.971	1.030
Adjusted R^2	0.133						

than their male counterparts.

Two independent variables classified as enabling resources in the Andersen framework achieved statistical significance in the final regression run. Residents of the Coastal Plain region of North Carolina were found to experience approximately 0.6 more primary care visits compared to residents in the Piedmont regions. By contrast, individuals who had no problem accessing specialty care – the model's proxy measure of access – had approximately 0.7 fewer primary care visits compared to respondents who encountered big problems accessing specialty care.

The health care system is modeled by the enrollee's care network in Smith's adaptation to the Andersen model. Enrollees in two care networks - the Community Care of Wake/Johnston Counties (a1011) and the Carolina Collaborative Community Care (a1013) networks – had fewer primary care visits compared to enrollees in the AccessCare Network, the lone care network not anchored to a geographical location. Individuals in the Community Care of Wake/Johnston Counties network were found to experience about 0.7 fewer visits per enrollee and those in the Carolina Collaborative Care Network had about 0.8 fewer visits compared to AccessCare Network enrollees.

Perceived health status within the Andersen model is represented in Smith's adaptation by the health status factor score derived from the factor analysis explained in Chapter 4. The enrollee's health status was highly significant and resulted in fewer primary care visits if health status was good.

The final variable that achieved statistical significance in the regression model was the variable measuring the impact of enrollment in the Asthma and Diabetes disease management program, which is classified within the Andersen framework as one representing evaluated health status. Beneficiaries who were enrolled in the Asthma and Diabetes disease management program had approximately 1.6 more primary care visits compared to beneficiaries not enrolled in a disease management program.

Table 6-3 displays the results of the impact of all predictor variables on the number of specialty care visits respondents made in the 6 months prior to being surveyed. This model explained 13.8% of the variation in the number of specialty care visits and, as was the case for primary care visits in Table 6-1, was characterized by a number of variables with VIF scores in excess of 3.0.

Table 6-4 summarizes the final regression run of independent variables that achieved statistical significance at the $p \leq 0.05$ level in predicting the number of specialty care visits. The model explained 14.1% of the variation in the number of visits to specialists and there was no indication of multicollinearity.

Two independent variables categorized as predisposing characteristics by Smith's

Table 6-3: Initial Regression Model for Specialty Care Utilization in Race Concordance-Matched Subsample

Predictor	B	SE	β	t	Sig	Tol	VIF	*Predictor*	B	SE	β	t	Sig	Tol	VIF
Race concordance	0.104	0.146	0.018	0.713	0.476	0.720	1.389	*Coastal Pl*	0.468	0.298	0.074	1.570	0.117	0.220	4.542
Gender concordance	-0.082	0.129	-0.015	-0.634	0.526	0.919	1.088	*Tidal*	0.507	0.470	0.043	1.080	0.280	0.308	3.247
General MD	-0.039	0.188	-0.007	-0.205	0.838	0.473	2.116	*A1003*	0.925	0.373	0.096	2.477	0.013	0.322	3.105
Specialist MD	0.576	0.262	0.062	2.198	0.028	0.614	1.629	*A1004*	0.414	0.382	0.039	1.084	0.278	0.375	2.665
Physician Assistant	-0.106	0.295	-0.010	-0.359	0.720	0.658	1.520	*A1007*	0.829	0.661	0.035	1.254	0.210	0.611	1.636
Nurse	0.659	0.388	0.042	1.697	0.090	0.795	1.257	*A1008*	0.289	0.394	0.025	0.732	0.464	0.420	2.382
Black	-0.275	0.157	-0.048	-1.750	0.080	0.639	1.565	*A1009*	-0.342	0.397	-0.032	-0.861	0.390	0.357	2.801
Asian	-0.486	0.925	-0.012	-0.525	0.600	0.892	1.121	*A1010*	0.614	0.393	0.053	1.562	0.119	0.417	2.397
Native American	-0.067	0.381	-0.004	-0.175	0.861	0.773	1.294	*A1011*	0.001	0.372	0.000	0.004	0.997	0.404	2.475
Latino	-0.987	0.892	-0.036	-1.106	0.269	0.457	2.187	*A1012*	0.324	0.399	0.029	0.812	0.417	0.383	2.610
Other Race	-0.131	0.451	-0.007	-0.291	0.771	0.880	1.136	*A1013*	-0.078	0.391	-0.007	-0.199	0.843	0.373	2.681
Female	0.192	0.154	0.029	1.246	0.213	0.900	1.111	*A2000*	-0.266	0.382	-0.025	-0.697	0.486	0.374	2.676
Spanish	1.160	0.935	0.040	1.241	0.215	0.465	2.152	*A2003*	0.921	0.367	0.092	2.507	0.012	0.356	2.810
Other Language	1.169	1.131	0.024	1.034	0.301	0.894	1.118	*A2004*	-0.222	0.432	-0.022	-0.514	0.607	0.263	3.797
Age	0.055	0.031	0.267	1.748	0.081	0.021	48.262	*A2005*	0.463	0.343	0.044	1.350	0.177	0.456	2.191
Age-squared	0.000	0.000	-0.265	-1.747	0.081	0.021	47.435	*Mnth pract*	-0.006	0.003	-0.041	-1.773	0.076	0.897	1.114
Some high school	0.469	0.228	0.074	2.060	0.040	0.373	2.679	*Asthma*	0.939	0.412	0.051	2.280	0.023	0.961	1.040
High school grad/GED	0.472	0.225	0.080	2.099	0.036	0.330	3.034	*Diabetes*	0.709	0.179	0.093	3.968	0.000	0.888	1.126
Some college	0.389	0.245	0.057	1.590	0.112	0.376	2.661	*A & D*	1.199	0.615	0.044	1.949	0.051	0.961	1.041
4-yr college degree	0.670	0.401	0.043	1.672	0.095	0.735	1.361	*Health*	-0.805	0.077	-0.274	-10.445	0.000	0.705	1.419
> 4-yr college degree	0.759	0.870	0.020	0.872	0.383	0.908	1.102	*Satisfaction*	0.101	0.083	0.029	1.213	0.225	0.874	1.144
Mixed	0.024	0.198	0.004	0.120	0.904	0.523	1.912	*Trust*	-0.006	0.085	-0.002	-0.073	0.942	0.832	1.203
Rural	-0.122	0.234	-0.015	-0.521	0.602	0.603	1.657	*Small*	-0.022	0.353	-0.002	-0.062	0.951	0.588	1.701
Mountains	0.470	0.457	0.033	1.028	0.304	0.461	2.167	*No problem*	-0.785	0.248	-0.094	-3.171	0.002	0.544	1.837
								Constant	0.792	0.781		1.1015	0.310		
Adjusted R^2	0.138														

Table 6-4: Final Regression Model for Specialty Care Utilization in Race-Concordance Matched Subsample

Predictor	B	S.E.	Beta	T	Sig.	Tolerance	VIF
Constant	2.520	0.190		13.227	0.000		
Specialist MD	0.661	0.206	0.071	3.207	0.001	0.992	1.008
Nurse	0.735	0.348	0.047	2.113	0.035	0.987	1.013
Black	-0.354	0.132	-0.062	-2.688	0.007	0.904	1.106
A1003	0.605	0.217	0.063	2.792	0.005	0.954	1.048
A1009	-0.556	0.241	-0.051	-2.307	0.021	0.968	1.033
A2003	0.574	0.222	0.058	2.581	0.010	0.969	1.032
Asthma	0.832	0.401	0.046	2.075	0.038	0.989	1.012
Diabetes	0.640	0.172	0.083	3.717	0.000	0.956	1.046
Asthma and Diabetes	1.359	0.606	0.050	2.241	0.025	0.986	1.014
Health Status	-0.795	0.068	-0.270	-11.631	0.000	0.891	1.123
Not a problem	-0.831	0.185	-0.100	-4.490	0.000	0.968	1.033
Adjusted R^2	0.139						

adaptation to Andersen's model of health utilization – race and type of provider – achieved statistical significance in the specialty care utilization regression model. Respondents who claimed that their personal doctor was a specialist or a nurse were found to have more visits to specialists (0.66 and 0.74 more specialty care visits, respectively) compared to respondents who reported that they did not have one person they considered as their personal provider. Conversely, black enrollees used approximately 0.35 less specialty care visits compared to white enrollees.

Among the independent variables classified as enabling resources in the Andersen framework, one achieved statistical significance in the final regression run. Individuals who experienced no problems getting referrals to specialty care had 0.8 fewer specialty care visits than those individuals who experienced a big problem getting this type of referral.

The health care system in the Andersen framework is modeled in Smith's adaptation by the enrollee's care network. Compared to individuals enrolled in the AccessCare Network, enrollees in the Community Health Partners (a1003) and Southern Piedmont Community Care Plan (a2003) networks were found to have more specialty care visits (0.61 and 0.57 visits, respectively), while individuals enrolled in Community Care Partners of Greater Mecklenburg (a1009) had 0.56 fewer visits to specialists.

Perceived health status within the Andersen model is represented in Smith's adaptation by the health status factor score. As was the case with primary care utilization, individuals with better self-reported health status had fewer visits to specialists. This variable was highly significant among the model's independent variables.

Evaluated health status in the Andersen framework is measured by variability in the disease management program variable. Individuals enrolled in each of the three disease management programs – asthma, diabetes, and asthma with diabetes – were found to experience an increased number of specialty care visits compared to those enrollees who were not enrolled in a disease management program. Individuals enrolled in the asthma program had 0.8 more specialty care visits compared to individuals not enrolled in a disease management program while individuals enrolled in the diabetes program had 0.64 more specialty care visits when compared to the same group. Individuals in the asthma and diabetes program had approximately 1.4 more specialty care visits compared to those individuals not enrolled in a formal disease management program.

Table 6-5 provides an extensive view of the impact of each of the study's independent variables on the utilization of emergency care. Six variables in this model have VIF scores greater than 3.0, suggesting the presence of multicollinearity.

Approximately 8.4% of the variation in the number of emergency care visits was explained by the independent variables in the model.

Table 6-6 summarizes the model of emergency care utilization after a number of insignificant variables have been removed by the backward elimination method. This model explained 8.1% of the variation in the number of emergency care visits and there was no indication of multicollinearity.

Four variables classified as predisposing characteristics with regard to health service utilization – race, age, education, and type of provider – were significant predictors of emergency care utilization. When controlled for all other variables in the model, black enrollees and individuals with some high school education used more emergency care services than whites and those with an 8th-grade education or less, respectively. In the case of black enrollees, they experienced an additional 0.24 emergency care visits compared to whites. Similarly, individuals with some high school education were found to have an additional 0.28 emergency care visits compared to individuals with less than an 8th grade education. Conversely, individuals who claimed that general doctors were their personal doctors used 0.19 fewer emergency care visits than those who said they did not have one person who they considered as their personal provider. The enrollee's age was negatively related to emergency care utilization, with the number of emergency care visits decreasing by 0.1 visits for every 10-year increase in the respondent's age. A fifth predisposing characteristic variable, gender concordance, was the final variable excluded in the regression's backward elimination process as its statistical significance was just over the $p \leq 0.05$ threshold required for model inclusion.

Table 6-5: Initial Regression Model for Emergency Care Utilization in Race-Concordance Matched Subsample

Predictor	B	SE	B	T	Sig	Tol	VIF	*Predictor*	B	SE	β	T	Sig	Tol	VIF
Race concordance	-0.049	0.090	-0.014	-0.541	0.588	0.719	1.392	*Coastal Pl*	-0.122	0.183	-0.032	-0.668	0.504	0.221	4.529
Gender concordance	-0.145	0.080	-0.043	-1.825	0.068	0.917	1.090	*Tidal*	0.012	0.287	0.002	0.040	0.968	0.310	3.225
General MD	-0.376	0.116	-0.107	-3.231	0.001	0.471	2.125	*A1003*	-0.092	0.229	-0.016	-0.400	0.689	0.322	3.106
Specialist MD	-0.202	0.162	-0.036	-1.246	0.213	0.613	1.632	*A1004*	-0.351	0.236	-0.055	-1.490	0.136	0.377	2.653
Physician Assistant	-0.377	0.182	-0.058	-2.070	0.039	0.656	1.523	*A1007*	-0.375	0.406	-0.027	-0.924	0.356	0.613	1.632
Nurse	-0.280	0.239	-0.030	-1.171	0.242	0.794	1.260	*A1008*	-0.140	0.242	-0.020	-0.579	0.562	0.421	2.376
Black	0.265	0.097	0.078	2.738	0.006	0.638	1.569	*A1009*	-0.118	0.245	-0.018	-0.483	0.629	0.359	2.787
Asian	0.788	0.570	0.033	1.382	0.167	0.892	1.121	*A1010*	-0.161	0.242	-0.023	-0.664	0.507	0.418	2.393
Native American	0.229	0.235	0.029	1.144	0.253	0.774	1.292	*A1011*	-0.004	0.228	0.000	-0.018	0.985	0.404	2.475
Latino	0.459	0.548	0.029	0.838	0.402	0.437	2.290	*A1012*	0.015	0.245	0.002	0.062	0.951	0.383	2.613
Other Race	-0.052	0.275	-0.005	-0.190	0.850	0.878	1.139	*A1013*	0.035	0.240	0.005	0.146	0.884	0.377	2.656
Female	0.036	0.095	0.009	0.374	0.708	0.901	1.110	*A2000*	-0.269	0.234	-0.042	-1.148	0.251	0.374	2.671
Spanish	-0.913	0.572	-0.054	-1.596	0.111	0.445	2.248	*A2003*	0.110	0.226	0.018	0.487	0.626	0.357	2.804
Other Language	-1.049	0.696	-0.036	-1.505	0.132	0.894	1.118	*A2004*	-0.356	0.264	-0.059	-1.349	0.178	0.266	3.760
Age	0.006	0.019	0.050	0.318	0.750	0.021	48.384	*A2005*	-0.444	0.211	-0.070	-2.103	0.036	0.458	2.184
Age-squared	0.000	0.000	-0.129	-0.828	0.408	0.021	47.553	*Mnth pract*	0.000	0.002	-0.010	-0.433	0.665	0.898	1.114
Some high school	0.127	0.140	0.034	0.909	0.364	0.374	2.675	*Asthma*	1.381	0.254	0.126	5.446	0.000	0.961	1.040
High school grad/GED	-0.113	0.138	-0.032	-0.815	0.415	0.330	3.030	*Diabetes*	0.506	0.110	0.111	4.613	0.000	0.892	1.121
Some college	-0.289	0.151	-0.071	-1.917	0.055	0.376	2.659	*A & D*	0.841	0.379	0.051	2.219	0.027	0.961	1.041
4-yr college degree	-0.271	0.247	-0.029	-1.099	0.272	0.736	1.359	*Health*	-0.150	0.047	-0.085	-3.156	0.002	0.705	1.419
> 4-yr college degree	-0.794	0.536	-0.035	-1.482	0.139	0.908	1.102	*Satisfaction*	-0.130	0.051	-0.061	-2.522	0.012	0.873	1.146
Mixed	0.142	0.122	0.037	1.167	0.243	0.523	1.913	*Trust*	-0.259	0.053	-0.122	-4.930	0.000	0.830	1.205
Rural	0.310	0.144	0.063	2.159	0.031	0.608	1.645	*Small*	-0.157	0.217	-0.021	-0.723	0.470	0.584	1.711
Mountains	-0.181	0.281	-0.021	-0.645	0.519	0.463	2.159	*No problem*	-0.454	0.153	-0.091	-2.969	0.003	0.540	1.850
								Constant	1.830	0.481		3.806	0.000		
Adjusted R^2	0.084														

Table 6-6: Final Regression Model for Emergency Care Utilization in Race Concordance-Matched Subsample

Predictor	B	S.E.	Beta	T	Sig.	Tolerance	VIF
Constant	1.540	0.180		8.560	0.000		
General MD	-0.188	0.081	-0.053	-2.312	0.021	0.960	1.042
Black	0.240	0.080	0.070	3.006	0.003	0.934	1.071
Age	-0.010	0.003	-0.081	-3.103	0.002	0.749	1.336
Some high school	0.275	0.086	0.073	3.196	0.001	0.987	1.013
A2005	-0.285	0.142	-0.046	-2.007	0.045	0.990	1.010
Asthma	1.364	0.248	0.126	5.505	0.000	0.986	1.015
Diabetes	0.501	0.109	0.110	4.612	0.000	0.910	1.099
Asthma and Diabetes	0.751	0.375	0.046	2.002	0.045	0.982	1.019
Health Status	-0.146	0.046	-0.083	-3.165	0.002	0.746	1.340
Trust	-0.245	0.051	-0.116	-4.783	0.000	0.878	1.139
Satisfaction	-0.153	0.050	-0.072	-3.060	0.002	0.923	1.084
Not a problem	-0.372	0.118	-0.075	-3.137	0.002	0.900	1.111
Adjusted R^2	0.081						

One enabling resource variable, the access proxy, achieved statistical significance in the regression model. Specifically, individuals who had no difficulty getting referred to specialists used 0.37 fewer emergency care visits than those who experienced difficulty getting these referrals.

In terms of the health care system, the care network variable was significant for individuals who received care via the Sandhills Community Care network (a2005). Enrollees in this network had 0.285 fewer emergency care visits than those individuals enrolled in the AccessCare Network (a1006).

Not surprisingly, both perceived and evaluated health status played a role in the number of emergency care visits among the survey respondents. The health factor score that measured the enrollees' perceived health status was negatively related to the number of emergency care visits, indicating that the number of visits was smaller among those with the highest health status factor scores (i.e., those with the best perceived health). By the same token, individuals who were enrolled in each of the three disease management programs experienced more emergency care visits than those who were not formally enrolled in a disease management program. Enrollees in the asthma disease management program used an extra 1.4 additional emergency care visits during the time period compared to individuals not enrolled in a disease management program. Similarly, enrollees in the diabetes disease management program used an additional 0.5 emergency care visits and those enrolled in the asthma and diabetes management program used an additional 0.75 emergency care visits compared to those who were not enrolled in disease management.

In contrast to the observations associated with primary and specialty care utilization within this subsample of survey respondents, the satisfaction and trust factor scores that represent consumer satisfaction within the Andersen framework were significant predictors of emergency care utilization. In the case of both variables, less emergency care use was used among respondents who had high levels of trust and satisfaction in their providers.

Table 6-7 summarizes the initial logistic regression for inpatient care utilization, a dichotomous dependent variable, for the subsample of survey respondents matched on the probability of their inclusion in the race concordant group. The value of the Nagelkerke R^2 in this model indicates that approximately 10% of the variance in inpatient care utilization is explained by the model. A comparison of the beginning block classification table with the Block One classification table indicates that the presence of the predictor variables had a very small impact, improving the predictive accuracy by a modest 0.1%.

Table 6-8 displays the significant predictors of inpatient care utilization after the backward elimination of variables procedure was performed. A noteworthy observation from this model is the absence of any significant predictors from the predisposing characteristics, enabling resources, or health care system components of the Andersen framework. With the exception of the trust variable, all variables in the model fall into either the perceived or evaluated health status categories.

Individuals enrolled in a formal disease management program were more likely to use inpatient care compared to individuals not enrolled in these programs. Specifically, individuals enrolled in the asthma, diabetes, and asthma and diabetes disease management programs had odds that were 2.4, 1.8, and 3.7 times, respectively, greater for using inpatient care than individuals not enrolled in these programs. When expressed in terms of probabilities, [36] individuals enrolled in the asthma, diabetes, and asthma and diabetes programs, respectively, had a 16.8%, 10.6%, and 26.9% greater probability of utilizing inpatient care than individuals not enrolled in these programs. By contrast, inpatient care utilization was lower if the respondent claimed that his or her health status was good or if he or she indicated that they had high levels of trust in their personal provider. Specifically, individuals who reported that they had good health status had odds

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[36] Changes in outcome probabilities associated with a change in the predictor variable can be calculated by using a four-step process that converts the odds ratio (Exp[B]) to a probability. Step One involves converting the original probability of the specific form of health service utilization into odds via the formula P/(1-P), where P is the mean of the dichotomous dependent variable. The initial probabilities of inpatient care utilization and prescription drug utilization in the race concordance-matched group were 0.18 and 0.78, respectively. The initial probabilities of inpatient care utilization and prescription drug utilization in the gender concordance-matched group were 0.19 and 0.80, respectively. In Step Two, the value obtained in Step One is multiplied by the Exp[B] of the predictor variable to obtain "new odds." Step Three involves calculating the "new" probability via the formula: "New Odds" (i.e., the value obtained in Step Two) = P/(1-P). Step Four determines the change in probability by subtracting the "old" probability of the utilization of the health service (i.e., the mean the dependent variable) from the "new" probability (the value obtained in Step Three). See Hair, Black, Babin, Anderson, and Tatham (2006) for additional information.

Table 6-7: Initial Regression Model for Inpatient Care Utilization in Race Concordance-Matched Subsample

						95% CI ExpB								95% CI ExpB	
Predictor	B	SE	Wald	Sig	Exp B	Low	High	*Predictor*	B	SE	Wald	Sig	Exp B	Low	High
Race concordance	-0.151	0.144	1.105	0.293	0.860	0.648	1.140	*Coastal Pl*	0.419	0.293	2.040	0.153	1.520	0.856	2.699
Gender concordance	-0.039	0.127	0.093	0.760	0.962	0.750	1.234	*Tidal*	0.657	0.461	2.030	0.154	1.929	0.781	4.766
General MD	0.078	0.198	0.153	0.695	1.081	0.733	1.592	*A1003*	0.246	0.363	0.456	0.499	1.278	0.627	2.606
Specialist MD	0.428	0.256	2.804	0.094	1.534	0.930	2.531	*A1004*	0.153	0.378	0.164	0.685	1.165	0.556	2.443
Physician Assistant	0.100	0.297	0.114	0.735	1.105	0.618	1.978	*A1007*	0.435	0.582	0.559	0.455	1.545	0.494	4.830
Nurse	0.400	0.369	1.177	0.278	1.492	0.724	3.072	*A1008*	0.127	0.384	0.110	0.740	1.136	0.535	2.412
Black	0.020	0.155	0.017	0.895	1.021	0.754	1.382	*A1009*	0.067	0.392	0.029	0.864	1.069	0.496	2.304
Asian	-19.694	13166.2	0.000	0.999	0.000	0.000	.	*A1010*	-0.104	0.393	0.070	0.791	0.901	0.418	1.946
Native American	-0.015	0.359	0.002	0.967	0.985	0.488	1.990	*A1011*	0.087	0.359	0.059	0.809	1.091	0.540	2.204
Latino	1.439	0.851	2.859	0.091	4.218	0.795	22.376	*A1012*	0.315	0.384	0.672	0.412	1.370	0.645	2.910
Other Race	-0.415	0.470	0.779	0.378	0.661	0.263	1.659	*A1013*	-0.133	0.372	0.127	0.721	0.876	0.422	1.816
Female	0.150	0.154	0.945	0.331	1.162	0.859	1.572	*A2000*	-0.472	0.372	1.609	0.205	0.624	0.301	1.293
Spanish	-2.011	1.104	3.318	0.069	0.134	0.015	1.165	*A2003*	0.036	0.367	0.009	0.923	1.036	0.505	2.128
Other Language	-0.254	1.212	0.044	0.834	0.776	0.072	8.335	*A2004*	-0.457	0.426	1.152	0.283	0.633	0.275	1.459
Age	-0.012	0.032	0.145	0.703	0.988	0.927	1.052	*A2005*	-0.259	0.340	0.580	0.446	0.772	0.396	1.504
Age-squared	0.000	0.000	0.395	0.529	1.000	0.999	1.001	*Mon_prac*	-0.004	0.003	1.176	0.278	0.996	0.990	1.003
Some high school	0.053	0.222	0.056	0.813	1.054	0.682	1.630	*Asthma*	0.876	0.342	6.549	0.010	2.401	1.228	4.695
High school grad/GED	0.275	0.218	1.593	0.207	1.316	0.859	2.016	*Diabetes*	0.567	0.157	12.982	0.000	1.764	1.295	2.401
Some college	0.104	0.240	0.189	0.664	1.110	0.694	1.776	*A & D*	1.338	0.490	7.466	0.006	3.810	1.460	9.945
4-yr college degree	0.158	0.395	0.161	0.688	1.172	0.540	2.540	*Health*	-0.330	0.082	16.378	0.000	0.719	0.612	0.843
> 4-yr college degree	-0.813	1.130	0.518	0.472	0.444	0.048	4.063	*Satisfac*	-0.104	0.079	1.730	0.188	0.901	0.772	1.052
Mixed	0.061	0.196	0.097	0.756	1.063	0.724	1.559	*Trust*	-0.161	0.080	4.102	0.043	0.851	0.728	0.995
Rural	-0.067	0.234	0.083	0.773	0.935	0.591	1.478	*Small*	-0.427	0.328	1.696	0.193	0.653	0.343	1.241
Mountains	0.373	0.420	0.790	0.374	1.452	0.638	3.308	*No prob*	-0.392	0.217	3.282	0.070	0.675	0.442	1.033
								Constant	-1.461	0.793	3.392	0.066	0.232		
Nagelkerke R^2	0.096														

Table 6-8: Final Regression Model for Inpatient Care Utilization in Race Concordance-Matched Subsample

						95% CI for ExpB	
Predictor	B	S.E.	Wald	Sig	Exp B	Low	High
Constant	-1.595	0.072	497.197	0.000	0.203		
Asthma	0.890	0.332	7.175	0.007	2.434	1.270	4.668
Diabetes	0.603	0.150	16.219	0.000	1.828	1.363	2.452
Asthma and Diabetes	1.310	0.471	7.744	0.005	3.706	1.473	9.326
Health Status	-0.369	0.071	27.107	0.000	0.692	0.602	0.795
Trust	-0.214	0.071	9.128	0.003	0.808	0.703	0.928
Nagelkerke R^2	0.065						

31% lower for using inpatient care and those who reported high levels of trust in their providers had odds 19% lower for using inpatient care. When expressed in terms of probability, the impact of these predictors was a 4.8% lower probability and a 2.9% lower probability to use inpatient care if the individual reported good health status and high trust levels, respectively.

The value of the model's Nagelkerke R^2 was 0.065, indicating that only 6.5% of the variation in inpatient care utilization was explained by the significant predictor variables. A comparison of the beginning block classification table with the Block One classification table indicated that the presence of the predictor variables had a negligible impact, improving the predictive accuracy by a modest 0.1% from 80.0% cases correctly classified to 80.1% of cases correctly classified.

Table 6-9 provides a view of the initial logistic regression involving the second dichotomous dependent variable, prescription drug utilization. The Nagelkerke R^2 value specified that 28% of the variation in the utilization of prescription drugs is explained by the model. The beginning block classification table containing the model constant with no predictor variables stated that the accuracy in predicting prescription drug use was 84.0%. Addition of the predictor variables in the Block One classification table resulted in predictive accuracy of 84.6% of cases correctly classified, another modest improvement of 0.6%.

Table 6-10 describes the impact of the nine independent variables that achieved statistical significance in explaining prescription drug utilization. The predisposing characteristics of race, race concordance, gender concordance, and education constituted the bulk of the predictors. These were accompanied by variables from the enabling resources, health care system, and perceived health status categories.

With respect to the predisposing characteristics category, black enrollees had odds 67.5% lower, or a 24.4% lower probability, for using prescription drugs than did whites. Additionally, individuals who were in race concordant relationships with their providers had odds 32.9% lower for using prescription drugs than individuals in race discordant relationships. An alternative way of stating this finding is that individuals in race discordant relationships had odds 1.49 times higher for using prescription drugs than individuals in race concordant relationships. Gender concordance was also significant with individuals in gender concordant relationships having odds 31% lower for using prescription drugs than individuals who were in gender discordant relationships with their providers. Individuals who had some college education and those who had obtained a 4-year college degree had odds that were 1.7 and 2.7 times greater, respectively, for using prescription drugs than individuals with an 8th grade education or less. This translated to a 7.7% higher probability for individuals with some college and a 12.6% higher probability for individuals with a 4-year college degree to use prescription drugs.

Table 6-9: Initial Regression Model for Prescription Drug Utilization in Race Concordance-Matched Subsample

						95% CI ExpB								95% CI ExpB	
Predictor	B	SE	Wald	Sig	Exp B	Low	High	*Predictor*	B	SE	Wald	Sig	Exp B	Low	High
Race concordance	-0.397	0.169	5.527	0.019	0.673	0.483	0.936	*Coastal Pl*	-0.163	0.334	0.238	0.626	0.849	0.441	1.636
Gender concordance	-0.357	0.151	5.568	0.018	0.699	0.520	0.941	*Tidal*	0.349	0.556	0.395	0.530	1.418	0.477	4.212
General MD	0.421	0.194	4.722	0.030	1.524	1.042	2.228	*A1003*	0.122	0.503	0.059	0.809	1.129	0.422	3.025
Specialist MD	0.253	0.293	0.747	0.388	1.288	0.725	2.288	*A1004*	-0.282	0.459	0.377	0.539	0.754	0.307	1.854
Physician Assistant	0.228	0.325	0.490	0.484	1.256	0.664	2.376	*A1007*	-0.137	1.060	0.017	0.897	0.872	0.109	6.962
Nurse	0.873	0.504	3.001	0.083	2.394	0.892	6.427	*A1008*	-0.577	0.484	1.418	0.234	0.562	0.218	1.451
Black	-1.009	0.184	29.935	0.000	0.365	0.254	0.523	*A1009*	-0.625	0.481	1.686	0.194	0.535	0.208	1.375
Asian	0.019	1.351	0.000	0.989	1.019	0.072	14.400	*A1010*	-0.611	0.476	1.645	0.200	0.543	0.214	1.381
Native American	-0.560	0.439	1.627	0.202	0.571	0.242	1.350	*A1011*	-0.555	0.455	1.492	0.222	0.574	0.235	1.399
Latino	1.451	1.524	0.907	0.341	4.268	0.215	84.596	*A1012*	-0.733	0.495	2.195	0.138	0.480	0.182	1.267
Other Race	0.787	0.787	1.001	0.317	2.197	0.470	10.270	*A1013*	-0.853	0.448	3.621	0.057	0.426	0.177	1.026
Female	0.157	0.180	0.766	0.382	1.170	0.823	1.665	*A2000*	-0.634	0.428	2.190	0.139	0.531	0.229	1.228
Spanish	-0.826	1.285	0.413	0.521	0.438	0.035	5.438	*A2003*	-0.334	0.459	0.528	0.467	0.716	0.291	1.761
Other Language	-0.025	1.388	0.000	0.986	0.976	0.064	14.811	*A2004*	-0.820	0.507	2.623	0.105	0.440	0.163	1.188
Age	0.063	0.035	3.242	0.072	1.065	0.994	1.140	*A2005*	-0.967	0.394	6.034	0.014	0.380	0.176	0.823
Age-squared	0.000	0.000	2.960	0.085	0.999	0.998	1.000	*Mon prac*	0.000	0.004	0.005	0.942	1.000	0.992	1.008
Some high school	-0.218	0.283	0.593	0.441	0.804	0.462	1.400	*Asthma*	0.587	0.644	0.833	0.362	1.799	0.510	6.350
High school grad/GED	-0.069	0.285	0.059	0.809	0.933	0.534	1.632	*Diabetes*	-0.030	0.227	0.018	0.893	0.970	0.622	1.513
Some college	0.310	0.322	0.927	0.336	1.363	0.726	2.560	*A & D*	-1.101	0.616	3.194	0.074	0.333	0.099	1.112
4-yr college degree	0.799	0.573	1.946	0.163	2.223	0.723	6.833	*Health*	-0.843	0.088	91.781	0.000	0.430	0.362	0.511
> 4-yr college degree	-0.952	0.897	1.128	0.288	0.386	0.067	2.237	*Satisfac*	0.071	0.092	0.606	0.436	1.074	0.897	1.285
Mixed	-0.182	0.233	0.612	0.434	0.833	0.528	1.316	*Trust*	-0.107	0.106	1.008	0.315	0.899	0.730	1.107
Rural	0.066	0.273	0.058	0.810	1.068	0.625	1.826	*Small*	-0.434	0.568	0.583	0.445	0.648	0.213	1.974
Mountains	0.153	0.675	0.052	0.820	1.166	0.311	4.375	*No prob*	-0.996	0.447	4.966	0.026	0.369	0.154	0.887
								Constant	2.790	0.951	8.611	0.003	16.286		
Nagelkerke R^2	0.280														

Table 6-10: Final Regression Model for Prescription Drug Utilization in Race Concordance-Matched Subsample

						95% CI for ExpB	
Predictor	B	S.E.	Wald	Sig	Exp B	Low	High
Constant	3.591	0.327	120.385	0.000	36.265		
Race concordance	-0.398	0.154	6.656	0.010	0.671	0.496	0.909
Gender concordance	-0.373	0.144	6.725	0.010	0.689	0.520	0.913
Black	-1.124	0.158	50.682	0.000	0.325	0.239	0.443
Some college	0.531	0.189	7.902	0.005	1.700	1.174	2.462
4-yr college degree	1.003	0.506	3.921	0.048	2.726	1.010	7.353
A1013	-0.499	0.253	3.912	0.048	0.607	0.370	0.995
A2005	-0.711	0.240	8.814	0.003	0.491	0.307	0.785
Health Status	-0.837	0.075	124.278	0.000	0.433	0.374	0.501
Not a problem	-0.811	0.283	8.244	0.004	0.444	0.255	0.773
Nagelkerke R^2	0.251						

One variable in the enabling resources category, the access proxy variable, was a significant predictor of prescription drug utilization. Respondents who claimed that they had no problems obtaining specialty care referrals had odds 55.6% lower for using prescription drugs compared to respondents who stated that obtaining these referrals was a big problem.

In terms of the health care system category in Andersen's theoretical model, two care networks in the CCNC system were significant for predicting prescription drug use. Individuals who received their care via the Carolina Collaborative Community Care (a1013) and the Sandhills Community Care (a2005) networks had odds 39.3% and 50.9% lower for using prescription drugs compared to individuals who received their care in the AccessCare Network (a1006).

The health status factor score that measures perceived health status constituted the final variable in the regression model. Individuals with higher self-reported health status scores (i.e., who claimed that they enjoyed good health) had odds that were 56.7% lower for using prescription drugs than those with lower health status scores. In terms of a change in probability, this equates to a 17.4% lower probability for individuals with good health status to use prescription drugs.

The value of the Nagelkerke R^2 in this model was 0.251, indicating that 25.1% of the variation in prescription drug utilization was explained by these predictors. A comparison of the beginning block classification table with the Block One classification table indicates that the presence of the predictor variables had a small effect, improving the predictive accuracy by 0.6% from 84.0% to 84.6%.

6.2 Regression Models Associated with Subjects Matched for Gender Concordance

Section 6.1 described the various regression models applicable to survey respondents matched on their propensity for inclusion in the race concordant group. Section 6.2 is depicted in a similar manner, but consists of the regression models for each of the five utilization measures for the survey respondents matched on their propensity to be included in the gender concordant group. Table 6-11 represents the first model in this series and summarizes the impact of all of the model's independent variables on the number of primary care visits respondents made in the 6 months prior to being surveyed. This regression run had an adjusted $R^2 = 0.129$ and was characterized by six predictor variables with VIF values in excess of 3.0, likely pointing to the presence of multicollinearity.

Table 6-12 displays a more efficient model for the utilization of primary care services among the gender-concordant matched subjects, consisting only of the predictor variables that achieved statistical significance. There was no evidence of multicollinearity

Table 6-11: Initial Regression Model for Primary Care Utilization in Gender Concordance-Matched Subsample

Predictor	B	SE	B	t	Sig	Tol	VIF	*Predictor*	B	SE	β	t	Sig	Tol	VIF
Race concordance	0.133	0.166	0.021	0.799	0.424	0.676	1.478	*Coastal Pl*	0.723	0.340	0.098	2.124	0.034	0.221	4.530
Gender concordance	-0.235	0.140	-0.038	-1.678	0.093	0.943	1.060	*Tidal*	-0.012	0.526	0.000	-0.023	0.981	0.305	3.274
General MD	-0.024	0.210	-0.004	-0.113	0.910	0.464	2.154	*A1003*	0.095	0.399	0.009	0.237	0.813	0.358	2.796
Specialist MD	0.335	0.297	0.031	1.127	0.260	0.619	1.615	*A1004*	-0.198	0.413	-0.016	-0.481	0.631	0.411	2.431
Physician Assistant	0.631	0.328	0.052	1.920	0.055	0.654	1.529	*A1007*	0.107	0.427	0.009	0.251	0.802	0.356	2.807
Nurse	0.297	0.414	0.018	0.718	0.473	0.770	1.299	*A1008*	-0.752	0.398	-0.059	-1.890	0.059	0.487	2.053
Black	-0.441	0.181	-0.068	-2.442	0.015	0.606	1.651	*A1009*	-0.353	0.428	-0.028	-0.826	0.409	0.399	2.503
Asian	-1.383	1.528	-0.021	-0.905	0.366	0.915	1.093	*A1010*	0.064	0.401	0.006	0.160	0.873	0.399	2.509
Native American	-0.129	0.470	-0.007	-0.275	0.783	0.793	1.260	*A1011*	-1.060	0.412	-0.081	-2.573	0.010	0.481	2.077
Latino	1.456	1.054	0.046	1.382	0.167	0.431	2.321	*A1012*	-0.418	0.432	-0.032	-0.967	0.334	0.434	2.306
Other Race	0.520	0.518	0.023	1.003	0.316	0.900	1.111	*A1013*	-1.168	0.436	-0.094	-2.676	0.008	0.381	2.622
Female	0.751	0.185	0.092	4.057	0.000	0.912	1.097	*A2000*	-0.416	0.440	-0.033	-0.947	0.344	0.393	2.547
Spanish	-1.753	1.073	-0.054	-1.634	0.103	0.439	2.276	*A2003*	-0.182	0.403	-0.015	-0.452	0.651	0.401	2.493
Other Language	-0.662	1.246	-0.012	-0.532	0.595	0.919	1.089	*A2004*	0.341	0.480	0.030	0.709	0.478	0.272	3.683
Age	0.019	0.035	0.083	0.544	0.586	0.021	48.728	*A2005*	-0.188	0.387	-0.015	-0.487	0.626	0.482	2.073
Age-squared	0.000	0.000	-0.103	-0.685	0.494	0.021	47.854	*Mnth pract*	0.000	0.004	-0.006	-0.254	0.800	0.893	1.120
Some high school	0.074	0.245	0.011	0.303	0.762	0.384	2.603	*Asthma*	-0.083	0.426	-0.004	-0.194	0.846	0.966	1.036
High school grad/GED	-0.025	0.243	-0.004	-0.104	0.917	0.343	2.914	*Diabetes*	0.248	0.193	0.030	1.284	0.199	0.887	1.127
Some college	-0.047	0.264	-0.006	-0.176	0.860	0.384	2.606	*A & D*	1.622	0.706	0.051	2.297	0.022	0.960	1.042
4-yr college degree	-0.254	0.447	-0.014	-0.568	0.570	0.747	1.338	*Health*	-0.933	0.085	-0.286	-11.042	0.000	0.704	1.421
> 4-yr college degree	-0.263	0.977	-0.006	-0.269	0.788	0.899	1.113	*Satisfaction*	-0.051	0.094	-0.013	-0.549	0.583	0.829	1.206
Mixed	-0.005	0.217	0.000	-0.021	0.983	0.513	1.951	*Trust*	0.040	0.093	0.010	0.428	0.668	0.865	1.156
Rural	-0.326	0.241	-0.037	-1.354	0.176	0.637	1.570	*Small*	-0.266	0.391	-0.019	-0.680	0.496	0.594	1.684
Mountains	-0.553	0.342	-0.062	-1.618	0.106	0.324	3.086	*No problem*	-0.798	0.276	-0.085	-2.886	0.004	0.544	1.840
								Constant	4.768	0.864		5.520	0.000		
Adjusted R^2	0.129														

Table 6-12: Final Regression Model for Primary Care Utilization in Gender Concordance-Matched Subsample

Predictor	B	S.E.	Beta	T	Sig.	Tolerance	VIF
Constant	4.769	0.258		18.517	0.000		
Physician assistant	0.633	0.269	0.052	2.349	0.019	0.966	1.036
Black	-0.574	0.149	-0.089	-3.846	0.000	0.880	1.136
Female	0.772	0.178	0.095	4.338	0.000	0.980	1.020
Mountains	-0.450	0.207	-0.050	-2.168	0.030	0.874	1.144
Coastal Plain	0.589	0.190	0.080	3.095	0.002	0.702	1.425
A1008	-0.682	0.282	-0.053	-2.418	0.016	0.964	1.037
A1011	-0.902	0.289	-0.068	-3.116	0.002	0.970	1.031
A1013	-0.870	0.310	-0.070	-2.804	0.005	0.749	1.335
Asthma and Diabetes	1.496	0.693	0.047	2.157	0.031	0.989	1.011
Health Status	-0.948	0.074	-0.290	-12.844	0.000	0.918	1.090
Not a problem	-0.677	0.207	-0.072	-3.279	0.001	0.969	1.033
R^2	0.134						

in the final regression model and the model explained 13.4% of the variation in primary care utilization.

Among the predisposing characteristics, race, gender, and provider type were significant predictors of the number of primary care visits. Blacks experienced 0.574 fewer primary care visits compared to whites. By contrast, respondents who stated that their personal provider was a physician assistant used an additional 0.6 primary care visits compared to respondents who reported that they did not have one person they considered as their personal provider. Females also used more primary care than males by visiting the primary care provider an additional 0.77 times.

Region and access were significant for predicting primary care utilization among the enabling resource variables. Residents in the Mountain region used less primary care compared to Piedmont region residents while residents of the Coastal Plain had more primary care visits compared to this group. Individuals who had no problem accessing specialty care had 0.677 fewer primary care visits compared to respondents who encountered big problems accessing specialty care.

Three care networks, representing the health care system in the Andersen model, were significant for predicting primary care usage. Enrollees in the Northwest Community Care Network (a1008), Community Care of Wake/Johnston Counties (a1011) and the Carolina Collaborative Community Care (a1013) networks used fewer primary care visits compared to enrollees in the AccessCare Network. The magnitude of these decreases was approximately 0.7, 0.9, and 0.9 fewer visits, respectively.

Perceived health status, in the form of the health status factor score, was a highly significant predictor of primary care utilization and resulted in fewer visits when health status was good. Evaluated health status, as measured by disease state management program enrollment, was also significant with beneficiaries who were enrolled in the Asthma and Diabetes disease management program experiencing an additional 1.5 primary care visits compared to beneficiaries not enrolled in a disease management program.

Table 6-13 displays the results of the impact of all predictor variables on the number of specialty care visits respondents made in the 6 months prior to being surveyed. This model explained 13.7% of the variation in the number of specialty care visits and, as was the case for primary care visits in Table 6-11, was characterized by six variables with VIF scores in excess of 3.0.

Table 6-14 summarizes the final regression run of independent variables that achieved statistical significance at the $p \leq 0.05$ level in terms of predicting the number of specialty care visits. The model explained 13.9% of the variation in the number of visits to specialists and there was no indication of multicollinearity.

Two variables listed among the predisposing characteristics – race and provider type – were significant predictors of specialty care utilization. Black enrollees used less specialty care – about 0.34 fewer visits – compared to white enrollees while respondents who stated that their personal doctor was a specialist or a nurse had more visits to specialists compared to respondents who reported that they did not have one person they considered as their personal provider.

The proxy variable for access was the only variable representing the enabling resources that achieved statistical significance in this model. Individuals who experienced no problems getting referrals to specialty care had nearly 0.9 fewer specialty care visits per enrollee than those who experienced a big problem getting this type of referral.

Three care networks achieved statistical significance for predicting the number of specialty care visits. Compared to individuals enrolled in the AccessCare Network, enrollees in the Community Health Partners (a1003) and Southern Piedmont Community Care Plan (a2003) networks used more specialty care visits, while individuals enrolled in Community Care Partners of Greater Mecklenburg (a1009) used less specialty care.

Not surprisingly, both perceived and evaluated health status were important predictors of specialty care usage. Individuals who had higher self-reported health status factor scores, an indicator of good health, were predicted to experience fewer visits to specialists. This variable was highly significant, with a t-test score exceeding an absolute value of 12.0. Additionally, enrollment in two of the three disease management programs – diabetes and asthma with diabetes – was found to increase the number of specialty care

Table 6-13: Initial Regression Model for Specialty Care Utilization in Gender Concordance-Matched Subsample

Predictor	B	SE	B	t	Sig	Tol	VIF	*Predictor*	B	SE	β	t	Sig	Tol	VIF
Race concordance	0.031	0.149	0.005	0.208	0.835	0.680	1.470	*Coastal Pl*	0.292	0.306	0.044	0.954	0.340	0.220	4.536
Gender concordance	-0.109	0.126	-0.019	-0.863	0.388	0.944	1.059	*Tidal*	0.244	0.479	0.020	0.509	0.611	0.308	3.249
General MD	-0.115	0.188	-0.019	-0.610	0.542	0.468	2.139	*A1003*	0.484	0.361	0.048	1.340	0.181	0.356	2.808
Specialist MD	0.433	0.267	0.044	1.624	0.105	0.623	1.606	*A1004*	0.020	0.372	0.002	0.052	0.958	0.409	2.448
Physician Assistant	-0.108	0.294	-0.010	-0.366	0.714	0.654	1.529	*A1007*	0.242	0.388	0.023	0.624	0.533	0.353	2.830
Nurse	0.608	0.372	0.040	1.637	0.102	0.772	1.296	*A1008*	-0.184	0.359	-0.016	-0.513	0.608	0.482	2.077
Black	-0.267	0.162	-0.046	-1.646	0.100	0.607	1.646	*A1009*	-0.818	0.386	-0.072	-2.120	0.034	0.397	2.520
Asian	-0.757	1.383	-0.012	-0.547	0.584	0.915	1.092	*A1010*	0.190	0.362	0.018	0.525	0.600	0.396	2.526
Native American	0.266	0.422	0.015	0.632	0.528	0.792	1.262	*A1011*	-0.461	0.374	-0.038	-1.233	0.218	0.482	2.076
Latino	-1.066	0.957	-0.036	-1.115	0.265	0.453	2.206	*A1012*	-0.162	0.393	-0.013	-0.413	0.680	0.438	2.285
Other Race	0.093	0.475	0.004	0.196	0.845	0.903	1.107	*A1013*	-0.353	0.396	-0.031	-0.891	0.373	0.379	2.638
Female	0.072	0.167	0.010	0.428	0.669	0.910	1.099	*A2000*	-0.393	0.397	-0.034	-0.990	0.322	0.388	2.575
Spanish	1.214	0.977	0.039	1.242	0.215	0.461	2.170	*A2003*	0.634	0.363	0.060	1.746	0.081	0.399	2.509
Other Language	1.559	1.127	0.031	1.383	0.167	0.919	1.088	*A2004*	-0.385	0.438	-0.036	-0.879	0.379	0.271	3.689
Age	0.051	0.032	0.242	1.609	0.108	0.021	48.719	*A2005*	0.186	0.347	0.017	0.535	0.593	0.469	2.132
Age-squared	0.000	0.000	-0.240	-1.610	0.107	0.021	47.855	*Mnth pract*	-0.005	0.003	-0.035	-1.538	0.124	0.891	1.122
Some high school	0.482	0.222	0.076	2.169	0.030	0.381	2.623	*Asthma*	0.629	0.386	0.036	1.632	0.103	0.966	1.036
High school grad/GED	0.547	0.220	0.092	2.487	0.013	0.341	2.935	*Diabetes*	0.681	0.176	0.089	3.877	0.000	0.882	1.134
Some college	0.348	0.239	0.051	1.453	0.146	0.383	2.612	*A & D*	1.197	0.639	0.041	1.873	0.061	0.960	1.042
4-yr college degree	0.647	0.405	0.040	1.600	0.110	0.747	1.339	*Health*	-0.843	0.076	-0.284	-11.071	0.000	0.704	1.421
> 4-yr college degree	0.950	0.884	0.024	1.075	0.282	0.899	1.113	*Satisfaction*	-0.021	0.084	-0.006	-0.250	0.802	0.832	1.202
Mixed	-0.104	0.195	-0.016	-0.531	0.595	0.513	1.951	*Trust*	0.109	0.084	0.030	1.305	0.192	0.868	1.153
Rural	-0.259	0.218	-0.032	-1.191	0.234	0.637	1.570	*Small*	-0.111	0.353	-0.009	-0.316	0.752	0.593	1.687
Mountains	-0.119	0.307	-0.015	-0.388	0.698	0.326	3.066	*No problem*	-0.851	0.249	-0.100	-3.411	0.001	0.543	1.841
								Constant	1.561	0.780		2.002	0.045		
Adjusted R^2	0.137														

Table 6-14: Final Regression Model for Specialty Care Utilization in Gender Concordance-Matched Subsample

Predictor	B	S.E.	Beta	T	Sig.	Tolerance	VIF
Constant	2.654	0.188		14.095	0.000		
Specialist MD	0.594	0.211	0.061	2.813	0.005	0.990	1.010
Nurse	0.700	0.329	0.046	2.130	0.033	0.986	1.014
Black	-0.335	0.132	-0.057	-2.531	0.011	0.915	1.093
A1003	0.575	0.219	0.057	2.627	0.009	0.967	1.034
A1009	-0.589	0.247	-0.052	-2.384	0.017	0.964	1.037
A2003	0.619	0.231	0.058	2.674	0.008	0.980	1.021
Diabetes	0.573	0.169	0.075	3.400	0.001	0.954	1.048
Asthma and Diabetes	1.313	0.630	0.045	2.083	0.037	0.985	1.016
Health Status	-0.832	0.068	-0.281	-12.280	0.000	0.887	1.127
Not a problem	-0.895	0.187	-0.105	-4.797	0.000	0.968	1.033
Adjusted R^2	0.139						

visits compared to those enrollees who were not enrolled in a disease management program.

Table 6-15 provides a broad view of the impact of each of the study's independent variables on the utilization of emergency care. Six variables in this model have VIF scores greater than 3.0, suggesting the presence of multicollinearity. The value of the model's adjusted R^2 was 0.074, indicating that 7.4% of the variation in the number of emergency care visits was explained by the independent variables in the model.

Table 6-16 summarizes a more efficient version of the model of emergency care utilization after a number of insignificant variables have been removed by the backward elimination method. The final version of the model explained 7.4% of the variation in the number of emergency care visits and there was no indication of multicollinearity.

Among the predisposing characteristics, three variables – race, age, and education

Table 6-15: Initial Regression Model for Emergency Care Utilization in Gender Concordance-Matched Subsample

Predictor	B	SE	B	T	Sig	Tol	VIF	*Predictor*	B	SE	β	t	Sig	Tol	VIF
Race concordance	-0.029	0.092	-0.009	-0.318	0.750	0.678	1.474	*Coastal Pl*	-0.110	0.189	-0.027	-0.580	0.562	0.221	4.522
Gender concordance	-0.105	0.078	-0.031	-1.347	0.178	0.944	1.060	*Tidal*	0.053	0.294	0.007	0.179	0.858	0.310	3.227
General MD	-0.308	0.117	-0.086	-2.630	0.009	0.464	2.155	*A1003*	-0.108	0.223	-0.018	-0.485	0.628	0.356	2.811
Specialist MD	-0.204	0.166	-0.035	1.234	0.218	0.620	1.612	*A1004*	-0.328	0.230	-0.049	-1.422	0.155	0.410	2.437
Physician Assistant	-0.225	0.183	-0.034	-1.230	0.219	0.652	1.534	*A1007*	-0.139	0.240	-0.022	-0.581	0.562	0.354	2.823
Nurse	-0.175	0.230	-0.019	-0.758	0.448	0.770	1.299	*A1008*	-0.184	0.222	-0.027	-0.828	0.408	0.483	2.071
Black	0.260	0.101	0.074	2.585	0.010	0.606	1.649	*A1009*	-0.088	0.239	-0.013	-0.369	0.712	0.399	2.507
Asian	0.538	0.855	0.015	0.629	0.530	0.915	1.092	*A1010*	-0.145	0.224	-0.023	-0.646	0.518	0.396	2.526
Native American	0.325	0.261	0.031	1.247	0.213	0.793	1.261	*A1011*	0.085	0.231	0.012	0.371	0.711	0.482	2.075
Latino	0.551	0.590	0.032	0.934	0.350	0.431	2.320	*A1012*	-0.017	0.242	-0.002	-0.070	0.944	0.437	2.289
Other Race	-0.045	0.290	-0.004	-0.154	0.877	0.901	1.110	*A1013*	0.043	0.244	0.006	0.175	0.861	0.383	2.612
Female	0.048	0.103	0.011	0.464	0.642	0.911	1.098	*A2000*	-0.256	0.245	-0.037	-1.046	0.295	0.389	2.573
Spanish	-1.069	0.601	-0.060	-1.779	0.075	0.439	2.276	*A2003*	0.108	0.225	0.017	0.480	0.631	0.399	2.506
Other Language	0.279	0.697	0.009	0.400	0.689	0.919	1.088	*A2004*	-0.392	0.269	-0.062	-1.461	0.144	0.274	3.655
Age	-0.003	0.020	-0.025	-0.162	0.871	0.020	48.833	*A2005*	-0.464	0.214	-0.070	-2.165	0.031	0.471	2.125
Age-squared	0.000	0.000	-0.076	-0.489	0.625	0.021	47.967	*Mnth pract*	-0.001	0.002	-0.012	-0.516	0.606	0.891	1.122
Some high school	0.161	0.137	0.042	1.172	0.241	0.381	2.625	*Asthma*	0.865	0.241	0.082	3.595	0.000	0.967	1.034
High school grad/GED	-0.137	0.136	-0.039	-1.009	0.313	0.340	2.941	*Diabetes*	0.498	0.108	0.109	4.604	0.000	0.885	1.130
Some college	-0.379	0.148	-0.092	-2.558	0.011	0.382	2.617	*A & D*	0.799	0.395	0.046	2.021	0.043	0.960	1.042
4-yr college degree	-0.387	0.250	-0.040	-1.547	0.122	0.747	1.339	*Health*	-0.157	0.047	-0.088	-3.328	0.001	0.704	1.421
> 4-yr college degree	-0.813	0.547	-0.035	-1.488	0.137	0.899	1.113	*Satisfaction*	-0.291	0.052	-0.136	-5.573	0.000	0.830	1.204
Mixed	0.086	0.121	0.022	0.713	0.476	0.513	1.951	*Trust*	-0.097	0.052	-0.045	-1.871	0.061	0.866	1.155
Rural	0.279	0.134	0.058	2.078	0.038	0.640	1.562	*Small*	-0.076	0.217	-0.010	-0.350	0.726	0.586	1.706
Mountains	-0.010	0.190	-0.002	0.054	0.957	0.327	3.059	*No problem*	-0.393	0.155	-0.077	-2.542	0.011	0.537	1.860
								Constant	1.974	0.482		4.093	0.000		
Adjusted R^2	0.074														

Table 6-16: Final Regression Model for Emergency Care Utilization in Gender Concordance-Matched Subsample

Predictor	B	S.E.	Beta	T	Sig.	Tolerance	VIF
Constant	1.656	0.173		9.573	0.000		
Black	0.204	0.077	0.058	2.629	0.009	0.946	1.057
Age	-0.014	0.003	-0.112	-4.497	0.000	0.752	1.330
Some high school	0.286	0.087	0.075	3.307	0.001	0.890	1.124
Some college	-0.197	0.095	-0.048	-2.070	0.039	0.866	1.154
Asthma	0.975	0.218	0.097	4.473	0.000	0.984	1.016
Diabetes	0.497	0.103	0.109	4.831	0.000	0.903	1.108
Asthma and Diabetes	0.783	0.390	0.044	2.006	0.045	0.984	1.016
Health Status	-0.152	0.044	-0.085	-3.464	0.001	0.761	1.314
Trust	-0.141	0.048	-0.066	-2.940	0.003	0.923	1.084
Satisfaction	-0.256	0.049	-0.120	-5.245	0.000	0.879	1.138
Not a problem	-0.388	0.115	-0.076	-3.376	0.001	0.903	1.108
Adjusted R^2	0.074						

– were significant for predicting the number of emergency care visits. When controlled for all other variables in the regression model, black enrollees experienced an additional 0.2 emergency care visits compared to white enrollees. Similarly, individuals with some high school education used more emergency care services – 0.286 visits per enrollee – than individuals with an 8th-grade education or less. Conversely, enrollees who reported that they had received some college education short of a 4-year degree used less emergency care compared to enrollees with an 8th-grade education or less. Age was negatively related to emergency care utilization, with the number of emergency care visits decreasing by 0.14 visits for every 10-year increase in the respondent's age.

The proxy variable for access was the sole variable among the enabling resources that achieved statistical significance in this regression model. Individuals who had no difficulty getting referred to specialists had 0.39 fewer emergency care visits than those who experienced difficulty getting these referrals.

Perceived and evaluated health statuses were important predictors of emergency care utilization. Individuals who reported that they were in good health and had higher health status factor scores used less emergency care. Similarly, individuals with chronic conditions enrolled in each of the three disease management programs experienced more emergency care visits than those individuals not enrolled in a disease management program. Individuals enrolled in the asthma disease management program experienced nearly one additional emergency care visit compared to individuals not enrolled in a disease management program while those enrolled in the asthma with diabetes disease management program experienced an additional 0.8 emergency care visits compared to individuals not enrolled in a disease management program. The impact of enrollment in the diabetes disease management program was not as large, but was, nonetheless, an additional 0.5 emergency care visits compared to individuals not enrolled in disease management programs.

The levels of trust and satisfaction, respectively, which respondents experienced with their providers, were significant predictors of emergency care utilization. Less emergency care utilization was experienced among respondents who had high levels of trust and satisfaction in their providers.

Table 6-17 summarizes the initial logistic regression for inpatient care utilization, a dichotomous dependent variable, for the subsample of survey respondents matched on the probability of their inclusion in the gender concordant group. The value of the Nagelkerke R^2 specifies that 10% of the variation in the utilization of inpatient care is explained by the model. The beginning block classification table containing the model constant with no predictor variables stated that the accuracy in predicting inpatient care use was 79.9%. Addition of the predictor variables in the Block One classification table resulted in predictive accuracy of 80.1% of cases correctly classified, a small improvement of 0.2%.

Table 6-18 displays the significant predictors of inpatient care utilization after the backward elimination of variables procedure was performed. The enrollee race variable that represents the predisposing characteristics component of the Andersen model was a significant predictor of inpatient care usage. Individuals in the Latino race group had odds that were 7.1 times greater for using inpatient care than whites, which translated to a 43.4% higher probability for using inpatient care.[37]

In terms of the enabling resources component of the Andersen model, the enrollee's primary language spoken in the home was a significant predictor of inpatient care utilization. Individuals who claimed that Spanish was the primary language spoken in the home were predicted to experience 94.7% lower odds for using inpatient care compared to their English-speaking counterparts. This finding appears to contradict the observation reported above where Latinos were predicted to have higher rates of inpatient care utilization. This can be explained by the fact that the numbers of Latinos and predominantly-Spanish speaking enrollees in the subsample were quite small and that most of the Latino enrollees who used inpatient care reported a language other than Spanish as the primary language spoken in the home.[38] Another enabling resource variable that was a significant predictor of inpatient care utilization was the access proxy variable, where individuals who encountered no problems obtaining referrals to specialty

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[37] See footnote 36 for a brief discussion of the steps involved in calculating changes in outcome probabilities associated with changes in a predictor variable.

[38] This finding may also be qualified by the fact that the Chi-square measure of statistical significance in a cross-tabulation between primary language spoken in the home and gender concordance (see Table 5-28) was compromised by the fact that two cells (33%) in the table had expected cell counts of less than five.

Table 6-17: Initial Regression Model for Inpatient Care Utilization in Gender Concordance-Matched Subsample

						95% CI ExpB								95% CI ExpB	
Predictor	B	SE	Wald	Sig	Exp B	Low	High	*Predictor*	B	SE	Wald	Sig	Exp B	Low	High
Race concordance	-0.159	0.145	1.198	0.274	0.853	0.642	1.134	*Coastal Pl*	0.283	0.297	0.906	0.341	1.327	0.741	2.374
Gender concordance	0.060	0.123	0.237	0.626	1.062	0.834	1.351	*Tidal*	0.430	0.461	0.868	0.352	1.537	0.622	3.798
General MD	0.266	0.200	1.767	0.184	1.305	0.881	1.932	*A1003*	-0.059	0.342	0.030	0.863	0.943	0.482	1.844
Specialist MD	0.607	0.261	5.393	0.020	1.835	1.099	3.064	*A1004*	-0.127	0.359	0.125	0.724	0.881	0.436	1.781
Physician Assistant	0.335	0.295	1.293	0.256	1.398	0.785	2.490	*A1007*	0.173	0.367	0.223	0.637	1.189	0.579	2.441
Nurse	0.557	0.353	2.490	0.115	1.746	0.874	3.488	*A1008*	-0.506	0.360	1.972	0.160	0.603	0.298	1.222
Black	0.067	0.159	0.178	0.673	1.069	0.783	1.459	*A1009*	-0.204	0.373	0.298	0.585	0.816	0.393	1.694
Asian	-19.55	19699.5	0.000	0.999	0.000	0.000	.	*A1010*	-0.339	0.354	0.8919	0.338	0.712	0.356	1.425
Native American	0.304	0.374	0.662	0.416	1.356	0.651	2.822	*A1011*	-0.283	0.359	0.623	0.430	0.753	0.373	1.522
Latino	1.968	0.953	4.263	0.039	7.159	1.105	46.38	*A1012*	0.017	0.369	0.002	0.964	1.017	0.493	2.098
Other Race	-0.194	0.470	0.171	0.680	0.823	0.328	2.069	*A1013*	-0.298	0.367	0.658	0.417	0.743	0.362	1.524
Female	0.106	0.164	0.421	0.517	1.112	0.807	1.533	*A2000*	-0.515	0.374	1.896	0.169	0.598	0.287	1.244
Spanish	-3.199	1.393	5.278	0.022	0.041	0.003	0.625	*A2003*	-0.217	0.354	0.374	0.541	0.805	0.402	1.612
Other Language	-0.437	1.179	0.138	0.711	0.646	0.064	6.513	*A2004*	-0.499	0.420	1.413	0.235	0.607	0.266	1.383
Age	-0.051	0.032	2.526	0.112	0.950	0.893	1.012	*A2005*	-0.464	0.334	1.933	0.164	0.629	0.327	1.210
Age-squared	0.001	0.000	2.927	0.087	1.001	1.000	1.001	*Mon prac*	-0.004	0.003	1.405	0.236	0.996	0.990	1.003
Some high school	0.002	0.213	0.000	0.994	1.002	0.659	1.522	*Asthma*	0.765	0.326	5.505	0.019	2.150	1.134	4.075
High school grad/GED	0.169	0.210	0.648	0.421	1.184	0.785	1.786	*Diabetes*	0.508	0.154	10.891	0.001	1.663	1.229	2.249
Some college	0.025	0.230	0.012	0.914	1.025	0.653	1.611	*A & D*	1.353	0.500	7.328	0.007	3.869	1.453	10.306
4-yr college degree	0.004	0.404	0.000	0.992	1.004	0.455	2.215	*Health*	-0.379	0.081	22.007	0.000	0.685	0.585	0.802
> 4-yr college degree	-0.818	1.124	0.530	0.467	0.441	0.049	3.996	*Satisfac*	-0.173	0.078	4.930	0.026	0.841	0.721	0.980
Mixed	-0.005	0.191	0.001	0.979	0.995	0.684	1.447	*Trust*	-0.104	0.078	1.746	0.186	0.902	0.773	1.051
Rural	-0.139	0.213	0.430	0.512	0.870	0.573	1.320	*Small*	-0.600	0.318	3.563	0.059	0.549	0.294	1.023
Mountains	-0.050	0.309	0.026	0.872	0.952	0.519	1.745	*No prob*	-0.571	0.211	7.360	0.007	0.565	0.374	0.853
								Constant	-0.250	0.771	0.105	0.746	0.779		
Nagelkerke R^2	0.100														

Table 6-18: Final Regression Model for Inpatient Care Utilization in Gender-Concordance Matched Subsample

						95% CI for ExpB	
Predictor	B	S.E.	Wald	Sig	Exp B	Low	High
Constant	-1.002	0.195	26.486	0.000	0.367		
Latino	1.956	0.947	4.269	0.039	7.073	1.106	45.242
Spanish	-2.940	1.377	4.558	0.033	0.053	0.004	0.786
Asthma	0.689	0.320	4.643	0.031	1.992	1.064	3.730
Diabetes	0.530	0.147	12.948	0.000	1.699	1.273	2.268
Asthma and Diabetes	1.326	0.483	7.552	0.006	3.768	1.463	9.703
Health Status	-0.358	0.071	25.798	0.000	0.699	0.609	0.803
Satisfaction	-0.169	0.073	5.434	0.020	0.844	0.733	0.973
Small problem	-0.681	0.310	4.844	0.028	0.506	0.276	0.928
Not a problem	-0.615	0.202	9.229	0.002	0.541	0.364	0.804
Nagelkerke R^2	0.075						

care had odds 45.9% lower for using inpatient care than individuals who encountered big problems obtaining referrals to specialty care.

Perceived health status, exemplified by the health status factor score, was highly significant ($p < 0.001$) for predicting inpatient care use. Individuals who reported that they had good health status had odds 30.1% lower for using inpatient care. Similarly, the variables classified within the evaluated health status component of the Andersen framework were also significant predictors of inpatient care utilization. Specifically, individuals enrolled in the asthma, diabetes, and asthma and diabetes disease management programs had odds that were 2.0, 1.7, and 3.8 times, respectively, greater for using inpatient care than individuals not enrolled in these programs. When expressed in terms of probabilities, individuals enrolled in the asthma, diabetes, and asthma and diabetes programs, respectively, had a 12.8%, 9.5%, and 27.9% greater probability of utilizing inpatient care than individuals not enrolled in these programs.

The satisfaction variable within the consumer satisfaction category of the Andersen framework attained statistical significance for predicting inpatient care. Individuals who reported high levels of satisfaction with their providers had odds 15.6% lower for using inpatient care. When expressed in terms of probability, the impact of this variable was a 2.5% lower probability to use inpatient care if the individual reported high satisfaction levels.

The value of the Nagelkerke R^2 in this model was 0.075, indicating that 7.5% of the variation in inpatient care utilization was explained by these predictors. A comparison of the beginning block classification table with the Block One classification table indicated that the presence of the predictor variables had a negligible effect on correctly classifying cases.

Table 6-19 provides a view of the initial logistic regression involving the second dichotomous dependent variable, prescription drug utilization. The Nagelkerke R^2 value specifies that nearly 26.9% of the variation in the utilization in prescription drug use is explained by the model. The beginning block classification table containing the model constant with no predictor variables stated that the accuracy in predicting prescription drug use was 84.9%. Addition of the predictor variables in the Block One classification table resulted in predictive accuracy of 85.3% of cases correctly classified, a small improvement of 0.4%.

Table 6-20 describes the impact of the nine predictor variables that achieved statistical significance in explaining prescription drug utilization. Five of these variables are classified as predisposing characteristics within Andersen's health utilization model.

Individuals in race concordant relationships with their primary care providers were predicted to have odds 34.7% lower for using prescription drugs than individuals in race discordant relationships with their primary care providers. This translated to a 7.7% lower probability for individuals in race concordant relationships to use prescription drugs. Gender concordance was also a significant predictor of prescription drug use, with individuals in gender concordant relationships with their primary care providers predicted to have odds 27.6% lower for using prescription drugs than individuals in gender discordant relationships with their providers. Thus, the probability of using prescription drugs was 5.7% lower for individuals in gender concordant relationships with their providers. The model also predicted that blacks had odds 66.4% lower for using prescription drugs than whites. An alternative way of expressing this finding is that whites had predicted odds 2.98 times higher for using prescription drugs than blacks. Individuals who stated that their personal doctor or nurse was a general physician had odds 1.4 times greater for using prescription drugs compared to individuals who reported that they did not have one person they considered as their personal provider and individuals with some high school education but lacking a diploma or GED had odds 32.7% lower for using prescription drugs compared to individuals with an 8th grade education or less.

Two variables classified as enabling resources – region and the access proxy variable – were significant predictors of prescription drug utilization in this model. Enrollees living in the Coastal Plain had predicted odds 31.7% lower for using prescription drugs compared to individuals living in the Piedmont region of the state. Additionally, individuals who encountered no problems obtaining referrals to specialty

Table 6-19: Initial Regression Model for Prescription Drug Utilization in Gender Concordance-Matched Subsample

						95% CI ExpB								95% CI ExpB	
Predictor	B	SE	Wald	Sig	Exp B	Low	High	*Predictor*	B	SE	Wald	Sig	Exp B	Low	High
Race concordance	-0.399	0.172	5.412	0.020	0.671	0.479	0.939	*Coastal Pl*	-0.193	0.345	0.312	0.577	0.825	0.420	1.621
Gender concordance	-0.361	0.148	5.908	0.015	0.697	0.521	0.933	*Tidal*	0.368	0.562	0.429	0.513	1.445	0.480	4.349
General MD	0.546	0.192	8.054	0.005	1.726	1.184	2.516	*A1003*	0.191	0.501	0.145	0.703	1.211	0.453	3.232
Specialist MD	0.201	0.290	0.482	0.487	1.223	0.693	2.158	*A1004*	-0.256	0.453	0.319	0.572	0.774	0.319	1.880
Physician Assistant	0.335	0.321	1.090	0.297	1.399	0.745	2.626	*A1007*	-0.204	0.599	0.116	0.734	0.816	0.252	2.638
Nurse	0.999	0.494	4.082	0.043	2.716	1.030	7.158	*A1008*	-0.689	0.463	2.219	0.136	0.502	0.203	1.243
Black	-0.940	0.187	25.147	0.000	0.391	0.270	0.564	*A1009*	-0.595	0.476	1.558	0.212	0.552	0.217	1.404
Asian	-0.828	1.502	0.304	0.581	0.437	0.023	8.302	*A1010*	-0.574	0.456	1.582	0.208	0.63	0.230	1.377
Native American	-0.538	0.465	1.341	0.247	0.584	0.235	1.451	*A1011*	-0.397	0.467	0.721	0.396	0.673	0.269	1.680
Latino	1.370	1.488	0.848	0.357	3.936	0.213	72.653	*A1012*	-0.731	0.490	2.226	0.136	0.482	0.184	1.258
Other Race	1.237	1.050	1.388	0.239	3.446	0.440	27.003	*A1013*	-0.747	0.446	2.801	0.094	0.474	0.197	1.136
Female	0.130	0.199	0.428	0.513	1.139	0.771	1.684	*A2000*	-0.500	0.436	1.312	0.252	0.607	0.258	1.427
Spanish	-0.823	1.259	0.427	0.513	0.439	0.037	5.181	*A2003*	-0.315	0.458	0.474	0.491	0.729	0.297	1.791
Other Language	0.207	1.480	0.020	0.889	1.230	0.068	22.372	*A2004*	-0.850	0.505	2.835	0.092	0.427	0.159	1.150
Age	0.060	0.035	2.965	0.085	1.062	0.992	1.138	*A2005*	-0.945	0.393	5.780	0.016	0.389	0.180	0.840
Age-squared	0.000	0.000	2.324	0.127	0.999	0.998	1.000	*Mon prac*	-0.002	0.004	0.166	0.684	0.998	0.990	1.006
Some high school	-0.194	0.273	0.509	0.476	0.823	0.483	1.405	*Asthma*	0.577	0.635	0.825	0.364	1.780	0.513	6.182
High school grad/GED	0.070	0.277	0.063	0.802	1.072	0.623	1.845	*Diabetes*	-0.044	0.227	0.038	0.845	0.957	0.613	1.492
Some college	0.376	0.311	1.456	0.227	1.456	0.791	2.680	*A & D*	-1.153	0.621	3.451	0.063	0.316	0.094	1.066
4-yr college degree	0.805	0.570	1.994	0.158	2.236	0.732	6.828	*Health*	-0.772	0.087	78.249	0.000	0.462	0.389	0.548
> 4-yr college degree	-0.476	0.963	0.244	0.621	0.621	0.094	4.103	*Satisfac*	-0.142	0.106	1.804	0.179	0.867	0.705	1.067
Mixed	-0.188	0.227	0.689	0.407	0.828	0.531	1.293	*Trust*	0.083	0.093	0.810	0.368	1.087	0.906	1.304
Rural	0.060	0.264	0.052	0.819	1.062	0.633	1.782	*Small*	-0.191	0.592	0.105	0.746	0.826	0.259	2.633
Mountains	0.266	0.412	0.418	0.518	1.305	.0582	2.926	*No prob*	-0.920	0.448	4.227	0.040	0.398	0.166	0.958
								Constant	2.490	0.944	6.955	0.008	12.057		
Nagelkerke R^2	0.269														

Table 6-20: Final Regression Model for Prescription Drug Utilization in Gender Concordance-Matched Subsample

						95% CI for ExpB	
Predictor	B	S.E.	Wald	Sig	Exp B	Low	High
Constant	3.718	0.360	106.556	0.000	41.188		
Race concordance	-0.426	0.159	7.197	0.007	0.653	0.478	0.892
Gender concordance	-0.323	0.143	5.121	0.024	0.724	0.547	0.958
General MD	0.342	0.144	5.636	0.018	1.408	1.062	1.868
Black	-1.090	0.159	46.737	0.000	0.336	0.246	0.459
Some high school	-0.395	0.153	6.711	0.010	0.673	0.499	0.908
Coastal Plain	-0.381	0.160	5.693	0.017	0.683	0.500	0.934
A2005	-0.593	0.242	6.021	0.014	0.553	0.344	0.887
Health Status	-0.786	0.074	111.694	0.000	0.456	0.394	0.527
Not a problem	-0.861	0.298	8.348	0.004	0.423	0.236	0.758
Nagelkerke R^2	0.237						

care had predicted odds 57.7% lower for using prescription drugs than individuals who encountered big problems obtaining referrals to specialty care.

In terms of the health care system component of the Andersen framework, one care network demonstrated significantly lower predicted odds for prescription drug utilization. Individuals enrolled in the Sandhills Community Care Network (a2005) network had predicted odds 44.7% lower for using prescription drugs than individuals enrolled in the AccessCare Network (a1006).

The variable representing perceived health status – the health status factor score – was a highly significant ($p < 0.001$) model predictor of prescription drug use. Individuals with good self-reported health status had predicted odds 54.4% lower for using prescription drugs than individuals with poor self-reported health status.

The value of the Nagelkerke R^2 in this model was 0.237, indicating that 23.7% of the variation in prescription drug utilization was explained by these predictors. A comparison of the beginning block classification table with the Block One classification table indicates that the presence of the predictor variables had no effect, maintaining the predictive accuracy at 84.9%.

6.3 Recap of Significant Findings

Table 6-21 provides a summary of the variables achieving statistical significance for each of the five forms of health service utilization among survey respondents who were matched on their propensity for race concordance. The summary table indicates whether the predictor increased or decreased utilization and is organized in a manner consistent with the way in which the study variables are categorized by Andersen's theoretical model of health service utilization.

The enrollee's race, gender, age, level of education, and the type of provider were among the predisposing characteristics that predicted the use of at least one type of health service. Race concordance and gender concordance, the focal points of this study, were also significant predictor variables, but the scope of their influence was limited.

The utilization of health services among blacks was statistically different when compared to whites, with more emergency care visits, but less primary care, specialty care, and prescription drug use for blacks than for whites. Asians also had fewer primary care visits compared to whites. On the other hand, females had more primary care visits than males and respondent's whose personal provider was either a specialty physician or a nurse were found to use more specialty care. Surprisingly, age had little impact on the use of most types of care. Education did not play a major role in the utilization of health services, but in those cases where education was significant, higher levels of education were associated with a greater likelihood of using prescription drugs while a relatively

Table 6-21: Recap of Significant Findings for the Race Concordance-Matched Subsample

	Primary	Specialty	Emergency	Inpatient	Rx Drugs
Predisposing Characteristics					
Race Concordance					↓
Gender Concordance	↓				↓
General MD			↓		
Specialist MD		↑			
Nurse		↑			
Black	↓	↓	↑		↓
Asian	↓				
Female	↑				
Age			↓		
Some high school			↑		
Some college					↑
4-yr college degree					↑
Enabling Resources					
Coastal Plain	↑				
No problem accessing specialty care	↓	↓	↓		↓
Health Care System					
A1003		↑			
A1009		↓			
A1011	↓				
A1013	↓				↓
A2003		↑			
A2005			↓		↓
Perceived Health Status					
Health Status	↓	↓	↓	↓	↓
Evaluated Health Status					
Asthma		↑	↑	↑	
Diabetes		↑	↑	↑	
Asthma and Diabetes	↑	↑	↑	↑	
Consumer Satisfaction					
Trust			↓	↓	
Satisfaction			↓		

low level of education (i.e., some high school) was associated with more emergency care visits. Race concordance significantly reduced the odds of prescription drug use while gender concordance also reduced the odds of prescription drug use and reduced the number of primary care visits.

The proxy variable for access – ease of obtaining specialty care referrals – was the enabling resource that impacted most forms of health service utilization. Individuals who experienced no problems accessing specialty care used less primary care, specialty care, these types of care. Inclusion in this group also reduced the odds that they used prescription drugs. Region was significant only for predicting primary care usage, with residents of the Coastal Plain experiencing more primary care visits than those residing in the Piedmont region.

The various CCNC care networks representing the health care system had a modest impact on health service utilization. Less primary care was used by individuals enrolled in the Community Care of Wake/Johnston Counties (a1011) compared to individuals enrolled in the AccessCare Network (a1006) and less specialty care was used by enrollees in the Community Care Partners of Greater Mecklenburg network (a1009) compared to enrollees in the AccessCare Network. Individuals enrolled in the Community Health Partners network (a1003) and in the Southern Piedmont Community Care Plan (a2003) used more specialty care than those individuals enrolled in the AccessCare Network. By contrast, individuals enrolled in the Carolina Collaborative Community Care network (a1013) used less primary care than individuals in the AccessCare Network and had lower odds for using prescription drugs. Similarly, individuals enrolled in the Sandhills Community Care Network (a2005) used less emergency care than individuals in the AccessCare Network and had lower odds for using prescription drugs.

One variable, the enrollee's health status factor score, was a highly significant predictor for each form of health service utilization (i.e., $p < 0.005$ for each of the five forms of health utilization), with good self-reported health status associated with less service use. Evaluated health status, in the form of enrollment in one of CCNC's disease management programs, also impacted health service utilization, with enrollees likely to use more specialty, emergency, and inpatient care than those individuals not formally enrolled in a disease management program.

The trust and satisfaction factor scores within the consumer satisfaction component of the Andersen framework were associated with fewer emergency care visits and, in the case of trust, lower predicted odds for inpatient care use. This finding may be a function of established patient-provider relationships that foster the detection of potential problems before they reach critical thresholds for higher levels of care.

Table 6-22 provides a summary of the variables achieving statistical significance for each of the five forms of health service utilization among survey respondents who were matched on their propensity for gender concordance. As was the case for table 6-21, this table indicates whether the predictor increased or decreased utilization and is organized in a manner consistent with the way in which the study variables are categorized by Andersen's theoretical model of health service utilization.

As was the case in the subsample matched on the basis of race concordance, the enrollee's race, gender, age, level of education, and the type of provider were among the predisposing characteristics that predicted the use of at least one type of health service

Table 6-22: Recap of Significant Findings for the Gender Concordance-Matched Subjects

	Primary	Specialty	Emergency	Inpatient	Rx Drugs
Predisposing Characteristics					
Race Concordance					↓
Gender Concordance					↓
General MD					↑
Specialist MD		↑			
Physician Assistant	↑				
Nurse		↑			
Black	↓	↓	↑		↓
Latino				↑	
Female	↑				
Age			↓		
Some high school			↑		↓
Some college			↓		
Enabling Resources					
Spanish				↓	
Mountains	↓				
Coastal Plain	↑				↓
Small problem accessing specialty				↓	
No problem accessing specialty	↓	↓	↓	↓	↓
Health Care System					
A1003		↑			
A1008	↓				
A1009		↓			
A1011	↓				
A1013	↓				
A2003		↑			
A2005					↓
Perceived Health Status					
Health Status	↓	↓	↓	↓	↓
Evaluated Health Status					
Asthma			↑	↑	
Diabetes		↑	↑	↑	
Asthma and Diabetes	↑	↑	↑	↑	
Consumer Satisfaction					
Trust			↓		
Satisfaction			↓	↓	

among respondents matched on the basis of gender concordance. Race and gender concordance were also significant predictor variables, but the scope of their influence was limited. The utilization of health services among blacks was statistically different when compared to whites, with more emergency care visits, but less primary care, specialty care, and lower predicted odds for prescription drug use among blacks than whites. Latinos also experienced greater predicted odds for inpatient care use than did whites. Additionally, females had more primary care visits than males, respondents whose personal provider was a physician assistant used more primary care than those who did not consider one person as their personal doctor or nurse, and respondent's whose personal provider was either a specialty physician or a nurse used more specialty care than those who did not consider one person as their doctor or nurse. As was the case in Table 6-21, age had surprisingly little impact on the use of most types of care. The effect of education was mixed, with the number of emergency care visits lower for individuals who garnered at least some level of a college education compared to individuals who did not advance to high school while individuals who had at least some high school training used more emergency care visits than their counterparts who did not advance to high school. This group was also less likely to use prescription drugs. Both race and gender concordance significantly reduced the odds of prescription drug use.

The proxy variable for access – ease of obtaining specialty care referrals – was, once again, the enabling resource that impacted the greatest number of health services in this subsample of respondents. Individuals who experienced no problems accessing specialty care had fewer primary care, specialty care, and emergency care visits than those who experienced big problems accessing these referrals. Inclusion in this group also reduced the likelihood of using inpatient care and prescription drugs. Individuals who lived in households where Spanish was the primary language spoken had lower odds for using inpatient care while residents of the Mountain region had fewer primary care visits than those residing in the Piedmont region.

Seven of the fourteen CCNC care networks representing the health care system demonstrated significant impact on health service utilization. Perhaps the most noteworthy observation was that individuals enrolled in three networks – the Northwest Community Care Network (a1008), the Community Care of Wake/Johnston Counties network, and the Carolina Collaborative Community Care network – had fewer primary care visits than individuals enrolled in the AccessCare Network (a1006). Enrollment in two networks – the Community Health Partners (a1003) and the Southern Piedmont Community Care Plans (a2003) networks – was associated with more specialty care visits than enrollment in the AccessCare (a1006) network while enrollees in the Community Care Partners of Greater Mecklenburg network (a1009) had fewer specialty care visits. Individuals enrolled in the Sandhills Community Care Network (a2005) had lower predicted odds for using prescription drugs.

The enrollee's health status factor score was a highly significant predictor for each form of health service utilization ($p \leq 0.001$), with good self-reported health status associated with less service use. Evaluated health status, in the form of enrollment in one of CCNC's disease management programs, also impacted health service utilization, with enrollees in the asthma and diabetes program using more primary, specialty, and emergency care and having higher predicted odds for using inpatient care than those individuals not formally enrolled in a disease management program. Enrollment in either the asthma or diabetes programs resulted in more emergency care visits compared to individuals not enrolled in a disease management program and was associated with greater odds for using inpatient care. Enrollment in the diabetes program resulted in more specialty care visits compared to individuals not enrolled in disease management.

Consistent with the observations in the subsample of respondents matched on their propensity for race concordance, the trust and satisfaction factor scores within the consumer satisfaction component of the Andersen framework were associated with fewer emergency care visits among respondents matched on the basis of gender concordance. High levels of satisfaction with their provider also reduced the odds for inpatient care use in this subsample. These findings may be a function of established patient-provider relationships that foster the detection of potential problems before they reach critical thresholds for higher levels of care.

Chapter Six has presented the results of a number of regression analyses that were designed to make causal inferences related to the five different dependent variables that measure the utilization of health services among individuals enrolled in the North Carolina Medicaid primary care case management delivery system. Chapter Seven assimilates these findings and, in conjunction with the findings related to the bivariate relationships that appeared in Chapter Five and the considerations related to the underlying theory and research hypotheses that were discussed in Chapters Two and Three, formulates discussion intended to address the research questions brought to the forefront in previous sections of the dissertation.

CHAPTER 7: DISCUSSION AND CONCLUSIONS

The primary focus of Chapter Seven is to answer the research questions that were proposed in Chapter Three by discussing the results obtained from the bivariate relationships (Chapter Five) and regression analyses (Chapter Six) as they apply to each question. The first portion of the chapter is dedicated to this purpose. In addition to resolving the study's research questions, the latter stages of Chapter Seven discuss the limitations of the research and offer policy implications associated with the study's conclusions.

Prior to initiating this discussion, a few remarks concerning health service utilization are appropriate. In the context of race- and gender-based health disparities, there is a natural tendency to think that less utilization of health services is a negative outcome and that more use of health care is desired. In fact, health care utilization can be a "double-edged sword," with the provision of more health care not necessarily congruent with better health outcomes. As the research questions are addressed in the following section, it is important to remember that the regression models express the dependent variable in terms of the number of health care visits reported by the respondent or the predicted odds of using care, thus making no attempt to draw distinctions between health care used and health care that improved outcomes.

7.1 Addressing the Research Questions

The essential research questions proposed in Chapter Three were oriented to discovering the impact of concordance on each of the five forms of health service utilization. The first of these asked, *“How does racial concordance between enrollee and primary care provider impact the utilization of primary care services?”* The Andersen model and the race concordance hypothesis suggest that racial or ethnic concordance between patient and provider would increase the number of primary care visits. Some support for the race concordance hypothesis was provided by examining the bivariate relationship between race concordance and primary care use among individuals matched on their propensity for race concordance. In this relationship, the proportion of enrollees who visited their primary care provider ten or more times was significantly greater among enrollees in the race concordant group (15.1%) compared to those in the race discordant group (11.5%) (see Table 5-14). However, when race concordance was employed as a predictor variable in an OLS regression model involving the same group of respondents, the number of primary care visits increased (see Table 6-1), but the increase was not statistically significant in the final regression (see Table 6-2). Among subjects matched on their propensity for gender concordance, race concordance between enrollee and primary care provider also increased the number of primary care visits (see Table 6-11) but, again, the increase was not statistically significant in the final regression (see Table 6-12). The lack of statistical significance with these findings suggests that enrollee – primary care provider race concordance does not directly impact the utilization of primary care.

The second research question asked, *“How does gender concordance between enrollee and primary care provider impact the utilization of primary care services?”*

Once again, the Andersen model and concordance theory suggest that gender concordance would increase the number of primary care visits. The bivariate relationship between gender concordance and primary care visits was not statistically significant among individuals matched on their propensity for gender concordance, although the proportion of enrollees who visited their primary care provider ten or more times was significantly greater among enrollees in the gender discordant group (15.2%) than in the gender concordant group (12.4%) (see Table 5-35). When gender concordance was employed as a predictor variable in an OLS regression model involving the same set of respondents, the number of primary care visits decreased (see Table 6-11), but the decrease was not statistically significant in the final regression (see Table 6-12). Among subjects matched on their propensity for race concordance, gender concordance between enrollee and primary care provider also decreased the number of primary care visits, but in this case, the decrease was statistically significant (see Table 6-2). These findings do not support the race concordance hypothesis and suggest that enrollee – primary care provider gender concordance may actually decrease the utilization of primary care. The findings may be explained by the fact that the proportion of male enrollees who were gender concordant (22.6%) was greater than the proportion of males who were gender discordant (15.4%) while a greater share of female enrollees was gender discordant (84.6%) than was gender concordant (77.4%) (see Table 5-24). This is probably a function of the patient-provider gender mismatch where 81.0% of the respondents were female, but only 46.4% of the providers associated with these respondents were female (see Table 5-50 and Table 5-51).

The third research question asked, *"How does racial concordance between enrollee and primary care provider impact the utilization of specialty care services?"* The impact on utilization under these conditions is less predictable. On the one hand, patient-provider concordance might be expected to facilitate access to specialty care by decreasing the social distance between patient and provider via improved communication and high levels of trust in the relationship. On the other hand, one of the central roles of the primary care provider in the primary care case management framework is that of the gatekeeper, which may limit access and the use of specialty care. The hypothetical nature of this relationship that was proposed in Chapter Three was that race concordance between beneficiary and primary care provider would increase the use of specialty care. The bivariate relationship between these variables among respondents matched on their propensity for inclusion in the race concordant group was not statistically significant, although the proportion of respondents who had 5-to-9 specialty care visits was significantly higher in the race concordant group (approximately 9%) compared to the race discordant group (6.5%) (see Table 5-15). When race concordance was employed as a predictor variable in an OLS regression model involving the same set of respondents, the number of specialty care visits increased (see Table 6-3), but this increase was not statistically significant in the final regression model (see Table 6-4). Among subjects matched on their propensity for gender concordance, race concordance between enrollee and primary care provider also increased the number of specialty care visits (see Table 6-13) but, again, this relationship was not statistically significant in the final model (see Table 6-14). The absence of statistical significance suggests that enrollee – primary care provider race concordance does not directly impact the utilization of specialty care.

The fourth research question asked, *"How does gender concordance between enrollee and primary care provider impact the utilization of specialty care services?"* Once again, the impact on utilization under these conditions is confounded by the gatekeeper role played by the primary care provider. The proposed hypothesis suggested that gender concordance between the enrollee and primary care provider would increase the use of specialty care. The bivariate relationship between gender concordance and specialty care utilization among enrollees matched on their propensity for inclusion in the gender concordant group was not statistically significant (see Table 5-36). When gender concordance was employed as an independent variable in an OLS regression model involving the same set of enrollees, the number of specialty care visits decreased (see Table 6-13) but the decrease was not statistically significant in the final regression (see Table 6-14). The same findings occurred when gender concordance was included as a predictor of specialty care among subjects matched on their propensity for race concordance (see Table 6-3 and Table 6-4). These findings do not support the proposed hypothesis of an increase in the number of specialty care visits and may be attributable to the conflicted nature of the primary care provider's gatekeeper role.

The fifth research question presented in Chapter Three was oriented to emergency care services. Specifically, *"How does racial concordance between enrollee and primary care provider impact the utilization of emergency care services?"* The race concordance hypothesis suggests that the social distance between patient and provider decreases when patient and provider are of the same race or ethnicity, resulting in more effective patient-provider relationships. Hypothetically, an effective, well-established patient – primary care provider relationship should result in the delivery of more preventive care, thereby reducing the number of potential emergency care situations. Additionally, a good patient-primary care provider relationship should decrease the likelihood that the enrollee would seek primary care in an emergency care setting. Thus, the theory suggests that race concordance should decrease the number of emergency care visits.

The bivariate relationship between race concordance and emergency care utilization among respondents matched on their propensity for race concordance was not statistically significant (see Table 5-16). When race concordance was employed as a predictor variable in an OLS regression model among the same set of respondents, the number of emergency care visits decreased (see Table 6-5). However, the decrease was not statistically significant (see Table 6-6). Among subjects matched on their propensity for gender concordance, race concordance between enrollee and primary care provider decreased the number of emergency care visits (see Table 6-15). However, this decrease was once again statistically insignificant in the final regression (see Table 6-16). These findings imply that enrollee – primary care provider race concordance does not directly impact the utilization of emergency care.

The sixth question shifts attention to gender concordance by asking, *"How does gender concordance between enrollee and primary care provider impact the utilization of emergency care services?"* Following the case that was presented above, concordance theory suggests that gender concordance should decrease the number of emergency care visits. The bivraiate relationship between gender concordance and emergency care utilization among individuals matched on their propensity for gender concordance was not statistically significant, despite the fact that the proportion of enrollees who did not use emergency care was significantly greater in the gender concordant group (63.3%)

compared to the gender discordant group (57.5%) (see Table 5-37). When gender concordance was included as a predictor variable in an OLS regression among the same set of respondents, the number of emergency care visits decreased (see Table 6-15). However, the decrease was not statistically significant in the final regression (see Table 6-16). Among subjects matched on their propensity for race concordance, gender concordance between enrollee and primary care provider also decreased the number of emergency care visits (see Table 6-5) and the decrease was not statistically significant in the final regression model (see Table 6-6). These findings indicate that enrollee – primary care provider gender concordance does not directly impact the utilization of emergency care.

The seventh essential question asks, *"How does racial concordance between enrollee and primary care provider impact the utilization of inpatient care services?"* As was the case for emergency care, conventional wisdom suggests that a well-established patient-primary care provider relationship built upon trust and effective communication would encourage the utilization of primary care and decrease the likelihood that the enrollee would experience episodes of care that escalate to the level requiring inpatient care.

The bivariate relationship between race concordance and inpatient care utilization was not significant among respondents matched on their propensity for inclusion in the race concordant group (see Table 5-17). When race concordance was included as a predictor variable in a logistic regression model among the same set of respondents, race concordance between enrollee and primary care provider decreased the predicted odds of using inpatient care (see Table 6-7). However, this decrease in the predicted odds was not statistically significant (see Table 6-8). When race concordance was included as a predictor variable in a logistic regression model among subjects matched on their propensity for gender concordance, race concordance decreased the predicted odds of inpatient care visits (see Table 6-17). However, this decrease in the predicted odds was also not statistically significant (see Table 6-18). These findings suggest that enrollee-primary care provider race concordance does not directly impact the likelihood of using inpatient care.

The eighth research question asks, *"How does gender concordance between enrollee and primary care provider impact the utilization of inpatient care services?"* The hypothesis proposed in Chapter Three indicated that gender concordance between enrollee and primary care physician would decrease the likelihood of using inpatient care. The bivariate relationship between gender concordance and inpatient care use among individuals matched on their propensity for gender concordance was statistically insignificant (see Table 5-38). When gender concordance was employed as a predictor variable in a logistic regression model with the same set of subjects, gender concordance increased the predicted odds of inpatient care visits (see Table 6-17). However, this relationship was not statistically significant (see Table 6-18). When gender concordance was used as a predictor variable in a logistic regression involving subjects matched on their propensity for race concordance, gender concordance decreased the predicted odds of inpatient care utilization (see Table 6-7). This relationship was not statistically significant (see Table 6-8). These contradictory and statistically insignificant findings do not support the proposed hypothesis that gender concordance between patient and primary care provider reduces the likelihood of using inpatient care.

The ninth question is focused on prescription drug use and asks, *"How does racial concordance between enrollee and primary care provider impact the utilization of prescription drugs?"* Much like specialty care, predicting the net effect of patient – primary care provider race concordance on prescription drug use is a bit uncertain. On one hand, a benefit of a well-established patient-provider relationship is regular doctor visits where drugs are prescribed preventively as an integral strategy in avoiding acute episodes of care that require more expensive treatments in the more expensive care settings. On the other hand, a different kind of benefit derived from a well-established patient – primary care provider relationship is the use of regular doctor visits where non-pharmacologic interventions such as dietary management, weight loss strategies, smoking cessation programs, and exercise regimens are promoted in lieu of prescription drugs. The hypothesis proposed in Chapter Three suggested that race concordance would increase the likelihood of using prescription drugs.

The bivariate relationship between race concordance and prescription drug use among respondents matched on their propensity for inclusion in the race concordant group was not statistically significant (see Table 5-18). However, when race concordance was introduced as a predictor variable in a logistic regression model involving the same set of individuals, race concordance decreased the predicted odds of prescription drug use (see Table 6-9) and the decrease was statistically significant (see Table 6-10). Among subjects matched on their propensity for gender concordance, race concordance between enrollee and primary care provider decreased the predicted odds of prescription drug use (see Table 6-19) and, once again, this relationship was statistically significant (see Table 6-20). If non-pharmacologic measures are embraced by primary care providers as a key element in promoting wellness, then these findings support the notion that patient – primary care provider race concordance affects prescription drug use by decreasing the likelihood of using prescription drugs.

Question ten asks, *"How does gender concordance between enrollee and primary care provider impact the utilization of prescription drugs?"* The underlying theory applied to question ten is the same as that described for question nine except that gender concordance replaces race concordance in the text. Among subjects matched on their propensity for inclusion in the gender concordant group, the bivariate relationship between gender concordance and prescription drug use was not significant. When gender concordance was employed as a predictor variable in a logistic regression model involving the same set of respondents, gender concordance between enrollee and primary care provider decreased the predicted odds of prescription drug use (see Table 6-19). This relationship was statistically significant (see Table 6-20). Among subjects matched on their propensity for race concordance, gender concordance between enrollee and primary care provider also decreased the predicted odds of prescription drug use (see Table 6-9). This decrease in the predicted odds for using prescription drugs was also statistically significant (see Table 6-10). These findings suggest that enrollee – primary care provider gender concordance impacts the use of prescription drugs.

Several other research questions arose as the topic of health service utilization was being considered and as the dissertation was being developed. One of these questions relates to the dissertation's theoretical foundation. Specifically, was the theoretical model that was selected a good choice? Stated differently, *"How effective was the Andersen model at explaining the various types of health utilization?"* The most objective way to answer this question is to provide a quantitative measure that expresses the percentage of explained variance in each of the dependent variables that measure health service utilization. The value of the adjusted R^2 for each of the forms of health service utilization that were analyzed by OLS regression – primary care, specialty care, and emergency care – is a logical choice, whereas evaluation of the classification tables and the Nagelkerke R^2 are the obvious choices for evaluating the health services analyzed using logistic regression techniques.

Recall that the values of the adjusted R^2 for primary, specialty, and emergency care in the final regression models for the subjects matched on their propensity for race concordance were 0.133, 0.139, and 0.081, respectively. Similarly, the values of the adjusted R^2 for primary, specialty, and emergency care in the final regression models for the subjects matched on their propensity for gender concordance were 0.134, 0.139, and 0.074, respectively. The corresponding interpretations of the adjusted R^2 values indicate that 13% of the variance in primary care, 14% in specialty care, and approximately 8% in emergency care is explained by Smith's adaptation to the Andersen model. Although the values of R^2 are respectable by social science standards, it is clear that the model does not explain a large proportion of the variance for these types of health services.

When considering the logistic regression models, the model improvements depicted by the classification tables were unimpressive in each of the regression runs. The value of the Nagelkerke R^2 statistics for the logistic regression models attempting to explain inpatient care did not fare much better with a value of 0.065 (6.5% of explained variance) for subjects matched on race concordance propensity and 0.072 (7.2% of explained variance) for subjects matched on gender concordance propensity. Smith's adaptation to the Andersen model appeared to be most effective for explaining variance in the use of prescription drugs with Nagelkerke R^2 values of 0.247 and 0.236 for individuals matched on race concordance propensity and gender concordance propensity, respectively.

Another compelling research question was related to *the effect that other model variables in the Andersen framework,* not withstanding race and gender concordance, *might have on the use of health services*. Table 6-21 and Table 6-22 provide summaries of the variables that were statistically significant predictors for each of the various health utilization measures and are laid out in accordance with the flow of the Andersen model. The following discussion is organized in a similar manner except that the role of the care networks is considered as a separate research question and discussed later in this section of Chapter Seven.

The enrollee's race, a predisposing characteristic in the Andersen model, was an important predictor of the utilization of health services. This was particularly true for black enrollees who, compared to whites, had significantly fewer primary and specialty care visits, more emergency care visits, and significantly lower predicted odds for using prescription drugs. When confronted with the fact that blacks had fewer primary care visits than whites, one is initially tempted to explain this as a potential problem with the delivery system or perhaps a function of lower socioeconomic status. These factors may indeed play a role in these findings. However, it is also important to note that among survey respondents, blacks reported that their health status was better than that reported by whites (Brandon, Schoeps, Sun, and Smith, 2008). This observation would also explain the fact that blacks used less specialty care than whites and had lower predicted odds for using prescription drugs than whites. It does not, however, explain the finding that blacks used more emergency care than whites, unless blacks were more predisposed than whites to substitute emergency care for primary care and sought their primary care in emergency care settings.

Two additional findings related to race achieved statistical significance. Asians used less primary care than whites among individuals matched on their propensity for race concordance and Latinos had higher predicted odds for using inpatient care than whites among individuals matched on their propensity for gender concordance. In both racial subgroups, the degree of patient – primary care provider race concordance among survey respondents was minimal (see Appendix C), allowing for the possibility that the race concordance hypothesis was responsible for these outcomes. Of course, other factors such as cultural influence or language barriers are equally plausible.

Gender, a second predisposing characteristic in the Andersen framework, was a significant predictor of the use of primary care. Among subjects matched on their propensity for race concordance and for gender concordance, females had significantly more primary care visits than males. This finding may be explained, in part, by the fact that there were no insurance-related barriers to care and that many of the mandatory and optional services and benefits in the Medicaid program are specifically targeted to low-income women and their children.

Age, a third predisposing characteristic, had little impact on the use of most types of care. The enrollee’s age was negatively related to emergency care utilization, with the number of emergency care visits decreasing by 0.1 visits for every 10-year increase in the respondent’s age among respondents matched on their propensity for race concordance and decreasing by 0.14 visits for every 10-year increase in the respondent's age among respondents matched on their propensity for gender concordance. This finding may be attributable to the fact that the age distribution of all survey respondents was relatively young, with approximately four of every five respondents less than 55 years of age.

Education, another predisposing characteristic, had a significant effect on the utilization of prescription drug and emergency care services. Individuals with education beyond the high school level had significantly higher predicted odds of using prescription drugs compared to individuals with an 8th-grade education or less among respondents matched on their propensity for race concordance. On the other hand, individuals in both the race concordance-matched and gender concordance-matched subsamples who did not complete high school had significantly more emergency care visits while individuals with some college-level education in the gender concordance-matched subsample had significantly fewer emergency care visits. The findings may suggest that higher levels of education are associated with healthier lifestyles and more preventive care behaviors.

Provider type, another predisposing characteristic, was a statistically significant predictor of utilization to the extent that enrollees who indicated that their personal provider was a specialist or a nurse used more specialty care than those who stated that they did not have one person they thought of as their personal doctor or nurse. In the case of specialists, this finding is not at all surprising. The finding does, however, indicate that in their role as gatekeeper, nurse providers may be more inclined to refer enrollees to specialists.

A consistent predictor of the utilization of health services was whether or not the enrollee encountered difficulties getting referrals to specialty care. This variable, also referred to in the text as the “access proxy” variable, is categorized as an enabling resource in the Andersen model. In almost all circumstances, individuals who reported that they had no problem getting these referrals used significantly less of each type of health care service or had predicted odds for using less of each type of health care service than individuals who claimed that they had a big problem getting specialty referrals. This consistent set of observations may be related to the manner in which the variable was constructed. Recall from Chapter Four that survey respondents who did not think that they needed to see a specialist (i.e., the “No” responses to question #18, “In the last 6 months, did you or a doctor think you needed to see a specialist?”) were consolidated with those who indicated that they did not have problem seeing a specialist. Thus, a number of individuals with relatively good self-reported health status were included in the “no problem obtaining specialty care” category and perhaps the variable is measuring health status as opposed to access. This account would certainly explain the significant decreases in the number of each type of health service visits. If this were the case, however, one would probably expect to see some evidence of multicollinearity with the health status factor score or any of the disease management program variables. Inspection of the tolerance and VIF statistics in each of the OLS regression tables that appear in Chapter Six does not indicate the presence of multicollinearity related to these variables.

The influence of region, an enabling resource, was limited to the use of primary care and prescription drugs. Individuals matched on their propensity for both race concordance and gender concordance who resided in the Coastal Plain region of the state had significantly more primary care visits than residents of the Piedmont region. In the gender concordant-matched subsample, individuals living in the Coastal Plain also had significantly lower predicted odds for using prescription drugs than residents of the Piedmont. These findings may be linked as more primary care visits may result in care strategies geared more toward non-pharmacologic interventions as opposed to the use of prescription drugs.

Clearly, the enrollee's perceived health status, an outcome in the Andersen model, was an important variable for predicting the use of health services. Individuals who experienced good health (i.e., had high health status factor scores) were predicted to use less of each of the five types of health services. This effect was observed among individuals matched on their propensity for both race concordance and gender concordance and was highly significant for most health services. The individual's evaluated health status, a different outcome in the Andersen framework and measured by formal enrollment in a disease management program, was also an important independent variable for predicting health utilization. Individuals enrolled in the disease management programs generally used or had higher predicted odds to use more of each of the various health services than individuals who were not enrolled in these programs. This finding is probably attributable to the likelihood that individuals enrolled in these programs have at least one, well-documented chronic condition that is difficult to manage and often associated with acute episodes of care.

High trust factor scores, a measure of trust and another outcome in the Andersen model, were associated with statistically significant decreases in the number of emergency care visits among respondents matched on their propensity for both race concordance and gender concordance. In the subsample of respondents matched for race concordance propensity, high trust factor scores also decreased the predicted odds of inpatient care utilization. These observations may be explained on theoretical grounds in a manner similar to that proposed for the impact of race/gender concordance on emergency or inpatient care. Patient – primary care provider relationships characterized by high levels of trust encourage the delivery of more preventive care thereby reducing the number of emergency care visits or the potential for inpatient care use. This finding is particularly relevant to this study because a high level of trust between patient and primary care provider is an anticipated outcome of race and gender concordance, neither of which was statistically significant in these care settings. Further research of this finding is warranted to determine if the direct impact of trust on emergency care visits is associated with an *indirect* effect of race or gender concordance on emergency care visits.

In a manner similar to the preceding discussion, high satisfaction factor scores, a measure of satisfaction and another outcome in the Andersen model, were associated with statistically significant decreases in emergency care visits among individuals matched on their propensity for both race concordance and gender concordance. In the subsample of respondents matched for gender concordance propensity, high satisfaction factor scores also decreased the predicted odds of inpatient care use. A plausible explanation for these findings is that patient – primary care provider relationships characterized by high levels of satisfaction encourage the delivery of more preventive care thereby reducing the number of emergency care visits or the potential for inpatient care use. As was the case for the trust factor score, further research of the satisfaction factor score is necessary to determine if the direct effect of satisfaction on emergency care utilization may be related to an indirect effect of race and gender concordance on emergency care and inpatient care use.

Another question that the study sought to answer was, *"How prevalent are race concordant relationships among individuals included in the various racial or ethnic subpopulations of this study?"* This was particularly salient among Hispanics, considering that the proportion of racial and ethnic minorities living in North Carolina has increased dramatically during the course of the last decade. For example, the Hispanic growth rate between 2000 and 2006 in North Carolina was 54.9%, placing it 5th overall among the fifty states in terms of the percentage change in the Hispanic or Latino population during that period (U.S. Census Bureau, 2008). With the extraordinary growth in the proportion of Hispanics, there has been a heightened interest in the health outcomes of this and other racial and ethnic populations. Along these lines, race concordant patient – provider relationships have the potential to significantly affect health outcomes.

The answer to the research question, unfortunately, is that there was not much race concordance among some of the low-frequency racial groupings. For example, Table 7-1 indicates that among respondents matched on their propensity for race concordance, 50% were race discordant, 36.9% were race concordant-white, and 12.3% were race concordant-black. Five respondents (0.2%) were race concordant-Asian/Pacific Islander/Native Hawaiian, eleven (0.5%) were race concordant-Native American/Alaska Native and only two (0.1%) were race concordant-Latino/Caribbean/South American. The situation was basically replicated among respondents matched on their propensity for gender concordance where 44.6% were race discordant, 43.6% were race concordant-white, 11.3% were race concordant-black, 0.1% (n = 2) were race concordant-Asian/Pacific Islander/Native Hawaiian, 0.4% (n =9) were race concordant-Native

Table 7-1: Percentage Distribution of Race Concordance by Race/Ethnicity

	Subjects Matched on Propensity for Race Concordance	Subjects Matched on Propensity for Gender Concordance
Race concordant – white	36.9%	43.6%
Race concordant – black	12.3%	11.3%
Race concordant – Asian	0.2%	0.1%
Race concordant – Native American	0.5%	0.4%
Race concordant – Latino	0.1%	0.0%
Race discordant	50.0%	44.6%

American/Alaska Native, and 0.0% (n = 1) was race concordant-Latino/Caribbean/South American. It is unclear from the available data if the low degree of concordance in some of these categories was due to a dearth of minority providers practicing in care networks where enrollees belonging to these racial and ethnic groups sought health care. What is clear is that the small number of concordant pairs in these groupings made it virtually impossible to make any meaningful comparisons among the low-frequency subpopulation groupings.

The next research question asked, "*What impact does enrollment in a specific care network have on the utilization of health services?*" Analyzing and interpreting the effect of the enrollee's care network on the utilization of health services is particularly problematic due to limitations of the data. The ideal care network to use as a comparison category would be one that had well-documented indicators of care and care outcomes. This information, however, was not readily available and in its absence the AccessCare Network Sites and Counties network (a1006) was selected as the comparison category because it was the one network that was geographically dispersed throughout the state. Thus, the care network comparisons are made to the AccessCare network (a1006) solely on the basis of geography and not because the AccessCare network (a1006) provides exemplary care, although that may, in fact, be the case. The analysis is further confounded by the fact that several of the geographically based care networks straddle regional lines thereby limiting the ability to use the region variable as a control variable.[39] These factors limit the ability to draw meaningful conclusions about the utilization of care in a given network and highlight the value in supplementing existing data with the appropriate outcome measures for future research and analysis.

Given the shortcomings of the data, several points related to care networks can be made. First, when compared to the AccessCare network (a1006), no care network was statistically significant for predicting the use of inpatient care. Second, enrollees in the Community Care of Wake/Johnston Counties (a1011) and Carolina Collaborative Community Care (a1013) networks had fewer primary care visits than enrollees in the AccessCare network (a1006). Third, enrollees in the Southern Piedmont Community Care Plans network (a2003) utilized more specialty and emergency care than enrollees in the AccessCare network (a1006). Fourth, enrollees in the Community Health Partners network (a1003) used more specialty care than enrollees in the AccessCare network (a1006). Finally, enrollees in the Sandhills Community Care network (a2005) had lower predicted odds for using prescription drugs than enrollees in the AccessCare network. Without more knowledge of the comparison category, it is impossible to make judgments about these observations.

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[39] For example, observed variation in care networks geographically contained within a single region could be compared to observed variation for the region as a whole. If the observations were of similar magnitude and direction, then one might argue that the effect could be attributable to region and not due to the care network. If the observations were of different directions, then one might argue more convincingly that the observation occurred as a result of variation among care networks.

The final research question asks, "*How do the concordant and discordant groups compare to one another*?" The answers to this question are found in the bivariate relationships described in Chapter Five. For the most part, the groups compared favorably to one another. There were more statistically significant differences among respondents matched on their propensity for race concordance compared to respondents matched on their propensity for gender concordance.

Among respondents matched on their propensity for race concordance, the race concordant and discordant groups differed significantly with respect to care network, enrollee's race, region, length of time with provider, chronicity, primary care use, provider race/ethnicity, and provider gender. Compared to the race discordant group, the race concordant group:

- had a higher proportion of white enrollees,
- was more likely to have either a white or black provider,
- was more likely to have a male provider,
- was more likely to live in the Piedmont region,
- was more likely to report a chronic condition that interfered with the respondent's quality of life,
- was more likely to have made at least 10 visits to their primary care provider in the 6 months prior to being surveyed, and
- was more likely to have received care in the Community Health Partners (a1003), Carolina Community Health Partnership (a1010), or Southern Piedmont Community Care Plans (a2003) networks.

On the other hand, when compared to the race concordant group, the race discordant group:

- had a higher proportion of minority enrollees,
- was more likely to have a provider that was neither white or black,
- was more likely to have a female provider,
- was more likely to live in the Coastal Plain region (although the majority of race discordant respondents lived in the Piedmont region),
- was less likely to report a chronic condition that interfered with the respondent's quality of life,

- was more likely to have made just one visit to their primary care provider in the 6 months prior to being surveyed, and
- was more likely to have received care in the Access II Care of Western North Carolina (a1007), Community Care of Wake/Johnston Counties (a1011), Carolina Collaborative Community Care (a1013), or the Community Care Plan of Eastern North Carolina (a2000) networks.

Among respondent matched on their propensity for gender concordance, the gender concordant and discordant groups differed statistically with respect to enrollee gender, length of time with provider, disease management status, and provider gender. Compared to the gender discordant group, the gender concordant group:

- had a higher proportion of male enrollees (although the majority of individuals in this group were female),
- had a lower proportion of beneficiaries enrolled in the asthma disease management program, and
- was more likely to have a female provider.

When compared to the gender concordant group, the gender discordant group:

- had a higher proportion of female enrollees,
- had a higher proportion of beneficiaries enrolled in the asthma disease management program, and
- was more likely to have a male provider.

This concludes the discussion of the research questions that were presented in Chapter Three of the dissertation. The answers to the essential research questions indicate that, when controlled for a number of variables in the Andersen model, race and gender concordance do not have a direct impact on the utilization of most types of health services conceptualized in the study. The exception was the statistically significant reduction in prescription drug use associated with both race and gender concordance. In terms of the explanatory effectiveness of Smith’s adaptation to the Andersen model, the impact of the model’s predictor variables on the utilization of health services reflects a number of the study’s limitations, which appear in the next section of Chapter Seven.

7.2 Limitations of the Study

A number of factors were present in this study that may limit the utility of the findings. Paramount among these is the fact that the measure of three forms of health service utilization – primary care, specialty care, and emergency care – is an upper-censored dependent variable that is not observed over its entire range in an OLS regression model. King, Keohane, and Verba (1994) describe the implications of this challenge in their discussion of the five essential rules to building good theories, one of which is focused on the importance of selecting and conceptualizing the dependent variable. This discussion emphasizes the bias that may be introduced when the entire range of variation in the dependent variable is unavailable to estimate the impact of the explanatory variables. In this case, the missing values in the dependent variable occurred as a result of the way in which the survey item was constructed and led to a less efficient estimation of effect, thereby compromising the ability to make causal inferences. An attempt was made to compensate for this shortcoming by recoding all relevant care visits in the five-to-nine visit range with a "midpoint" of seven visits and all episodes of care in excess of ten visits as ten visits. Nonetheless, without the benefit of actual claims data or more precision in the survey instrument, the ability to accurately identify more than five visits for primary, specialty, or emergency care in this OLS regression model was impaired. Use of a Tobit model, a censored regression model that is designed to analyze censored, or limited, dependent variables, may be a more effective technique than OLS regression to study this data and should be employed in subsequent research with this data in order to circumvent this problem (Tobin, 1958).

The recall ability of the respondent when answering survey questions related to the utilization of health services was another important limitation of the study. The primary concern was that self-reporting by respondents would jeopardize the accuracy of the actual number of visits patients had with their health providers. Once again, access to Medicaid claims data would alleviate this concern and might also be informative with regard to whether care was provided in the appropriate care setting. The use of claims data, however, would introduce additional costs and heighten privacy concerns.

Another limitation of the study was the low proportion of health service utilization explained by the regression models. This was evident in the OLS regression models where approximately 13% of primary care visits, 14% of specialty care visits, and 8% of emergency care visits were explained. A similar situation occurred with the logistic regression models used to explain inpatient care where 7% of the variance was explained. The logistic regression models explaining prescription drug use fared somewhat better with approximately 25% of the variance explained by the models. Although the proportion of explained variance associated with this study is respectable in the context of the standards applicable to social science research, it is clear that a number of relevant variables were either missing, unmeasured, or subject to measurement error in the models.

One possible explanation for the low proportion of explained variance lies with the extent of the data collected via the CAHPS survey. A number of the components in the Andersen framework were aligned with the data elements in the set collected by Brandon, Schoeps, Sun, and Smith (2008) via UNC Charlotte’s Urban Institute. However, there were some components within the Emerging Model – Phase Four where the data were either unavailable or not readily retrievable for application in Smith's adaptation. For instance, the Andersen model acknowledges the impact of political and economic factors in the external environment as important inputs for understanding health service utilization. These data elements were not explicitly solicited by the CAHPS survey instrument and were, therefore, unavailable in the data at hand. Furthermore, it was unclear as to whether there would be sufficient inter-subject variation related to these data elements to warrant using external, aggregate-level data to supplement the existing data. Given the time constraints for completing the dissertation, the time and effort involved in consulting additional data sources, and the uncertainty associated with achieving a productive and viable outcome, these data elements were not pursued for inclusion in this study.

Another area of Andersen's Emerging Model – Phase Four that influences health service utilization that was not explicitly represented in this study was the categorical reference to "personal health practices." The personal health practices specified within this component of the model include diet, exercise, and self care, each of which interacts with formal health services to influence utilization (Evans and Stoddart, 1990; Lalonde, 1975; U.S. Department of Health and Human Services, Public Health Service, 1990). The available data did not include elements related to these important aspects of personal health, which may, at least in part, contribute to the low proportion of explained variance revealed by the findings.

Another potential explanation for the low proportion of explained variance is the possibility that a different theoretical model may be more effective at predicting the use of health services. Rosenstock's (1966) health belief model, with its emphasis on health beliefs and personal preferences, or Fishbein's (1979) theory of reasoned action that underscores an individual's motivations, assessment of risk, and avoidance of negative outcomes, would have entailed additional collected data and would have been more difficult to quantify and measure, but, if operationalized, may have yielded more explained variance. Pescosolido and Boyer (2010) suggest several alternative theories of health utilization that come from a different perspective, with less focus on rational, self-conscious choices and geared more to the influence of social networks on utilization. Ciechanowski et al. (2002) approach health care utilization from yet a different perspective – the psychosomatic perspective of attachment theory – whereby one of four different attachment styles (Bartholomew and Horowitz, 1991) based upon earlier experiences with caregivers is an important factor in assessing symptom perception and health care utilization. Perhaps one of these alternative theories that attempt to explain health service utilization from a different and unique perspective would explain more variance in the use of health care.

Pescosolido and Boyer (2010) describe a different kind of limitation that may be applicable to this study by identifying problems associated with maintaining the integrity of model parsimony when stage models are used to explain the use of health services. The biggest drawback that they identify is that the models can become burdened with a number of feedback loops, thereby compromising the time order sequence of independent variable preceding the dependent variable. This form of model complexity compromises the ability to assert causal inference by diffusing explained variance to other variables that may be present in the model at the expense of the major dependent variable under study.

Typically, the cross-sectional research design that characterizes this study is plagued by a number of threats to internal validity that limit the utility of the findings. However, the use of propensity score matching techniques created concordant and discordant groups that allowed use of what amounts to a posttest only comparison group design that minimizes most of the threats to internal validity. Despite the propensity score matching, the threat of selection was not totally eliminated because the Medicaid enrollees were not randomly assigned to the two study groups.

The study's cross-sectional research design also limits observations to a single point in time, which constrains the ability to examine the effect of time on the research subjects' attitudes, beliefs, and behaviors. These constraints may be particularly relevant to operationalizing integral components of the patient-provider relationship such as trust and satisfaction, which may require some period of time to evolve and become established.

Another limitation of the study involves its *external validity*, or the generalizability of the study's finding to other contexts. The findings associated with a non-elderly, adult Medicaid population that is enrolled in a specific type of managed care arrangement and void of institutionalized long-term care enrollees may not be applicable to other Medicaid populations or to non-Medicaid populations that consist of children or the elderly. External validity may be of particular concern if the study's findings are extrapolated to the "working poor," who display many of the same traits typically associated with Medicaid populations but lack formal access to health care services via a public or private insurance arrangement.

The relatively low response rate to the survey limited the study's utility. The low response rate may have been attributable, in part, to compliance with practice standards that impose limits on the use of automated dialing devices to cell phones, thereby compromising the ability to survey enrollees who use cell phones as their primary mode of communication. Recent research, however, indicates that low response rates may not be problematic if there is no systematic bias in determining who responds to the survey or who does not respond (Groves, 2006; Keeter et al., 2006; Stang and Jöckel, 2004; Triplett, 2008).

Failure to collect data related to the provider's primary spoken language(s) prevented the creation of a language concordance variable. Language concordance plays a compelling role in establishing effective communication between provider and patient and would be useful in terms of separating the effect of language from the effect of race or ethnicity. The experience of Brandon, Schoeps, and Smith (2008) in this area is particularly noteworthy. Their work described the interplay between language and race and ethnicity in this population and the difficulty they encountered separating the effects of these variables. Additionally, Perez-Stable et al. (1997) reported that patient-provider language concordance might be more important than ethnic concordance with respect to patient reports of better well being and functioning.

A final consideration that may limit the research findings as they relate to the utilization of health services occurs as a result of discriminatory practices and racial stereotypes imposed upon black physicians in the time of legal segregation. There is some historical evidence that African American patients, particularly those who were wealthy, preferred white physicians to black physicians (Ward, 2003). This phenomenon was also observed in hospitals that routinely denied attending privileges to black physicians. Forty-six years have elapsed since the introduction of the Civil Rights Act that outlawed racial segregation and an entire generation of Americans has recalibrated its behavior and attitudes with respect to race relations. Though diminished, the vestiges of racial segregation continue to haunt American society. It is unclear from the available data how racial discrimination imposed upon minority physicians may impact the selection of a physician within this population. Unfortunately, this study's focus and time constraints preclude a thorough examination of this topic at this time. However, future research, grounded in qualitative research methodology, may be appropriate to enhance our understanding of provider choice in this context and the impact that this choice has on the utilization of health services.

7.3 Policy Implications

One of the stated goals of this dissertation that was previously mentioned in Chapter One was to make a contribution to what Kingdon (1984) refers to as the "policy stream" of ideas and proposals related to combating race and gender-based health disparities. The key findings of the dissertation suggest that for most forms of health services, race and gender concordance have no direct impact on utilization. The policy implications of these findings are discussed in the final portion of Chapter Seven by contextualizing the findings to those areas of public policy most relevant to eradicating health disparities.

The major policy area where the impact of race or gender concordance on the utilization of care is especially important is the establishment of a more diverse provider workforce (McGuire and Miranda, 2008; U.S. Department of Health and Human

Services, Health Resources and Services Administration, 2006; Greenfield, 2003; LaVeist et al., 2003). A snapshot of the proportion of minority health care providers in relation to the U.S. population at-large in 2000 revealed minority underrepresentation, particularly among non-Hispanic blacks and Hispanics, with respect to the three most pertinent medical professions associated with the delivery of primary care: physicians, nurses, and physician assistants (Association of American Medical Colleges, 2005). The data indicate that non-Hispanic blacks and Hispanics represented 12.3% and 12.5%, respectively, of the entire U.S. population in 2000. Yet, non-Hispanic blacks represented only 4.5% of the physician and surgeon workforce, 9.0% of registered nurses and 8.6% of physician assistants. Similarly, Hispanics represented only 5.1% of physicians and surgeons, 3.3% of registered nurses, and 8.1% of physician assistants (see Figure 7-1). Without interventions to change the status quo, the situation is likely to worsen over time as the observed rate of growth of the proportion of minorities relative to the proportion of

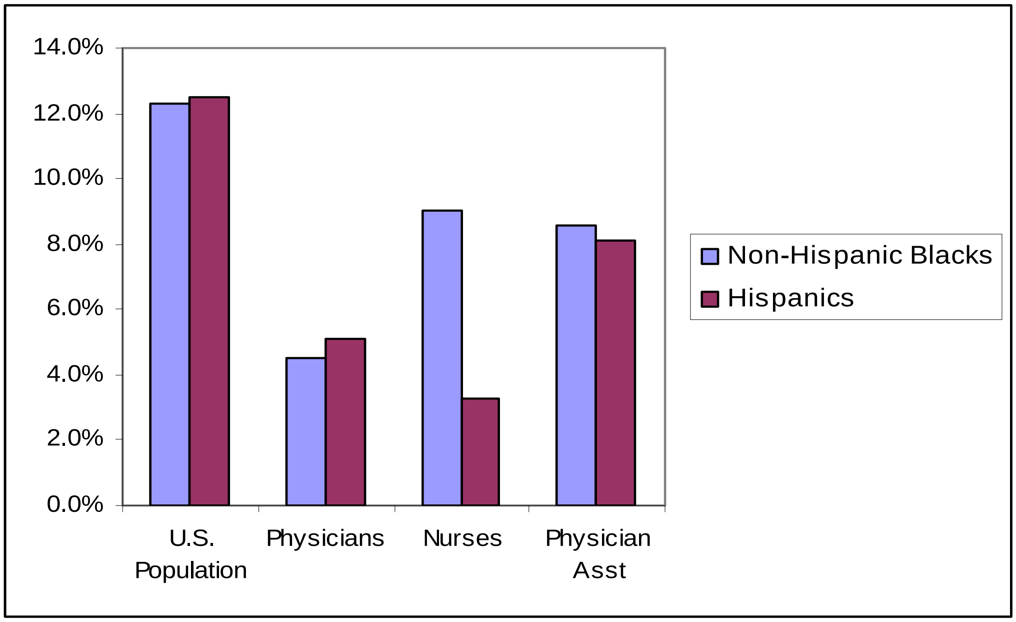

Figure 7-1: Underrepresentation of Minorities in Various Health Professions (2000)
Source: Association of American Medical Colleges, 2005.

whites in the United States is projected to result in more than half of the U.S. population being a member of a minority group by the middle of the twenty-first century (U.S. Census Bureau, 2001).[40]

Increasing the number of racial and ethnic minority health providers has been suggested as a policy proposal to combat the underrepresentation of minority providers (Association of American Medical Colleges, 2005). The rationale for this objective is aligned with the race concordance hypothesis: increasing the number of minority providers offers minorities greater opportunities to relate to a provider of their own racial or ethnic background, thereby improving the quality of communication and trust associated with the patient-provider relationship. Effective communication and high levels of trust should lead to better decision-making and better health outcomes. In some circumstances, better health outcomes may include more frequent and regular doctor visits or other types of health services.

Another policy area where the impact of race or gender concordance on the utilization of care is especially important is the development of more formal cultural sensitivity educational initiatives in the curriculums of professional schools. The primary goal of establishing a heightened sense of cultural awareness is to ensure that the desired outcomes associated with the "typical" race and gender concordant patient-provider relationship – effective communication, high levels of trust, better decision-making, etc. – are replicated in race and gender discordant relationships. Greenfield (2003, p. 326)

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[40] The U.S. Census Bureau (2001) reported that the rate of growth of minority populations in the United States rapidly outpaced the growth rate of the majority white population since 1980. Between 1980 and 2000, the white population grew by about 9% while the African American population increased by 28%, the Native American population by 55%, the Hispanic population by 122% and the Asian population by more than 190%. By the middle of the twenty-first century, more than one-half of the U.S. population is projected to be members of a minority group.

suggests that this training should include “sensitivity to varying beliefs and attitudes on matters of adherence, diet, exercise, choice of treatment, and risk aversion.”

The research conducted in this dissertation, however, suggests that, with the exception of prescription drugs, race and gender concordance between patient and primary care provider had no direct effect on the utilization of health services. Thus, one might infer from this research that policy initiatives directed at increasing the diversity of the health professional workforce or enhancing cultural sensitivity in professional school education curriculums are misguided and represent a suboptimal application of available resources. Before dismissing these initiatives, however, one must consider the study’s limitations, particularly in terms of measures and methods, as well as the other findings that were obtained from the study. For instance, recall that the study demonstrated that the satisfaction and trust factor scores were significant predictors of the number of emergency care visits and the predicted odds for using inpatient care. Given the body of literature documenting the association between concordance and patient satisfaction, it is reasonable to theorize that satisfaction or trust may be endogenous variables affected by race or gender concordance in the context of a larger, more complex path model. If this was the case, then race or gender concordance would have an *indirect* effect on the utilization of these forms of health care. It is also important to reiterate that data were not collected or were unavailable for a number of variables that impact the utilization of health services. For example, data related to the respondent’s diet and exercise, predictor variables classified as *personal health practices* by the Andersen framework, were not available while data pertaining to a number of respondents’ beliefs and attitudes were limited, unavailable, or difficult to measure. Additionally, the cross-sectional study design curtailed the ability to study the influence of time, particularly in relation to attitudes and beliefs. Measurement error associated with the upper-censored dependent variables in the OLS models and model specification concerns associated with use of the backward elimination method[41] in the various regression models are other examples of study limitations that must be considered when evaluating provider diversity proposals and professional school curriculum reforms that may be influenced by research that explores the impact of race and gender concordance on the utilization of health services.

Another important policy initiative that may be informed by the study involves the role of race and gender concordance research in the reporting of health care quality and health disparities. Greenfield (2003) suggests that this reporting should be standardized, interpretable, continuous, and controlled for socioeconomic status (SES). Barr (2008) describes socioeconomic status in terms of income, education, and occupational status while Scott and Leonhardt (2005) include the same dimensions, but add "wealth" to their description. Each of these dimensions, with the possible exception of occupational status, is controlled for in this study by the inclusion of an education variable and by virtue of the fact that all survey respondents were enrolled in a means-tested public assistance program targeted to low-income individuals. Thus, this research is uniquely positioned to make an immediate contribution to this area of health policy.

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[41] Recall that the various regression models were derived using the backward elimination method, a sequential search method that may maximize the predictive ability of the regression model, but may result in the exclusion of correlated predictor variables. Hair et al. (2006, p. 212) describe the situation where "two independent variables that have almost equal correlations with the dependent variable … are also highly correlated. If one of these variables enters the regression model, it is highly unlikely that the other variable will also enter because these variables are highly correlated and separately show little unique variance." In this study, variables that failed to achieve statistical significance at the $p < 0.05$ level when combined with the other variables present in the model were systematically removed from the regression model. The resultant model may have omitted variables that might be statistically significant if reintroduced at a later stage in the regression procedures. Hence, race or gender concordance may have been significant predictors of health service utilization had they been reintroduced into the regression models after they had been eliminated in the early stages of the regression procedures.

This study also presents a unique opportunity to evaluate outcomes in a primary care case management delivery system controlled for an individual's health insurance status, socioeconomic status, and care delivery system. This feature is especially fertile for health reform policy proposals oriented to using care management programs and the medical home model[42] as their method of health care delivery, given the role that these care models may play in improving quality and coordinating care in future reform proposals (Dean, Volsky, and Shakir, 2009).

Barr (2008) provides an excellent account of the deleterious effects on health imposed by the interaction of environmental stress and allostatic load on individuals of low socioeconomic status. In the same light, Williams and Jackson (2005) examine the negative impact of residential segregation on health and suggest modifications to housing policy as a mechanism toward reducing race-based health disparities. Policy initiatives aimed at eliminating social disparities are essential to reducing health disparities and worthy of pursuit. Although this dissertation was not specifically directed to examining environmental and social impacts on health disparities, it does provide an account of the health behaviors and health outcomes occurring in a low SES population, which may have some value in terms of informing policymakers in these specialized areas of public policy.

Chapter Seven has answered the study's research questions, described its limitations, and provided a brief description of the policy implications and policy areas

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[42] The medical home model links patients with primary care providers who provide "acute and preventive care, (manage) chronic illnesses, (coordinate) specialty care, and (provide) 24/7 on-call assistance" (Kaiser Commission on Medicaid and the Uninsured, 2009, p.1). Under this type of care delivery model, provider initiatives that emphasize health promotion, disease prevention, and the use of less expensive care venues (i.e., avoiding emergency room visits via after-hours accessibility) are reimbursed at higher rates (Kaiser Health News, 2009).

where the research may be applied. In a larger context, the dissertation makes a unique contribution to the literature examining the impact of race and gender concordance on the utilization of health services because of its ability to control for health insurance status and most of the widely accepted dimensions of socioeconomic status. The research should be a valuable asset to policymakers tasked with determining the appropriate levels of resources that ensure adequate utilization of health services that may ultimately diminish disparities in health outcomes.

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APPENDIX A: NORTH CAROLINA MEDICAID CAHPS 3.0 2006 ADULT SURVEY QUESTIONNAIRE

North Carolina Medicaid
CAHPS® 3.0 Adult Survey
2006

MID#_______________
GROUP#____________
COUNTY#___________

INTRODUCTION: “Hello, this is ___________________ and I am calling from the University of North Carolina at Charlotte on behalf of North Carolina Medicaid in connection with an effort to improve health care.

Is this the home of _______________________?
target respondent

IF NOT, say, “Do you know the phone number where I might reach *target respondent*? (record new phone number and then call.

IF YES, say, “I’d like to talk with *target respondent* about his/her healthcare, is *he/she* available?”

IF PERSON AVAILABLE: When selected person answers, repeat introduction and continue.

IF PERSON NOT AVAILABLE: “Can you tell me a convenient time to call back to speak with (him/her)?” RECORD CALL BACK NOTES

Let me tell you a little about the study before we continue. This interview will last approximately 20 minutes. We want you to know that your answers are confidential. You are a volunteer and may stop at any time. Your Medicaid benefits will not be affected in any way by your participation in the survey. No one at the doctor’s office or Medicaid will see any names or know how you answered. May I continue with the interview?

1. YES – Start Interview
2. No – “Thank you for your time.”

1. Our records show that you are now in Carolina Access or Medicaid. Is that right?

1☐ Yes ➔ **If Yes, Go to Question 2**
2☐ No ➔**If No, End Survey**

YOUR PERSONAL DOCTOR OR NURSE

The next questions ask about your own health care. Do not include care you got when you stayed overnight in a hospital. Do not include the times you went for dental care visits.

2. A personal doctor or nurse is the health provider who knows you best. This can be a general doctor, a specialist doctor, a nurse practitioner, or a physician assistant. Do you have one person you think of as your personal doctor or nurse?

1☐ Yes
2☐ No ➔**If No, Go to Question 9**

3. Is this person a general doctor, a specialist doctor, a physician assistant, or a nurse?

1☐ General Doctor (Family Practice or Internal Medicine)
2☐ Specialist Doctor
3☐ Physician Assistant
4☐ Nurse

4. How many months or years have you been going to your personal doctor or nurse?

1☐ Less than 6 months
2☐ At least 6 months but less than 1 year
3☐ At least 1 year but less than 2 years
4☐ At least 2 years but less than 5 years
5☐ 5 or more years

5. Do you have a physical or medical condition that seriously interferes with your ability to work, attend school, or manage your day-to-day activities?

1☐ Yes
2☐ No ➔ **If No, Go to Question 7**

6. Does your personal doctor or nurse understand how any health problems you have affect your day-to-day life?

1☐ Yes
2☐ No

7. Using <u>any number from 0 to 10</u> where 0 is the worst personal doctor or nurse possible and 10 is the best personal doctor or nurse possible, what number would you use to rate your personal doctor or nurse?

0☐ 0 Worst personal doctor or nurse possible
1☐ 1
2☐ 2
3☐ 3
4☐ 4
5☐ 5
6☐ 6
7☐ 7
8☐ 8
9☐ 9
10☐ 10 Best personal doctor or nurse possible

8. Did you have the same personal doctor or nurse <u>before</u> you joined Carolina Access or Medicaid?

1☐ Yes ➔ **If Yes, Go to Question 10**
2☐ No

9. Since you joined Carolina Access or Medicaid, how much of a problem, if any, was it to get a personal doctor or nurse you are happy with?

1☐ A big problem
2☐ A small problem
3☐ Not a problem

TRUST IN YOUR PROVIDER

Please think about the doctor or nurse you usually see when you are sick or need advice about your health.

10. Is this doctor or nurse a male or female?

- 1☐ Male
- 2☐ Female

11. What is the race of this doctor or nurse?

- 1☐ White
- 2☐ Black or African-American
- 3☐ Asian
- 4☐ Native Hawaiian or other Pacific Islander
- 5☐ American Indian or Alaska Native
- 6☐ Other

Please think of this personal doctor or nurse. For each of the following statements, tell me whether you strongly agree, somewhat agree, somewhat disagree, or strongly disagree.

12. I think my doctor or nurse may not refer me to a specialist when needed.

- 1☐ Strongly Agree
- 2☐ Somewhat Agree
- 3☐ Neither Agree/Disagree
- 4☐ Somewhat Disagree
- 5☐ Strongly Disagree

13. I trust my doctor or nurse to put my medical needs above all other considerations when treating my medical problems.

- 1☐ Strongly Agree
- 2☐ Somewhat Agree
- 3☐ Neither Agree/Disagree
- 4☐ Somewhat Disagree
- 5☐ Strongly Disagree

14. I think my doctor or nurse is strongly influenced by government rules when making decisions about my medical care.

- 1☐ Strongly Agree
- 2☐ Somewhat Agree
- 3☐ Neither Agree/Disagree
- 4☐ Somewhat Disagree
- 5☐ Strongly Disagree

15. I sometimes think that my doctor or nurse might perform unnecessary tests or procedures.

1☐ Strongly Agree
2☐ Somewhat Agree
3☐ Neither Agree/Disagree
4☐ Somewhat Disagree
5☐ Strongly Disagree

16. My doctor's or nurse's medical skills are not as good as they should be.

1☐ Strongly Agree
2☐ Somewhat Agree
3☐ Neither Agree/Disagree
4☐ Somewhat Disagree
5☐ Strongly Disagree

17. My doctor or nurse always pays full attention to what I am trying to tell him or her.

1☐ Strongly Agree
2☐ Somewhat Agree
3☐ Neither Agree/Disagree
4☐ Somewhat Disagree
5☐ Strongly Disagree

GETTING HEALTH CARE FROM A SPECIALIST

When you answer the next questions,
<u>do not</u> include dental visits.

18. <u>Specialists</u> are doctors like surgeons, heart doctors, allergy doctors, skin doctors, and others who specialize in one area of health care. In the last 6 months, did you or a doctor think you needed to see a specialist?

1☐ Yes
2☐ No ➔ **If No, Go to Question 20**

19. In the last 6 months, how much of a problem, if any, was it to see a specialist that you needed to see?

1☐ A big problem

2☐ A small problem
3☐ Not a problem

20. In the last 6 months, did you see a specialist?

1☐ Yes
2☐ No ➔**If No, Go to Question 24**

21. In the last 6 months, how many times did you go to specialists for care for yourself?

1☐ 1
2☐ 2
3☐ 3
4☐ 4
5☐ 5 to 9
6☐ 10 or more

22. We want to know your rating of the <u>specialist you saw most often</u> in the last 6 months.
Using <u>any number from 0 to 10</u> where 0 is the worst specialist possible and 10 is the best specialist possible, what number would you use to rate the specialist?

0☐ 0 Worst specialist possible
1☐ 1
2☐ 2
3☐ 3
4☐ 4
5☐ 5
6☐ 6
7☐ 7
8☐ 8
9☐ 9
10☐ 10 Best specialist possible

23. In the last 6 months, was the specialist you saw most often the same doctor as your personal doctor?

1☐ Yes
2☐ No

YOUR HEALTH CARE IN THE LAST 6 MONTHS

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24. In the last 6 months, did you call a doctor's office or clinic <u>during regular office hours</u> to get help or advice <u>for yourself</u>?

1☐ Yes
2☐ No ➔ **If No, Go to Question 26**

25. In the last 6 months, when you called during regular office hours, how often did you <u>get</u> the help or advice you <u>needed</u>?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

26. In the last 6 months, did you have an illness, injury, or condition that <u>needed care right away</u> in a clinic, emergency room, or doctor's office?

1☐ Yes
2☐ No ➔ **If No, Go to Question 28**

27. In the last 6 months, when you <u>needed care right away</u> for an illness, injury, or condition, how often did you get care as soon as you wanted?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

28. A <u>health provider</u> could be a general doctor, a specialist doctor, a nurse practitioner, a physician assistant, a nurse, or anyone else you would see for health care.
In the last 6 months, not counting the times you needed health care right away, did you make any <u>appointments</u> with a doctor or other health provider for health care?

1☐ Yes
2☐ No ➔ **If No, Go to Question 30**

29. In the last 6 months, not counting times you needed health care right away, how often did you get an appointment for health care as soon as you wanted?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

30. In the last 6 months, how many times did you go to an <u>emergency room</u> to get care for yourself?

☐ None

1☐ 1
2☐ 2
3☐ 3
4☐ 4
5☐ 5 to 9
6☐ 10 or more

31. In the last 6 months (not counting times you went to an emergency room), how many times did you go to a <u>doctor's office or clinic</u> to get care for yourself?

0☐ None ➔ **If None, Go to Question 45**
1☐ 1
2☐ 2
3☐ 3
4☐ 4
5☐ 5 to 9
6☐ 10 or more

32. In the last 6 months, how much of a problem, if any, was it to get the care, tests, or treatments you or a doctor believed necessary?

1☐ A big problem
2☐ A small problem
3☐ Not a problem

33. In the last 6 months, how often were you taken to the exam room <u>within 15 minutes</u> of your appointment?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

34. In the last 6 months, how often did office staff at a doctor's office or clinic treat you with <u>courtesy and respect</u>?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

35. In the last 6 months, how often were office staff at a doctor's office or clinic as <u>helpful</u> as you thought they should be?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

36. In the last 6 months, how often did doctors or other health providers <u>listen carefully to you</u>?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

37. In the last 6 months, how often did you have a hard time <u>speaking with or understanding</u> a doctor or other health providers because you spoke different languages?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

38. In the last 6 months, how often did doctors or other health providers <u>explain things</u> in a way you could understand?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

39. In the last 6 months, how often did doctors or other health providers show <u>respect for what you had to say</u>?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

40. We want to know how you, your doctors, and other health providers make decisions about your health care. In the last 6 months, were any decisions made about your health care?

1☐ Yes
2☐ No ➔ **If No, Go to Question 43**

41. In the last 6 months, how often were you involved as must as you wanted in these decisions about your health care?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

42. In the last 6 months, how much of a problem, if any, was it to get your doctors or other health providers to agree with you on the best way to manage your health conditions or health problems?

1☐ A big problem
2☐ A small problem
3☐ Not a problem

43. In the last 6 months, how often did doctors or other health providers <u>spend enough time</u> with you?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

44. Using <u>any number from 0 to 10</u> where 0 is the worst health care possible and 10 is the best health care possible, what number would you use to rate all your health care in the last 6 months?

0☐ 0 Worst health care possible
1☐ 1
2☐ 2

3☐ 3
4☐ 4
5☐ 5
6☐ 6
7☐ 7
8☐ 8
9☐ 9
10☐ 10 Best health care possible

45. In the last 6 months, did you have a health problem for which you needed special medical equipment, such as a cane, a wheelchair, or oxygen equipment?

1☐ Yes
2☐ No ➔**If No, Go to Question 47**

46. In the last 6 months, how much of a problem, if any, was it to get the special medical equipment you needed through Carolina Access or Medicaid?

1☐ A big problem
2☐ A small problem
3☐ Not a problem

47. In the last 6 months, did you have any health problems that needed special therapy, such as physical, occupational, or speech therapy?

1☐ Yes
2☐ No ➔**If No, Go to Question 49**

48. In the last 6 months, how much of a problem, if any, was it to get the special therapy you needed through Carolina Access or Medicaid?

1☐ A big problem
2☐ A small problem
3☐ Not a problem

49. Home health care, or assistance means home nursing, help with bathing or dressing, and help with basic household tasks. In the last 6 months, did you need someone to come into your home to give you home health care or assistance?

1☐ Yes
2☐ No ➔**If No, Go to Question 51**

50. In the last 6 months, how much of a problem, if any, was it to get the care or assistance you needed through Carolina Access or Medicaid?

1☐ A big problem
2☐ A small problem
3☐ Not a problem

51. An interpreter is someone who repeats or signs what one person says in a language used by another person.
In the last 6 months, did you <u>need</u> an interpreter to help you speak with doctors or other health providers?

1☐ Yes
2☐ No ➔**If No, Go to Question 53**

52. In the last 6 months, when you needed an interpreter to help you speak with doctors or other health providers, how often did you get one?

1☐ Never
2☐ Sometimes
3☐ Usually
4☐ Always

PRESCRIPTION MEDICATIONS

53. In the last 6 months, did you get any new prescription medicine or refill a prescription?

1☐ Yes
2☐ No ➔ **If No, Go to Question 56**

54. In the last 6 months, how much of a problem, if any, was it to get your prescription medicine from Carolina Access or Medicaid?

1☐ A big problem
2☐ A small problem
3☐ Not a problem

55. In the last 6 months, how often did you get the prescription medicine you needed through Carolina Access or Medicaid?

1☐ Never
2☐ Sometimes

3☐ Usually
4☐ Always

CAROLINA ACCESS OR MEDICAID

The next question asks about your experience with <u>Carolina Access or Medicaid</u>.

56. Using <u>any number from 0 to 10</u> where 0 is the worst Carolina Access or Medicaid possible and 10 is the best Carolina Access or Medicaid possible, what number would you use to rate Carolina Access or Medicaid now?

0☐ 0 Worst possible
1☐ 1
2☐ 2
3☐ 3
4☐ 4
5☐ 5
6☐ 6
7☐ 7
8☐ 8
9☐ 9
10☐ 10 Best possible

ABOUT YOU

57. In general, how would you rate your <u>overall health now</u>?

1☐ Excellent
2☐ Very good
3☐ Good
4☐ Fair
5☐ Poor

58. Because of any impairment or health problem, do you need the help of other persons with your personal care needs, such as eating, dressing, or getting around the house?

[1]☐ Yes

[2]☐ No

59. Because of any impairment or health problem, do you need help with your routine needs, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes?

[1]☐ Yes

[2]☐ No

60. Do you have a physical or medical condition that seriously interferes with your independence, participation in the community, or quality of life?

[1]☐ Yes

[2]☐ No

61. In the last 6 months, have you been a patient in a hospital overnight or longer?

[1]☐ Yes

[2]☐ No

62. Do you now have any physical or medical conditions that have lasted for at least 3 months? (Women: Do not include pregnancy).

[1]☐ Yes

[2]☐ No ➔**If No, Go to Question 65**

63. In the last 6 months, have you seen a doctor or health provider more than twice for any of these conditions?

[1]☐ Yes

[2]☐ No

64. Have you been taking prescription medicine for at least 3 months for any of these conditions?

[1]☐ Yes

[2]☐ No

65. In the last six months, have you received health care from a provider who is not paid for by Medicaid, such as a faith healer or herbalist?

[1]☐ Yes

[2]☐ No

66. What is your age now?

1☐ 18 to 24
2☐ 25 to 34
3☐ 35 to 44
4☐ 45 to 54
5☐ 55 to 64
6☐ 65 to 74
7☐ 75 or older

67. Are you male or female?

1☐ Male
2☐ Female

68. What is the highest grade or level of school that you have completed?

1☐ 8th grade or less
2☐ Some high school, but did not graduate
3☐ High school graduate or GED
4☐ Some college or 2-year degree
5☐ 4-year college graduate
6☐ More than 4-year college degree

69. Are you of Hispanic or Latino origin or descent?

1☐ Yes, Hispanic or Latino
2☐ No, not Hispanic or Latino

70. What is your race? Please mark one or more.

1☐ White
2☐ Black or African-American
3☐ Asian
4☐ Native Hawaiian or other Pacific Islander
5☐ American Indian or Alaska Native
6☐ Other

71. What language do you mainly speak at home?

1☐ English

2☐ Spanish
3☐ Some other language
(Please print)
____
____

72. Which is your preferred way to receive information about Medicaid and Carolina Access so that you can best remember the information? Please choose only one answer.

1☐ A written brochure or pamphlet
2☐ Audio CD
3☐ VHS Video Tape
4☐ DVD
5☐ TV
6☐ Radio
7☐ Internet
8☐ Email
9☐ Magazine
10☐ Other

73. Do you know how to use a computer?

1☐ Yes
2☐ No - If no, go to question 77

74. Do you use the internet?

1☐ Yes
2☐ No - If no, go to question 77

75. Where do you most often use the internet? Please choose only one answer.

1☐ Home
2☐ School/Work
3☐ Public Library
4☐ Friend's/Family's House
5☐ Church
6☐ Other

76. How often do you use the internet?

1☐ Daily
2☐ Once/Week
3☐ Several Times/Week
4☐ A few times/month
5☐ Once/month or less often

77. Do you watch DVDs?

1☐ Yes
2☐ No - If no, go to question 81

78. Where do you most often watch DVDs? Please choose only one answer.

1☐ Home
2☐ School/Work
3☐ Public Library
4☐ Friend's/Family's House
5☐ Church
6☐ Other

79. How often do you watch DVDs?

1☐ Daily
2☐ Once/Week
3☐ Several Times/Week
4☐ A few times/month
5☐ Once/month or less often

80. If you were to receive a DVD about Medicaid and Carolina Access, would you be most likely to watch it if you received it from:

1☐ Your doctor's office?
2☐ The mail
3☐ Your Medicaid Case Worker
4☐ Other ______________

81. What would most attract you to read or look at information about Medicaid and Carolina Access? Please choose only one answer.

1☐ A famous person
2☐ Someone of your own race or ethnic group

3☐ A Cartoon
4☐ Other ___________________

82. In an emergency situation related to your health, what is the quickest way for you to receive information? Please choose only one answer.

1☐ Email
2☐ Cell Phone
3☐ Home Phone
4☐ Work/School
5☐ TV
6☐ Church
7☐ Radio
8☐ Other

INTERVIEWER EVALUATION:

83. Were there any questions you thought might not have been understood?

1☐ Yes
2☐ No

84. First question misunderstood:______________

85. Second question misunderstood:___________

86. Third question misunderstood:____________

87. How you you rate the respondent's overall cooperation during the interview?

1☐ Excellent
2☐ Good
3☐ Fair
4☐ Poor

88. Any other comments (BE SPECIFIC):

____

____

____

APPENDIX B: PERCENTAGE DISTRIBUTIONS OF SURVEY QUESTIONS

1. Our records show that you are now in Carolina Access or Medicaid. Is that right? (n=2815)

Yes	No
100%	0%

2. A personal doctor or nurse is the health provider who knows you best. This can be a general doctor, a specialist doctor, a nurse practitioner, or a physician assistant. Do you have one person you think of as your personal doctor or nurse? (n=2808)

Yes	No
79.6%	20.4%

3. Is this person a general doctor, a specialist doctor, a physician assistant, or a nurse? (n=2217)

General Doctor	Specialist	Physician Assistant	Nurse
77.1%	11.8%	7.5%	3.6%

4. How many months or years have you been going to your personal doctor or nurse? (n=2226)

Less than 6	6 month-1 year	1 year-2 year	2 years-5 years	5 or more years
6.3%	6.1%	13.8%	31.5%	42.3%

5. Do you have a physical or medical condition that seriously interferes with your ability to work, attend school, or manage your day-to-day activities? (n=2234)

Yes	No
70.0%	30.0%

6. Does your personal doctor or nurse understand how any health problems you have affect your day-to-day life? (n=1547)

Yes	No
96.1%	3.9%

7. Using any number from 0 to 10 where 0 is the worst personal doctor or nurse possible and 10 is the best personal doctor or nurse possible, what number would you use to rate your personal doctor or nurse? (n=2213)

0 through 7	8-9	10
14.9%	32.0%	53.1%

8. Did you have the same personal doctor or nurse <u>before</u> you joined Carolina Access or Medicaid? (n=2213)

Yes	No
38.9%	61.1%

9. Since you joined Carolina Access or Medicaid, how much of a problem, if any, was it to get a personal doctor or nurse you are happy with? (n=1916)

A big problem	A small problem	Not a problem
11.4%	12.4%	76.2%

10. Is this doctor or nurse a male or female? (n=2717)

Male	Female
57%	43%

11. What is the race of this doctor or nurse? (n=2538)

Black	Other	White
17.4%	13.3%	69.3%

12. I think my doctor or nurse may not refer me to a specialist when needed. (n=2743)

Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree
12.1%	6.4%	2.3%	12.8%	66.4%

13. I trust my doctor or nurse to put my medical needs above all other considerations when treating my medical problems. (n=2758)

Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree
78.1%	14.3%	1.4%	2.7%	3.5%

14. I think my doctor or nurse is strongly influenced by government rules when making decisions about my medical care. (n=2688)

Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree
47%	14.9%	10.6%	9.7%	17.8%

15. I sometimes think that my doctor or nurse might perform unnecessary tests or procedures. (n=2748)

Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree
6.8%	4.6%	2%	13.8%	72.8%

16. My doctor's or nurse's medical skills are not as good as they should be. (n=2739)

Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree
7.1%	5.8%	3.4%	11.9%	71.8%

17. My doctor or nurse always pays full attention to what I am trying to tell him or her. (n=2763)

Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree
80.6%	10.4%	0.8%	3.7%	4.5%

18. Specialists are doctors like surgeons, heart doctors, allergy doctors, skin doctors, and others who specialize in one area of health care. In the last 6 months, did you or a doctor think you needed to see a specialist? (n=2801)

Yes	No
47.6%	52.4%

19. In the last 6 months, how much of a problem, if any, was it to see a specialist that you needed to see? (n=1325)

A big problem	A small problem	Not a problem
14.6%	10.9%	74.5%

20. In the last 6 months, did you see a specialist? (n=2803)

Yes	No
45.4%	54.6%

21. In the last 6 months, how many times did you go to specialists for care for yourself? (n=1257)

1	2	3	4	5-9	10 or more
24.6%	24.7%	14.4%	10%	17%	9.3%

22. We want to know your rating of the specialist you saw most often in the last 6 months. Using any number from 0 to 10 where 0 is the worst specialist possible and 10 is the best specialist possible, what number would you use to rate the specialist? (n=1256)

0 through 7	8-9	10
17.0%	27.2%	55.7%

23. In the last 6 months, was the specialist you saw most often the same doctor as your personal doctor? (n=1266)

Yes	No
20.8%	79.2%

24. In the last 6 months, did you call a doctor's office or clinic <u>during regular office hours</u> to get help or advice <u>for yourself</u>? (n=2806)

Yes	No
56.3%	43.7%

25. In the last 6 months, when you called during regular office hours, how often did you <u>get</u> the help or advice you <u>needed</u>? (n=1575)

Never	Sometimes	Usually	Always
4.2%	14.3%	16%	65.5%

26. In the last 6 months, did you have an illness, injury, or condition that <u>needed care right away</u> in a clinic, emergency room, or doctor's office? (n=2807)

Yes	No
44.4%	55.6%

27. In the last 6 months, when you <u>needed care right away</u> for an illness, injury, or condition, how often did you get care as soon as you wanted? (n=1240)

Never	Sometimes	Usually	Always
5%	14.9%	14.8%	65.3%

28. A <u>health provider</u> could be a general doctor, a specialist doctor, a nurse practitioner, a physician assistant, a nurse, or anyone else you would see for health care. In the last 6 months, not counting the times you needed health care right away, did you make any <u>appointments</u> with a doctor or other health provider for health care? (n=2806)

Yes	No
61.1%	38.9%

29. In the last 6 months, not counting times you needed health care right away, how often did you get an appointment for health care as soon as you wanted? (n=1702)

Never	Sometimes	Usually	Always
2.9%	14.2%	22.6%	60.3%

30. In the last 6 months, how many times did you go to an <u>emergency room</u> to get care for yourself? (n=2796)

0	1	2	3	4	5-9	10 or more
61.3%	18%	10.3%	4.6%	2.7%	2.2%	0.9%

31. In the last 6 months (not counting times you went to an emergency room), how many times did you go to a <u>doctor's office or clinic</u> to get care for yourself? (n=2776)

0	1	2	3	4	5-9	10 or more
15.6%	13.9%	17.5%	13%	8.4%	18.5%	13.1%

32. In the last 6 months, how much of a problem, if any, was it to get the care, tests, or treatments you or a doctor believed necessary? (n=2373)

A big problem	A small problem	Not a problem
5.4%	11.1%	83.5%

33. In the last 6 months, how often were you taken to the exam room within 15 minutes of your appointment? (n=2354)

Never	Sometimes	Usually	Always
20.1%	25.9%	22.2%	31.8%

34. In the last 6 months, how often did office staff at a doctor's office or clinic treat you with courtesy and respect? (n=2374)

Never	Sometimes	Usually	Always
1%	6.2%	9.4%	83.4%

35. In the last 6 months, how often was office staff at a doctor's office or clinic as helpful as you thought they should be? (n=2374)

Never	Sometimes	Usually	Always
1.5%	11.6%	16.1%	70.8%

36. In the last 6 months, how often did doctors or other health providers listen carefully to you? (n=2371)

Never	Sometimes	Usually	Always
1.4%	8.7%	14.5%	75.4%

37. In the last 6 months, how often did you have a hard time speaking with or understanding a doctor or other health providers because you spoke different languages? (n=2379)

Never	Sometimes	Usually	Always
86.1%	9.9%	1.6%	2.4%

38. In the last 6 months, how often did doctors or other health providers explain things in a way you could understand? (n=2375)

Never	Sometimes	Usually	Always
2.9%	8.1%	13.2%	75.7%

39. In the last 6 months, how often did doctors or other health providers show respect for what you had to say? (n=2369)

Never	Sometimes	Usually	Always
1.6%	8.4%	11.8%	78.2%

40. We want to know how you, your doctors, and other health providers make decisions about your health care. In the last 6 months, were any decisions made about your health care? (n=2361)

Yes	No
57.3%	42.7%

41. In the last 6 months, how often were you involved as much as you wanted in these decisions about your health care? (n=1349)

Never	Sometimes	Usually	Always
2.1%	9.8%	12.6%	75.5%

42. In the last 6 months, how much of a problem, if any, was it to get your doctors or other health providers to agree with you on the best way to manage your health conditions or health problems? (n=1344)

A big problem	A small problem	Not a problem
5.5%	14.2%	80.3%

43. In the last 6 months, how often did doctors or other health providers spend enough time with you? (n=2368)

Never	Sometimes	Usually	Always
2.8%	11.8%	20.1%	65.3%

44. Using any number from 0 to 10 where 0 is the worst health care possible and 10 is the best health care possible, what number would you use to rate all your health care in the last 6 months? (n=2365)

0 through 7	8-9	10
18.9%	34.8%	46.3%

45. In the last 6 months, did you have a health problem for which you needed special medical equipment, such as a cane, a wheelchair, or oxygen equipment? (n=2807)

Yes	No
20.6%	79.4%

46. In the last 6 months, how much of a problem, if any, was it to get the special medical equipment you needed through Carolina Access or Medicaid? (n=566)

A big problem	A small problem	Not a problem
10.6%	7.1%	82.3%

47. In the last 6 months, did you have any health problems that needed special therapy, such as physical, occupational, or speech therapy? (n=2801)

Yes	No
12.9%	87.1%

48. In the last 6 months, how much of a problem, if any, was it to get the special therapy you needed through Carolina Access or Medicaid? (n=356)

A big problem	A small problem	Not a problem
11.5%	10.1%	78.4%

49. Home health care, or assistance means home nursing, help with bathing or dressing, and help with basic household tasks. In the last 6 months, did you need someone to come into your home to give you home health care or assistance? (n=2811)

Yes	No
11%	89%

50. In the last 6 months, how much of a problem, if any, was it to get the care or assistance you needed through Carolina Access or Medicaid? (n=304)

A big problem	A small problem	Not a problem
7.6%	8.5%	83.9%

51. An interpreter is someone who repeats or signs what one person says in a language used by another person. In the last 6 months, did you <u>need</u> an interpreter to help you speak with doctors or other health providers? (n=2811)

Yes	No
1.6%	98.4%

52. In the last 6 months, when you needed an interpreter to help you speak with doctors or other health providers, how often did you get one? (n=20)

Never	Sometimes	Usually	Always
35%	40%	25%	0%

53. In the last 6 months, did you get any new prescription medicine or refill a prescription? (n=2810)

Yes	No
78.1%	21.9%

54. In the last 6 months, how much of a problem, if any, was it to get your prescription medicine from Carolina Access or Medicaid? (n=2190)

A big problem	A small problem	Not a problem
5.4%	8.4%	86.2%

55. In the last 6 months, how often did you get the prescription medicine you needed through Carolina Access or Medicaid? (n=2185)

Never	Sometimes	Usually	Always
2%	4.8%	8%	85.2%

56. Using <u>any number from 0 to 10</u> where 0 is the worst Carolina Access or Medicaid possible and 10 is the best Carolina Access or Medicaid possible, what number would you use to rate Carolina Access or Medicaid now? (n=2781)

0 through 7	8-9	10
14.4%	27.4%	58.2%

57. In general, how would you rate your <u>overall health now</u>? (n=2802)

Excellent	Very good	Good	Fair	Poor
9.3%	14.7%	25.1%	31.3%	19.6%

58. Because of any impairment or health problem, do you need the help of other persons with your personal care needs, such as eating, dressing, or getting around the house? (n=2811)

Yes	No
15.4%	84.6%

59. Because of any impairment or health problem, do you need help with your routine needs, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes? (n=2811)

Yes	No
35.6%	64.4%

60. Do you have a physical or medical condition that seriously interferes with your independence, participation in the community, or quality of life? (n=2792)

Yes	No
46.3%	53.7%

61. In the last 6 months, have you been a patient in a hospital overnight or longer? (n=2811)

Yes	No
17.9%	82.1%

62. Do you now have any physical or medical conditions that have lasted for at least 3 months? (Women: Do not include pregnancy). (n=2812)

Yes	No
63.5%	36.5%

63. In the last 6 months, have you seen a doctor or health provider more than twice for any of these conditions? (n=1783)

Yes	No
76.5%	23.5%

64. Have you been taking prescription medicine for at least 3 months for any of these conditions? (n=1785)

Yes	No
88.1%	11.9%

65. In the last six months, have you received health care from a provider who is not paid for by Medicaid, such as a faith healer or herbalist? (n=2805)

Yes	No
2.2%	97.8%

66. What is your age now? (n=2812)

18-24	25-34	35-44	45-54	55-64	65-74	75 or older
15.4%	20.6%	20.7%	22.2%	19.4%	1.6%	0.1%

67. Are you male or female? (n=2815)

Male	Female
25.3%	74.7%

68. What is the highest grade or level of school that you have <u>completed</u>? (n=2798)

8th grade or less	Some high school, but did not graduate	High school graduate or GED	Some college or 2-year degree	4-year college graduate	More than 4-year college degree
11.6%	27.9%	36.6%	20.2%	3.1%	0.6%

69. Are you of Hispanic or Latino origin or descent? (n=2800)

Yes	No
2.7%	97.3%

70. What is your race? Please mark one or more. (n=2798)

Black	Other	White
40%	6.6%	53.4%

71. What language do you <u>mainly</u> speak at home? (n=2814)

English	Spanish	Some other language
98.7%	0.9%	0.4%

72. Which is your preferred way to receive information about Medicaid and Carolina Access so that you can best remember the information? Please choose only one answer. (n=2776)

Brochure or pamphlet	Audio CD	VHS Video Tape	DVD	TV	Radio	Internet	Email	Magazine	Other
60.5%	3%	2.7%	9%	3.9%	0.8%	1.9%	3.1%	9.6%	5.5%

73. Do you know how to use a computer? (n=2815)

Yes	No
60%	40%

74. Do you use the internet? (n=1684)

Yes	No
74.1%	25.9%

75. Where do you most often use the internet? Please choose only one answer. (n=1246)

Home	School/Work	Public Library	Friend's/Family's House	Church	Other
69%	9.2%	10.4%	11.1%	0.1%	0.2%

76. How often do you use the internet? (n=1244)

Daily	Once/Week	Several Times/Week	A few times/Month	Once/Month or less often
42.6%	10.4%	22.9%	12.8%	11.3%

77. Do you watch DVDs? (n=2814)

Yes	No
81.6%	18.4%

78. Where do you most often watch DVDs? Please choose only one answer. (n=2295)

Home	School/Work	Public Library	Friend's/Family's House	Church	Other
96.2%	0.3%	0.1%	3.3%	0%	0.1%

79. How often do you watch DVDs? (n=2276)

Daily	Once/Week	Several Times/Week	A few times/Month	Once/Month or less often
15.5%	16.1%	25.3%	23.6%	19.5%

80. If you were to receive a DVD about Medicaid and Carolina Access, would you be most likely to watch it if you received it from: (n=2231)

Your doctor's office	The mail	Your Medicaid Care Worker	Other
20.8%	34.5%	15.1%	29.6%

81. What would most attract you to read or look at information about Medicaid and Carolina Access? Please choose only one answer. (n=2573)

A famous person	Someone of your own race or ethnic group	A cartoon	Other
18.5%	34.7%	15.7%	31.1%

82. In an emergency situation related to your health, what is the quickest way for you to receive information? Please choose only one answer. (n=2808)

Email	Cell Phone	Home Phone	Work/School	TV	Church	Radio	Other
3.7%	19%	69%	0.5%	5%	0.6%	1.4%	0.8%

Source: Brandon, Schoeps, Sun, and Smith (2008)

APPENDIX C: FREQUENCY DISTRIBUTIONS OF KEY VARIABLES

Gender (enrollee)	Population (Sampling Frame)		Sample		Survey Respondents	
Female	72,612	72.6%	21,099	72.5%	2,104	74.7%
Male	27,402	27.4%	8,023	27.5%	711	25.3%
N/n	100,014		29,122		2,815	
	Respondents Matched for Race Concordance		Respondents Matched for Gender Concordance			
Female	1,690	75.0%	2,010	81.0%		
Male	562	25.0%	472	19.0%		
n	2,252		2,482			

Age Group (enrollee)	Population (Sampling Frame)		Sample		Survey Respondents	
18-24 yrs.	28,605	28.6%	8,353	28.7%	495	17.6%
25-34 yrs.	24,356	24.4%	7,121	24.5%	576	20.5%
35-44 yrs.	20,370	20.4%	6,028	20.7%	582	20.7%
45-54 yrs.	15,137	15.1%	4,405	15.1%	623	22.1%
55 yrs. and older	11,546	11.5%	3,215	11.0%	539	19.1%
N/n	100,014		29,122		2,815	
	Respondents Matched for Race Concordance		Respondents Matched for Gender Concordance			
18-24 yrs.	409	18.2%	398	16.0%		
25-34 yrs.	450	20.0%	503	20.3%		
35-44 yrs.	469	20.8%	529	21.3%		
45-54 yrs.	489	21.7%	569	22.9%		
55 yrs. and older	435	19.3%	483	19.5%		
n	2,252		2,482			

Race/Ethnicity (enrollee)	Population (Sampling Frame)		Sample		Survey Respondents	
White					1,496	53.5%
Black					1,120	40.0%
Asian/ Pacific Islander/Native Hawaiian					13	0.5%
Native American/Alaska Native					83	3.0%
Latino/Caribbean/South American					31	1.1%
Other					55	2.0%
n					2,798	

Race/Ethnicity (enrollee)	Respondents Matched for Race Concordance		Respondents Matched for Gender Concordance	
White	1,117	49.6%	1361	54.8%
Black	977	43.4%	984	39.6%
Asian/ Pacific Islander/Native Hawaiian	10	0.4%	5	0.2%
Native American/Alaska Native	77	3.4%	63	2.5%
Latino/Caribbean/South American	26	1.2%	24	1.0%
Other	45	2.0%	45	1.8%
n	2,252		2,482	

Region (enrollee)	Population (Sampling Frame)		Sample		Survey Respondents	
Mountains	11,394	11.4%	3,461	11.9%	382	13.6%
Piedmont	45,922	45.9%	16,870	57.9%	1,583	56.2%
Coastal Plain	33,677	33.7%	6,940	23.8%	694	24.7%
Tidewater	9,021	9.0%	1,851	6.4%	156	5.5%
N/n	100,014		29,122		2,815	
	Respondents Matched for Race Concordance			Respondents Matched for Gender Concordance		
Mountains	98		4.4%	334		13.5%
Piedmont	1,412		62.7%	1,392		56.1%
Coastal Plain	602		26.7%	612		24.7%
Tidewater	140		6.2%	144		5.8%
n	2,252			2,482		

Urbanicity (enrollee)	Population (Sampling Frame)		Sample		Survey Respondents	
Urban	60,172	60.2%	18,719	64.3%	1,732	61.5%
Mixed	24,228	24.2%	6,814	23.4%	702	24.9%
Rural	15,614	15.6%	3,589	12.3%	381	13.5%
N/n	100,014		29,122		2,815	
	Respondents Matched for Race Concordance			Respondents Matched for Gender Concordance		
Urban	1,412		62.7%	1,487		59.9%
Mixed	559		24.8%	654		26.3%
Rural	281		12.5%	341		13.7%
n	2,252			2,482		

<table>
<tr><th>Language (enrollee)</th><th colspan="4">Population (Sampling Frame)</th><th colspan="4">Sample</th><th colspan="4">Survey Respondents</th></tr>
<tr><td>English</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">2,778</td><td colspan="2">98.7%</td></tr>
<tr><td>Spanish</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">26</td><td colspan="2">0.9%</td></tr>
<tr><td>Other</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">11</td><td colspan="2">0.4%</td></tr>
<tr><td>n</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">2,815</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="6">Respondents Matched for Race Concordance</td><td colspan="6">Respondents Matched for Gender Concordance</td></tr>
<tr><td>English</td><td colspan="3">2,220</td><td colspan="3">98.6%</td><td colspan="3">2,452</td><td colspan="3">98.8%</td></tr>
<tr><td>Spanish</td><td colspan="3">25</td><td colspan="3">1.1%</td><td colspan="3">22</td><td colspan="3">0.9%</td></tr>
<tr><td>Other</td><td colspan="3">7</td><td colspan="3">0.3%</td><td colspan="3">8</td><td colspan="3">0.3%</td></tr>
<tr><td>n</td><td colspan="3">2,252</td><td colspan="3"></td><td colspan="3">2,482</td><td colspan="3"></td></tr>
</table>

<table>
<tr><th>Education (enrollee)</th><th colspan="4">Population (Sampling Frame)</th><th colspan="4">Sample</th><th colspan="4">Survey Respondents</th></tr>
<tr><td>8th grade or less</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">326</td><td colspan="2">11.7%</td></tr>
<tr><td>Some high school without graduation</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">781</td><td colspan="2">27.9%</td></tr>
<tr><td>High school graduate or GED</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">1,023</td><td colspan="2">36.6%</td></tr>
<tr><td>Some college or 2-yr degree</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">566</td><td colspan="2">20.2%</td></tr>
<tr><td>4-yr college degree</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">86</td><td colspan="2">3.1%</td></tr>
<tr><td>> 4-yr degree</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">16</td><td colspan="2">0.6%</td></tr>
<tr><td>n</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2">2,798</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="6">Respondents Matched for Race Concordance</td><td colspan="6">Respondents Matched for Gender Concordance</td></tr>
<tr><td>8th grade or less</td><td colspan="3">248</td><td colspan="3">11.0%</td><td colspan="3">291</td><td colspan="3">11.7%</td></tr>
<tr><td>Some high school without graduation</td><td colspan="3">626</td><td colspan="3">27.8%</td><td colspan="3">694</td><td colspan="3">28.0%</td></tr>
<tr><td>High school graduate or GED</td><td colspan="3">826</td><td colspan="3">36.7%</td><td colspan="3">890</td><td colspan="3">35.9%</td></tr>
<tr><td>Some college or 2-yr degree</td><td colspan="3">469</td><td colspan="3">20.8%</td><td colspan="3">521</td><td colspan="3">21.0%</td></tr>
<tr><td>4-yr college degree</td><td colspan="3">72</td><td colspan="3">3.2%</td><td colspan="3">74</td><td colspan="3">3.0%</td></tr>
<tr><td>> 4-yr degree</td><td colspan="3">11</td><td colspan="3">0.5%</td><td colspan="3">12</td><td colspan="3">0.5%</td></tr>
<tr><td>n</td><td colspan="3">2,252</td><td colspan="3"></td><td colspan="3">2,482</td><td colspan="3"></td></tr>
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Networks (enrollee)	Population (Sampling Frame)		Sample		Survey Respondents	
Community Health Partners (a1003)	3,185	3.2%	2,229	7.7%	215	7.6%
Northern Piedmont Community Care (a1004, a2007)	6,053	6.1%	2,282	7.8%	192	6.8%
Access Care Network Sites and Counties (a1006)	21,556	21.6%	1,937	6.7%	205	7.3%
Access II Care of Western North Carolina (a1007)	4,096	4.1%	2,083	7.2%	215	7.6%
Northwest Community Care Network (a1008, a2006)	6,263	6.3%	2,061	7.1%	200	7.1%
Community Care Partners of Greater Mecklenburg (a1009)	10,010	10.0%	2,035	7.0%	192	6.8%
Carolina Community Health Partnership (a1010)	2,924	2.9%	2,037	7.0%	215	7.6%
Community Care of Wake/Johnston Counties (a1011)	4,739	4.7%	2,031	7.0%	200	7.1%
Partnership for Health Management (a1012)	2,666	2.7%	2,017	6.9%	170	6.0%
Carolina Collaborative Community Care (a1013)	6,352	6.4%	2,070	7.1%	201	7.1%
Community Care Plan of Eastern Carolina (a2000)	15,013	15.0%	2,099	7.2%	200	7.1%
Southern Piedmont Community Care Plan (a2003)	3,360	3.4%	2,037	7.0%	210	7.5%
Access III of Lower Cape Fear (a2004)	8,197	8.2%	2,122	7.3%	200	7.1%
Sandhills Community Care Network (a2005)	5,600	5.6%	2,082	7.1%	200	7.1%
N/n	100,014		29,122		2,815	

Networks (enrollee)	Respondents Matched for Race Concordance		Respondents Matched for Gender Concordance	
Community Health Partners (a1003)	207	9.2%	203	8.2%
Northern Piedmont Community Care (a1004, a2007)	168	7.5%	172	6.9%
Access Care Network Sites and Counties (a1006)	164	7.3%	183	7.4%
Access II Care of Western North Carolina (a1007)	35	1.6%	177	7.1%
Northwest Community Care Network (a1008, a2006)	144	6.4%	158	6.4%
Community Care Partners of Greater Mecklenburg (a1009)	170	7.5%	177	7.1%
Carolina Community Health Partnership (a1010)	148	6.6%	209	8.4%
Community Care of Wake/Johnston Counties (a1011)	167	7.4%	153	6.2%
Partnership for Health Management (a1012)	153	6.8%	148	6.0%
Carolina Collaborative Community Care (a1013)	169	7.5%	181	7.3%
Community Care Plan of Eastern Carolina (a2000)	170	7.5%	169	6.8%
Southern Piedmont Community Care Plan (a2003)	193	8.6%	185	7.5%
Access III of Lower Cape Fear (a2004)	180	8.0%	181	7.3%
Sandhills Community Care Network (a2005)	184	8.2%	186	7.5%
n	2,252		2,482	

Disease Management Program Enrollment	Population (Sampling Frame)		Sample		Survey Respondents	
Asthma	2,671	2.7%	761	2.6%	81	2.9%
Asthma and Diabetes	471	0.5%	130	0.4%	21	0.7%
Diabetes	8,547	8.5%	2,401	8.2%	410	14.6%
None	88,325	88.3%	25,830	88.7%	2,303	81.8%
N/n	100,014		29,122		2,815	

	Respondents Matched for Race Concordance		Respondents Matched for Gender Concordance	
Asthma	52	2.3%	69	2.8%
Asthma and Diabetes	20	0.9%	19	0.8%
Diabetes	330	14.7%	384	15.5%
None	1,850	82.1%	2,010	81.0%
n	2,252		2,482	

Chronic Disease Status (dichotomous variable)	Population (Sampling Frame)		Sample		Survey Respondents	
Yes					1,144	40.9%
No					1,652	59.1%
N/n					2,796	

	Respondents Matched for Race Concordance		Respondents Matched for Gender Concordance	
Yes	907	40.5%	1,017	41.3%
No	1,330	59.5%	1,448	58.7%
n	2,237		2,465	

Number of months in current medical practice	Population (Sampling Frame)		Sample		Survey Respondents	
0-12 months					271	9.6%
13-24 months					500	17.8%
25-36 months					432	15.3%
37-48 months					349	12.4%
49-60 months					517	18.4%
61 months or more					746	26.5%
n					2,815	

	Respondents Matched for Race Concordance		Respondents Matched for Gender Concordance	
0-12 months	222	9.9%	240	9.7%
13-24 months	407	18.1%	443	17.8%
25-36 months	362	16.1%	382	15.4%
37-48 months	275	12.2%	321	12.9%
49-60 months	403	17.9%	458	18.5%
61 months or more	583	25.9%	638	25.7%
n	2,252		2,482	

Length of time with same provider	Population (Sampling Frame)		Sample		Survey Respondents	
0 months					572	20.4%
< 6 months					140	5.0%
6 months to < 1 year					136	4.9%
1 year to < 2 years					306	10.9%
2 years to < 5 years					701	25.1%
5 or more years					943	33.7%
n					2,798	

	Respondents Matched for Race Concordance		Respondents Matched for Gender Concordance	
0 months	415	18.4%	441	17.9%
< 6 months	113	5.0%	130	5.3%
6 months to < 1 year	109	4.9%	124	5.0%
1 year to < 2 years	259	11.6%	283	11.5%
2 years to < 5 years	574	25.6%	637	25.8%
5 or more years	768	34.3%	855	34.6%
n	2,238		2,470	

Gender (provider)	Population (Sampling Frame)		Sample		Survey Respondents	
Female					1,168	43.0%
Male					1,549	57.0%
n					2,717	

	Respondents Matched for Race Concordance		Respondents Matched for Gender Concordance	
Female	974	43.4%	1,151	46.4%
Male	1,270	56.6%	1,331	53.6%
n	2,244		2,482	

Race/Ethnicity (provider)	Population (Sampling Frame)		Sample		Survey Respondents	
White					1,764	69.5%
Black					449	17.7%
Asian/ Pacific Islander/Native Hawaiian					196	7.7%
Native American/Alaska Native					49	1.9%
Latino/Caribbean/South American					23	0.9%
Other					57	2.2%
n					2,538	

Race/Ethnicity (provider)	Respondents Matched for Race Concordance		Respondents Matched for Gender Concordance	
White	1,485	65.9%	1,589	68.8%
Black	444	19.7%	419	18.1%
Asian/ Pacific Islander/Native Hawaiian	195	8.7%	185	8.0%
Native American/Alaska Native	49	2.2%	45	1.9%
Latino/Caribbean/South American	23	1.0%	22	1.0%
Other	56	2.5%	50	2.2%
n	2,252		2,310	

Race Concordance	Population (Sampling Frame)		Sample		Survey Respondents	
White					1,100	43.5%
Black					278	11.0%
Asian/Pacific Islander/Native Hawaiian					5	0.2%
Native American/Alaska Native					11	0.4%
Latino/Caribbean/South American					2	0.1%
Discordant					1,133	44.8%
n					2,529	

	Respondents Matched for Race Concordance		Respondents Matched for Gender Concordance	
White	832	36.9%	1,008	43.6%
Black	276	12.3%	260	11.3%
Asian/Pacific Islander/Native Hawaiian	5	0.2%	2	0.1%
Native American/Alaska Native	11	0.5%	9	0.4%
Latino/Caribbean/South American	2	0.1%	1	0.0%
Discordant	1,126	50.0%	1,030	44.6%
n	2,252		2,310	

Gender Concordance	Population (Sampling Frame)		Sample		Survey Respondents	
Male					486	17.9%
Female					971	35.7%
Discordant					1,260	46.4%
n					2,717	

Gender Concordance	Respondents Matched for Race Concordance		Respondents Matched for Gender Concordance	
Male	394	17.5%	281	11.3%
Female	808	35.9%	960	38.7%
Discordant	1,042	46.4%	1,241	50.0%
n	2,244		2,482	

APPENDIX D: DERIVATION OF URBANICITY VARIABLE

The Economic Research Services within the U.S. Department of Agriculture has established nine categories for classifying an area's degree of urbanicity. These categories are based on an area's population and metropolitan location. The frequency distribution of North Carolina counties within each category of urbancity appears below:

Nine-Level Classification of County Urbanicity and Number of NC Counties in Each Category

Code	*Defining Criteria*	*Number of N.C. Counties*
1	County in metropolitan area with population of 1 million or more	6
2	County in metropolitan area with population of 250,000 to 1 million	27
3	County in metropolitan area with population of fewer than 250,000	7
4	Nonmetropolitan county with urban population of 20,000 or more, adjacent to a metropolitan area	17
5	Nonmetropolitan county with urban population of 20,000 or more, not adjacent to a metropolitan area	2
6	Nonmetropolitan county with urban population of 2,500-19,999, adjacent to a metropolitan area	15
7	Nonmetropolitan county with urban population of 2,500-19,999, not adjacent to a metropolitan area	5
8	Nonmetropolitan county completely rural or less than 2,500 urban population, adjacent to metropolitan area	9
9	Nonmetropolitan county completely rural or less than 2,500 urban population, not adjacent to metropolitan area	12

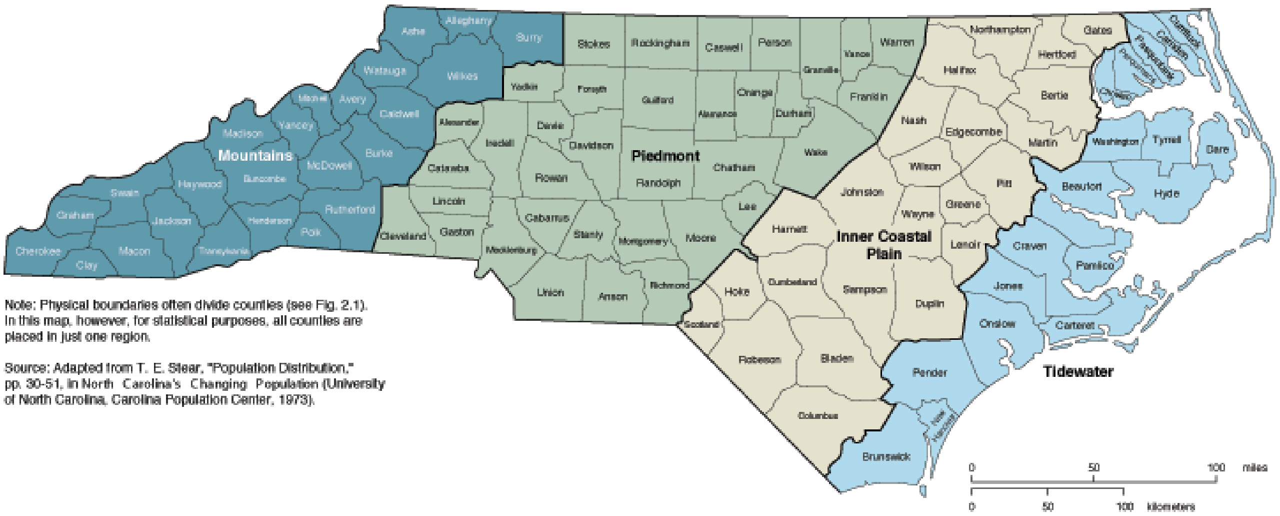
Source: U.S. Department of Agriculture, Economic Research Services. 2004. *Measuring Rurality: Rural-Urban Continuum Codes*. U.S. Department of Agriculture, April 28, 2004. Available at http://www.ers.usda.gov/Briefing/Rurality/RuralUrbCon/ on April 16, 2008.

The nine-level classification was aggregated into the three general categories of *urban*, *rura*l, and *mixed* by Brandon, Schoeps, Sun, and Smith (2008) in order to streamline interpretation of the data. The revised classification aggregated codes 1, 2, and 3 to “urban,” codes 4 and 5 to “mixed,” and codes 6, 7, 8, and 9 to “rural.” The revised frequency distribution of urbanicity among North Carolina counties and the percentage of the population of enrollees in North Carolina Medicaid’s CCNC programs living in each type of county appears below.

Frequency Distribution of NC Counties and Study Populations’ Residence by Degree of County Urbanicity (Three-Level Scheme)		
Code	*Number of Counties*	*Population (n = 100,014)*
Urban (1); metropolitan area	40	60.2%
Mixed (2); Non-metropolitan with population ≥ 20,000	19	24.2%
Rural (3); Non-metropolitan with population < 20,000	41	15.6%

APPENDIX E: NORTH CAROLINA LAND REGIONS BY COUNTY

Figure 1b. Land Regions



Note: Physical boundaries often divide counties (see Fig. 2.1). In this map, however, for statistical purposes, all counties are placed in just one region.

Source: Adapted from T. E. Stear, "Population Distribution," pp. 30-51, in North Carolina's Changing Population (University of North Carolina, Carolina Population Center, 1973).

Mountains

Alleghany, Ashe, Avery, Buncombe, Burke, Caldwell, Cherokee, Clay, Graham, Haywood, Henderson, Jackson, Macon, Madison, McDowell, Mitchell, Polk, Rutherford, Surry, Swain, Transylvania, Watauga, Wilkes, Yancey

Piedmont

Alamance, Alexander, Anson, Cabarrus, Caswell, Catawba, Chatham, Cleveland, Davidson, Davie, Durham, Forsyth, Franklin, Gaston, Granville, Guilford, Iredell, Lee, Lincoln, Mecklenburg, Montgomery, Moore, Orange, Person, Randolph, Richmond, Rockingham, Rowan, Stanly, Stokes, Union, Vance, Wake, Warren, Yadkin

Coastal Plain

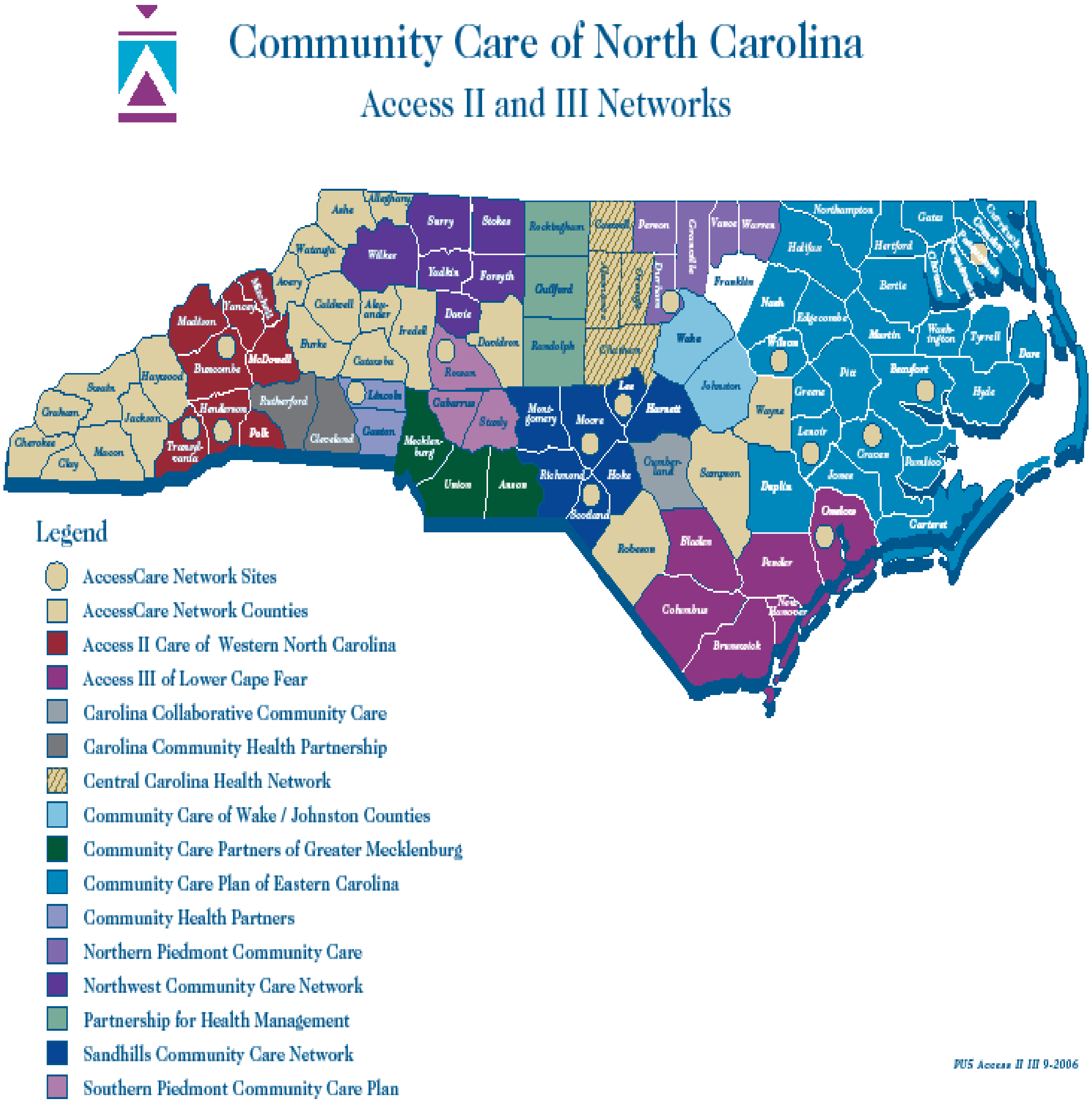
Bertie, Bladen, Columbus, Cumberland, Duplin, Edgecombe, Gates, Greene, Halifax, Harnett, Hertford, Hoke, Johnston, Lenoir, Martin, Nash, Northampton, Pitt, Robeson, Sampson, Scotland, Wayne, Wilson

Tidewater

Beaufort, Brunswick, Camden, Carteret, Chowan, Craven, Currituck, Dare, Hyde, Jones, New Hanover, Onslow, Pamilico, Pasquotank, Pender, Perquimans, Tyrrell, Washington

From THE NORTH CAROLINA ATLAS: PORTRAIT FOR A NEW CENTURY edited by Alfred Stuart and Douglas M. Orr.

APPENDIX F: GEOGRAPHIC DEPICTION OF COMMUNITY CARE OF NORTH CAROLINA NETWORKS



Source: North Carolina Department of Health and Human Services, Division of Medical Assistance. 2007. *Medicaid in North Carolina: Annual Report, State Fiscal Year 2006.* Raleigh, NC.

APPENDIX G: THREATS TO VALIDITY

Threats to external validity

- Unique program features- variability program features from one program to another that prevent generalizing outcomes from one program to another program.
- Selection- the subjects in the study are unrepresentative; the group being studied may have responded differently to the program treatment than others who would be likely to participate.
- Setting- factors related to the project's location may influence study outcomes.
- History- an evaluation of a particular program may be undertaken at a time when clients and the community are unusually receptive (or unreceptive) to its services.
- Testing- if the pretest administered to a subject affects the subject's reactivity to the program, the pretest becomes a unique program feature and the program will not work in its absence.
- Reactive effects of experimental arrangements- behavioral changes on the part of study participants who know that they are being studied.

Threats to internal validity

- History- events other than the independent variable that could have affected the dependent variable.
- Instrumentation- changes occurring in the measuring instrument between the beginning of the study and its conclusion.
- Maturation- natural changes taking place in the units under study.
- Mortality- cases that drop out of a study or intervention (program) before it is completed; validity is compromised if these cases are systematically different from those that remain.
- Statistical regression to the mean- changes occurring in the dependent variable arising from the instability of extreme scores.
- Selection- the way that cases are selected for an intervention (or program) may affect the way that they react to the intervention (or program).
- Testing- the initial measure or test influences the subjects' behavior, which affects the outcome of the posttest.

Sources: O'Sullivan and Rassel (1995); Royse, Thyer, Padgett, and Logan (2001)

APPENDIX H: SPSS SYNTAX FOR PROPENSITY SCORE MATCHING PROCEDURES TO CREATE DATASET BASED ON RACE CONCORDANCE

Adapted for this project from SPSS syntax originally created by Raynald Levesque and subseqently modified by John Painter, PhD, and appearing at: http://www.spsstools.net/Syntax/RandomSampling/MatchCasesOnBasisOfPropensityScores.txt and http://pages.infinit.net/rlevesqu/Syntax/RandomSampling/MatchCasesOnBasisOfPropensityScores.txt and http://ssw.unc.edu/VRC/Lectures/index.htm

```
/*** Conventions for this program:                                          ***/
/*** Propensity score variable is named 'propen'                              ***/
/*** Treatment group is indicated by 'raceconcord2', where 1 = Treatment and 0 = all
others    ***/
/*** Case id is 'id' and is a unique numeric identifier                        ***/
/*** Setup:                                                                 ***/
/*** Step 1: Type the path location of folder containing data file, this is also where the
results will be placed. The default is c:\temp\  ***/
/*** Step 2: Type name of original data file on GET FILE line
***/
/*** Step 3: Type the number of treatment cases                                ***/

*******************************************.
* Step 1: File path for original data file .
*******************************************.

DEFINE !pathd() '/Users/galensmith/Desktop/temp/' !ENDDEFINE.

******************** .
* Perform logistical regression to compute propensity score .
******************* .

LOGISTIC REGRESSION VAR=raceconcord2
  /METHOD=ENTER q67 AGE q68 q70rr net2 Region newrur CDFRSRD1
  /CONTRAST (q67)=Indicator
  /CONTRAST (q70rr)=Indicator
  /CONTRAST (region)=Indicator
  /CONTRAST (newrur)=Indicator
  /CONTRAST (net2)=Indicator
  /SAVE PRED
  /CRITERIA PIN(.05) POUT(.10) ITERATE(20) CUT(.5) .
RENAME VARIABLES (PRE_1=propen) .
```

```
********************.
* Note number of Treatment cases and place number after MACRO CALL near end
ofthis program .
******************** .
FREQUENCIES
  VARIABLES=raceconcord2
  /ORDER=  ANALYSIS .


SAVE OUTFILE=!pathd + "raceconcord2population.sav" .


******************** .
** End Preparation .
******************** .
******************************************.
* Step 2: Define data file                  .
******************************************.

GET FILE= !pathd + "raceconcord2population.sav".

COMPUTE x = RV.UNIFORM(1,1000000) .
SORT CASES BY raceconcord2(D) propen x.
COMPUTE idx=$CASENUM.
SAVE OUTFILE=!pathd + "raceconcord2mydata.sav".

* Erase the previous temporary result file, if any.
ERASE FILE=!pathd + "raceconcord2results.sav".
COMPUTE key=1.
SELECT IF (1=0).
* Create an empty data file to receive results.
SAVE OUTFILE=!pathd + "raceconcord2results.sav".
exec.

******************************************.
* Define a macro which will do the job.
******************************************.

SET MPRINT=no.
*////////////////////////////////.
DEFINE !match (nbtreat=!TOKENS(1))
!DO !cnt=1 !TO !nbtreat

GET FILE=!pathd + "raceconcord2mydata.sav".
SELECT IF idx=!cnt OR raceconcord2=0.
* Select one treatment case and all control .
```

```
DO IF $CASENUM=1.
COMPUTE #target=propen.
ELSE.
COMPUTE delta=propen-#target.
END IF.
EXECUTE.
SELECT IF ~MISSING(delta).
IF (delta<0) delta=-delta.

SORT CASES BY delta.
SELECT IF $CASENUM=1.
COMPUTE key=!cnt .
SAVE OUTFILE=!pathd + "raceconcord2used.sav".
ADD FILES FILE=*
          /FILE=!pathd + "raceconcord2results.sav".
SAVE OUTFILE=!pathd + "raceconcord2results.sav".

********************************************* Match back to original and drop case  from original .
GET FILE= !pathd + "raceconcord2mydata.sav".
SORT CASES BY idx .
MATCH FILES
 /FILE=*
 /IN=raceconcord2mydata
 /FILE=!pathd + "raceconcord2used.sav"
 /IN=raceconcord2used
 /BY idx .
SELECT IF (raceconcord2used = 0).
SAVE OUTFILE=!pathd + "raceconcord2mydata.sav"
 / DROP = raceconcord2used raceconcord2mydata key delta.
EXECUTE.
!DOEND
!ENDDEFINE.
*////////////////////////////////.

SET MPRINT=yes.


*************************.
*Step 3: insert the number of cases after nbtreat=   .
*************************.

!match nbtreat=1133 .


SET MPRINT=no.
```

```
* Sort results file to allow matching.

GET FILE=!pathd + "raceconcord2results.sav".
SORT CASES BY key.
SAVE OUTFILE=!pathd + "raceconcord2results.sav".

******************.
* Match each treatment cases with the most similar non treatment case.
* To include additional variables from original file list them on the RENAME
subcommand below .
******************.

GET FILE=!pathd + "raceconcord2mydata.sav".
MATCH FILES /FILE=*
 /FILE=!pathd + "raceconcord2results.sav"
 /RENAME (idx = d0) (id=id2) (propen=propen2)  (raceconcord2=raceconcord3)
(key=idx)
 /BY idx
 /DROP= d0 x.
FORMATS delta propen propen2  (F10.8).
SAVE OUTFILE=!pathd + "raceconcord2mydata and results.sav".
EXECUTE .



/*** Results of the analysis are summed up by the variables id, idx, delta, and key
***/
/*** id   = original case id
***/
/*** idx = original case id of the matching record (comparison case) for the treatment
case    ***/
/*** delta = propensity score for id - propensity score for idx; or the closeness of the
match  ***/
/*** key = new case number, also serves as a unique identifier for records in the results
file  ***/ .
```

APPENDIX I: SPSS SYNTAX FOR PROPENSITY SCORE MATCHING PROCEDURES TO CREATE DATASET BASED ON GENDER CONCORDANCE

Adapted for this project from SPSS syntax originally created by Raynald Levesque and subseqently modified by John Painter, PhD, and appearing at: http://www.spsstools.net/Syntax/RandomSampling/MatchCasesOnBasisOfPropensityScores.txt and http://pages.infinit.net/rlevesqu/Syntax/RandomSampling/MatchCasesOnBasisOfPropensityScores.txt and http://ssw.unc.edu/VRC/Lectures/index.htm

```
/*** Conventions for this program:                                        ***/
/*** Propensity score variable is named 'propen'                           ***/
/*** Treatment group is indicated by 'genderconcord', where 1 = Treatment and 0 = all
others    ***/
/*** Case id is 'id' and is a unique numeric identifier                     ***/
/*** Setup:                                                              ***/
/*** Step 1: Type the path location of folder containing data file, this is also where the
results will be placed. The default is c:\temp\  ***/
/*** Step 2: Type name of original data file on GET FILE line
***/
/*** Step 3: Type the number of treatment cases                            ***/

********************************************.
* Step 1: File path for original data file .
********************************************.

DEFINE !pathd() '/Users/galensmith/Desktop/temp/' !ENDDEFINE.

******************** .
* Perform logistical regression to compute propensity score .
******************* .

LOGISTIC REGRESSION VAR=genderconcord
  /METHOD=ENTER q67 AGE q68 q70rr net2 Region newrur CDFRSRD1
  /CONTRAST (q67)=Indicator
  /CONTRAST (q70rr)=Indicator
  /CONTRAST (region)=Indicator
  /CONTRAST (newrur)=Indicator
  /CONTRAST (net2)=Indicator
  /SAVE PRED
  /CRITERIA PIN(.05) POUT(.10) ITERATE(20) CUT(.5) .
RENAME VARIABLES (PRE_1=propen) .


*********************.
```

```
* Note number of Treatment cases and place number after MACRO CALL near end
ofthis program .
********************* .
FREQUENCIES
  VARIABLES=genderconcord
  /ORDER=  ANALYSIS .


SAVE OUTFILE=!pathd + "genderconcordpopulation.sav" .


********************* .
** End Preparation .
********************* .
********************************************.
* Step 2: Define data file                  .
********************************************.

GET FILE= !pathd + "genderconcordpopulation.sav".

COMPUTE x = RV.UNIFORM(1,1000000) .
SORT CASES BY genderconcord(D) propen x.
COMPUTE idx=$CASENUM.
SAVE OUTFILE=!pathd + "genderconcordmydata.sav".

* Erase the previous temporary result file, if any.
ERASE FILE=!pathd + "genderconcordresults.sav".
COMPUTE key=1.
SELECT IF (1=0).
* Create an empty data file to receive results.
SAVE OUTFILE=!pathd + "genderconcordresults.sav".
exec.

********************************************.
* Define a macro which will do the job.
********************************************.

SET MPRINT=no.
*//////////////////////////////.
DEFINE !match (nbtreat=!TOKENS(1))
!DO !cnt=1 !TO !nbtreat

GET FILE=!pathd + "genderconcordmydata.sav".
SELECT IF idx=!cnt OR genderconcord=0.
* Select one treatment case and all control .
DO IF $CASENUM=1.
```

```
COMPUTE #target=propen.
ELSE.
COMPUTE delta=propen-#target.
END IF.
EXECUTE.
SELECT IF ~MISSING(delta).
IF (delta<0) delta=-delta.

SORT CASES BY delta.
SELECT IF $CASENUM=1.
COMPUTE key=!cnt .
SAVE OUTFILE=!pathd + "genderconcordused.sav".
ADD FILES FILE=*
          /FILE=!pathd + "genderconcordresults.sav".
SAVE OUTFILE=!pathd + "genderconcordresults.sav".

************************************************ Match back to original and
drop case  from original .
GET FILE= !pathd + "genderconcordmydata.sav".
SORT CASES BY idx .
MATCH FILES
 /FILE=*
 /IN=genderconcordmydata
 /FILE=!pathd + "genderconcordused.sav"
 /IN=genderconcordused
 /BY idx .
SELECT IF (genderconcordused = 0).
SAVE OUTFILE=!pathd + "genderconcordmydata.sav"
 / DROP = genderconcordused genderconcordmydata key delta.
EXECUTE.
!DOEND
!ENDDEFINE.
*///////////////////////////////.

SET MPRINT=yes.


**************************.
* MACRO CALL (first insert the number of cases after nbtreat below).
*Step 3: insert the number of cases after nbtreat=   .
**************************.

!match nbtreat=1260 .


SET MPRINT=no.
```

```
* Sort results file to allow matching.

GET FILE=!pathd + "genderconcordresults.sav".
SORT CASES BY key.
SAVE OUTFILE=!pathd + "genderconcordresults.sav".

******************.
* Match each treatment cases with the most similar non treatment case.
* To include additional variables from original file list them on the RENAME
subcommand below .
******************.

GET FILE=!pathd + "genderconcordmydata.sav".
MATCH FILES /FILE=*
 /FILE=!pathd + "genderconcordresults.sav"
 /RENAME (idx = d0) (id=id2) (propen=propen2)  (genderconcord=genderconcord2)
(key=idx)
 /BY idx
 /DROP= d0 x.
FORMATS delta propen propen2  (F10.8).
SAVE OUTFILE=!pathd + "genderconcordmydata and results.sav".
EXECUTE .


/*** Results of the analysis are summed up by the variables id, idx, delta, and key
***/
/*** id   = original case id
***/
/*** idx = original case id of the matching record (comparison case) for the treatment
case    ***/
/*** delta = propensity score for id - propensity score for idx; or the closeness of the
match  ***/
/*** key = new case number, also serves as a unique identifier for records in the results
file  ***/ .
```