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THE IMPACT OF MINORITY GROUP MEMBERSHIP ON CHANGES IN
SELECTED HEALTH OUTCOMES AMONG MIDLIFE
AMERICANS WITH TYPE 2 DIABETES

by

Brenda H. Ralls

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Sociology

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

2000

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ABSTRACT

The Impact of Minority Group Membership on Changes in
Selected Health Outcomes among Midlife
Americans with Type 2 Diabetes

by

Brenda H. Ralls, Doctor of Philosophy
Utah State University, 2000

Major Professor: Dr. William F. Stinner
Department: Sociology

Minority ethnic groups have disproportionately high rates of diabetes prevalence and complications. This study examined the degree, nature, and mediation of ethnic differences in changes over time in four health outcomes: functional limitations, emotional symptomatology, psychosomatic symptomatology, and self-reported health status. The theoretical context incorporated tenets from the social characteristics and the minority status perspectives.

Data were drawn from two rounds (1992 and 1996) of the Health and Retirement Survey, a national panel survey of midlife Americans. The study focused on a subsample of 744 respondents who had been diagnosed with diabetes or high blood sugar by the time of the first round. Descriptive and lag-time regression analyses were employed.

Five models were used to: (1) assess the independent effects of being Black and being Hispanic on changes over time in each of the outcome variables without and with the set of mediating variables; and (2) gauge the specific manner in which mediating variables affected initial statistically significant effects among Blacks and Hispanics. The mediating variables included five social position measures (education, income, net worth, gender, and a role integration index), health insurance coverage, and four health-related lifestyle measures (body mass index, drinking, smoking, and physical inactivity).

The results pointed to a complex pattern of effects between Blacks and Hispanics and across outcomes. The social characteristics hypothesis was supported in two instances: increases in functional limitations over time for Blacks and poorer self-reported health over time for Hispanics. The minority status hypothesis was supported only for increases in emotional symptomatology among Hispanics. No support for either hypothesis was observed for psychosomatic symptomatology. Critical mediating variables also differed between Blacks and Hispanics across the outcomes. The two variables mediating the Black effect for functional limitations were body mass index and gender, whereas the two variables mediating the Hispanic effect for self-reported were smoking and education.

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Brenda Ralls

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CHAPTER I
INTRODUCTION

Statement of the Problem

The increase in life expectancy in the United States has led to a greater proportion of the population surviving to older ages, putting a greater number of individuals at risk of developing chronic conditions. Chronic disease is a serious health problem in the United States. Over 70% of all deaths in the United States are from chronic diseases, with heart disease, cancer, chronic obstructive pulmonary disease, and diabetes topping the list (Centers for Disease Control and Prevention [CDC], 1998). Living with a chronic disease can severely restrict physical activity and cause considerable emotional distress, resulting in a substantial decrease in the quality of life for those afflicted.

Prevalence rates of chronic disease have persistently been higher among members of ethnic minority groups. In recent years, a great deal of attention has focused on these ethnic differences. Comprehensive efforts by public and private health industries have led to a decline in death rates from heart disease, stroke, and cancer over the last decade for all ethnic groups (U. S. Department of Health and Human Services [USDHHS], 1994; Glantz, Lewis, & Rimer, 1997; Pol & Thomas, 1992). Death rates related to diabetes, however, have risen, this increase being particularly sharp for members of ethnic minority groups (CDC, 1998; Laporte, Matsusuhima, & Chang, 1995; Young, 1998).

Diabetes is a complicated and costly disease that afflicts over 16 million Americans, with prediction to double within the next 15 years. Over 150,000 people die

each year from diabetes and its complications. Financial losses related to diabetes are phenomenal, with estimated costs due to medical expenses and lost productivity averaging nearly \$100 billion annually (American Diabetes Association [ADA], 2000). The seriousness of diabetes is evidenced by the high risk of hospitalization among the diabetic population, which accounts for as much as 42% of related medical charges (Moore, 2000).

People with diabetes are two to three times more likely to face hospital admissions than those without diabetes. Once admitted, people with diabetes are likely to stay four times longer than those without. The extent of disability is far-reaching among people with diabetes. Half of all people diagnosed with diabetes report some level of limitation in physical and/or work activities (Harris, 1995).

Diabetes affects the body's ability to produce and/or respond to insulin, leading to reduced capacity of cells to use blood glucose in creating energy. Serious physical complications from diabetes include blindness, kidney failure, lower extremity amputations, and cardiovascular problems. Diabetic retinopathy is the leading cause of new cases of adult blindness. Between 10% and 21% of all people with diabetes eventually develop kidney disease. The risk of amputation is 15 to 40 times greater for the diabetic than the rest of the ; each year 56,000 people lose a foot or leg because of diabetes (ADA, 2000). The most critical complication of diabetes is heart disease. Evidence of heart disease for individuals with diabetes occurs at a younger age than for those without diabetes. Approximately 50% of diabetes-related deaths list ischemic heart disease as the underlying cause (Harris, 1995). Diabetes management requires a rather

stringent lifestyle and diabetes “burnout” is common. Depression is highly correlated to having diabetes. Rates of depression are two to four times higher among members of the diabetic than for the rest of the (Harris, 1995; Lustman & Gavard, 1995).

With proper management, many of the complications can be prevented. The Diabetes Control and Complications Trial (DCCT) provides substantial documentation that over 60% of diabetes-related complications are avoidable. However, successful prevention appears to favor non-Hispanic Whites over members of other ethnic group (Adler, Boyko, Ahroni, Stensel, Forsberg, & Smith, 1997; Stern & Mitchell, 1995; Tull & Roseman, 1995).

Genetic variation accounts for only a small proportion of ethnic disease differentials. The bulk of evidence in ethnic variations points, instead, to the advantages of membership in upper social classes (Williams & Collins, 1995). Two competing perspectives emerge from the literature regarding poorer health in minority populations: (1) the effect of behavioral and lifestyle characteristics associated with minority group membership; and (2) the effect of minority group status itself.

Many theorists claim that the lifestyles and characteristics associated with belonging to a certain ethnic group are the real causes of differentials in health. The well-established relationship of high rates of mortality with high rates of morbidity has persisted over time for lower income groups, regardless of whether or not the diseases are from acute illness or chronic conditions (Marmot, Koegevinas, & Elston, 1987). However, the differences in health levels among different classes of social groups are striking in their consistency. Minority members are disproportionately represented in lower

socioeconomic strata, and many health researchers attribute a good portion of the health differences in racial and ethnic groups to differences in income. This latter idea has strong empirical support in chronic disease research. Higher rates of hypertension and concomitant heart conditions among Blacks, for instance, are well known (Tull & Roseman, 1995). Many health professionals believe the difference is related to the economic disadvantage experienced by the Black population. At least one major study found that, when income is held constant, heart disease rates for Blacks are actually lower than those for Whites (USDHHS, 1985).

Lifestyles, including diet and alcohol use, vary among different ethnic groups, perhaps acting as additional factors accounting for the differentials. Social connection and the structure of social networks tend to vary among ethnic groups, perhaps also contributing to the health differentials. Social support, encouragement, and listening are associated with improved physical health (Markides, Coreil & Rogers, 1989; Rowe & Kahn, 1998) addresses this issue for Hispanics, providing evidence that social networks account for a good proportion of the similarity of Hispanics' health levels to those of Whites, despite their socioeconomic status being closer to that of Blacks.

Access to health care, e.g., having medical insurance, may also account for a substantial proportion of the variations in health. Blacks and Hispanics are less likely to have medical insurance coverage than are Whites (Brown, Ojeda, Wyn & Levan, 2000; Council on Ethical and Judicial Affairs, 1990). Overall, according to this perspective, if all these characteristics were to be controlled (i.e., included in a comprehensive multivariate

analysis), health differences between members of minority groups and Whites should disappear.

Proponents of the minority status hypothesis, on the other hand, posit that the lower social status and concomitant discrimination inherent in belonging to a minority class defines the mortality and morbidity outcomes for members (see, for example, Goldscheider & Uhlenberg, 1969; Keith & Herring, 1991; Pol & Thomas, 1992; Sly, 1980; Williams & Collins, 1995). The effect of racial discrimination is pervasive throughout the health care system in our nation. Dr. Louis Sullivan, former Secretary of Health and Human Services, stated, "There is clear, demonstrable, undeniable evidence of discrimination and racism in the health care system" (Sullivan, 1991, p. 2674). When Blacks and Whites have similar health conditions for which intensive treatment would be expedient, Whites are more likely to receive the necessary care. Whites are more likely to receive certain procedures commonly related to diabetes' complications, including coronary angiography, bypass surgery, angioplasty, hemodialysis, intensive care for pneumonia, and kidney transplants. Racial discrimination in any form inevitably affects one's sense of empowerment and self-efficacy, which may ultimately translate into poor health status (Rowe & Kahn, 1998).

A comprehensive framework for analyzing these issues among persons with diabetes remains to be specified. Such a framework needs, at the minimum, to focus on both objective and subjective outcomes of disease progression, the extent to which ethnic effects on changes in these outcomes over time are similar or dissimilar, as well as the degree to which any effects on changes in outcome are mediated by selected differences

among ethnic groups in other occupied social positions such as socioeconomic status and gender, and role integration, health-related life styles, and health care access. For this study, variations in changes will be examined for two ethnic minority groups, Blacks and Hispanics. Four measures of health outcomes were selected for analyses: (1) level of functional limitations, (2) level of emotional symptomatology, (3) level of psychosomatic symptomatology, and (4) self-reported health status. The relative contributions of ethnic status with regard to changes in these four health outcomes over a four-year period, among a national sample of individuals aged 51 to 61 diagnosed with diabetes or high blood sugar prior to the baseline, will be examined. In addition to minority status, two important social positions, namely socioeconomic status and gender, as well as role integration, access to health care, and a set of health-related lifestyles, are included to assess the extent and manner in which they mediate the impact of race/ethnicity on the selected outcomes. Time 1 level of the outcome variable, age, and disease severity are likewise included as controls.

In summary, this study employs data drawn from two rounds (1992 and 1996) of the Health and Retirement Survey (hereafter referred to as HRS), a national panel survey of midlife Americans aged 51 to 61. The investigation centers on a subsample of respondents who had been diagnosed with Type 2 diabetes or high blood sugar prior to the baseline round in 1992. The specific study objectives are:

1. To evaluate and compare the extent to which race/ethnicity (being Black or Hispanic) impacts changes over time in functional limitations, emotional symptomatology, psychosomatic symptomatology, and self-reported health, independent of occupied social

positions (in addition to being a member of a minority group), access to health care, role integration, and health-related lifestyles.

2. To evaluate and compare the specific manner in which occupied social positions, role integration, access to health care, and health-related lifestyles mediate any observed initial effects of race/ethnicity (i.e., being Black or being Hispanic) on functional limitations, emotional symptomatology, psychosomatic symptomatology, and self-reported health.

Significance of the Research

This study offers both theoretical and methodological contributions to the extant literature. Most recent studies on ethnic differentials in chronic disease have been primarily descriptive. This study is couched in a framework using a unique theoretical approach placing the exploration of ethnic minority differentials into a contextual analysis.

Methodologically, this study expands upon previous research, the bulk of which has been limited to cross-sectional analyses. This study uses longitudinal data, an essential component in any endeavor to address cause and effect relationships (Lieberson, 1985). Furthermore, the data used are from a probabilistic sample drawn from national panel data, which allows the use of lag-time regression analysis, a technique that is not possible with cross-sectional data. As opposed to simpler regression techniques, which describe those factors that are the best predictors of a static outcome at one point in time, lag-time analysis permits exploration of underlying dynamics of changes in health status.

This study also contributes to the body of existing knowledge by bringing in multiple dimensions of health through the examination of four health outcomes. Often researchers focus on single outcomes, therein neglecting how the pathways to these outcomes might be similar or dissimilar. The techniques employed in this study provide the opportunity for a systematic examination of the manner in which potential mediating variables operate. Moreover, the research also focuses on two race/ethnic groups, thereby providing an opportunity to gauge whether there are important variations across ethnic groups in the nature of effects and underlying dynamics and how these might vary across selected outcomes. This study expands current research by examining effects of social position, access to health care, and lifestyle characteristics that may or may not lead to the poorer health outcomes among minority-group members.

An additional contribution of this study is the incorporation of both physical and subjective outcomes. Objective health, as measured by functional limitations, provides an indication of the extent of physical impairments and disabilities that may limit participation in the work force, place demands on care givers, and diminish quality of life. Two dimensions of emotional well-being, namely, emotional symptomatology and psychosomatic symptomatology, are included to capture the psychological component of health, often omitted in more basic epidemiological studies. Self-reported, or global, health ratings are included because they encompass not only physical health, but perceptions of health, quality of life, and even a subtle sense of expected number of years left of life.

This study focuses on individuals diagnosed with diabetes or high blood sugar who are members of one of two ethnic minority groups. Minority groups in the United States have disproportionately high rates of diabetes, and if current trends continue, this burden will increase substantially over the next decades, compounded by a growing minority and aging within that population. Population estimates indicate that by 2005 almost half the American population will be "other than white" (USDHHS, 2000; National Center for Health Statistics [NCHS], 1992; NCHS, 1994). The extent of suffering from diabetes-related complications among those who are members of ethnic minority groups is a health issue that warrants considerable attention (Coates et al., 1990; Cowie et al., 1989; Harris, 1995; Klag et al., 1997).

Organization of the Dissertation

This dissertation is organized follows. Chapter II provides a theoretical and conceptual review of the literature. It centers on two perspectives, social characteristics and minority group status hypotheses. Alternative explanations for the higher prevalence rates among ethnic minority groups are discussed. The chapter concludes with three specific hypotheses for this study.

Chapter III describes the data and methods used in the study. It begins with a discussion of the sampling methodology used by the Health and Retirement Survey, the data used in this study. The procedures for the generation of the modified sample used in this study are likewise described. Measurement procedures are then systematically discussed. Finally, a discussion of the analysis procedure is presented, including a specific

delineation of five models evaluated with linear regression techniques for each of the four selected outcomes.

Chapter IV presents the empirical results from the descriptive and multivariate regression analyses. Chapter V provides a summary of the basic background and objectives of the study, major findings and conclusions, and limitations and suggestions for future research.

CHAPTER II
REVIEW OF THE LITERATURE

“Diabetes is a disease about which we can do a great deal but only when those affected are informed and empowered to take the kind of control of this disease that is now possible.”

Dr. James R. Gavin III, MD Ph.D.

Chair, African American Program

As developed nations have moved from the era of deaths due to infectious diseases to the era of deaths precipitated by chronic conditions, there has been increased interest in preventing and treating chronic disease and attendant physical and psychological impacts (Omran, 1983; Rogers, Rogers, & Belanger, 1992). This is especially the case given the aging of the American population, with its corresponding rise in numbers of people at risk for chronic disease. Unfortunately, health care costs have also risen dramatically, making effective health care management one of the greatest challenges facing Americans today.

Over 70% of all deaths in the United States are linked to chronic disease. Potentially fatal chronic conditions include heart disease, cancer, chronic obstructive pulmonary disease (COPD), and diabetes. Morbidity associated with chronic disease can be debilitating in terms of physical limitations and restrictions in work activities. Overall, medical care costs in the U.S. average \$3,000 per person annually (Vickery & Fries, 1996). At the national level, estimates of the costs for medical expenditures involved in treating chronic diseases are phenomenal, over \$400 billion annually (CDC, 1998). Nearly two million Americans die from causes directly attributable to chronic disease annually. More effective interventions could greatly reduce this burden of chronic disease and lead

to considerable savings, both in terms of financial expenditures and physical suffering. Each heart attack prevented by successful interventions, for example, would save the health care system an average of \$50,000 (Vickery & Fries, 1996). One disease, diabetes, is particularly costly, with estimates reaching over \$100 billion annually in direct and indirect costs, including lost productivity and years of potential life lost (Javitt & Chiang, 1995).

Better understanding of the ways in which chronic diseases progress, in terms of both various sequelae and factors linked to these outcomes, would substantially aid in creating more effective interventions and prevention measures. Federal initiatives have prompted broad-scale efforts aimed at increasing public awareness and promoting education in disease prevention and treatment. Over the past two decades, target objectives have evolved into a strategy that is comprehensive enough to encompass the vast diversity among various subpopulations.

The federal publication *Promoting Health and Preventing Disease: Health Objectives for the Nation*, issued by U.S. Department of Health and Human Services (USDHHS, 1980), was one of the first national initiatives to mandate the development of an agenda to investigate and promote health education programs and to improve healthy behaviors of the population. *Healthy People 2000*, the national-based program of health objectives, also issued by USDHHS, established baseline prevalence data and set standards of acceptable rates of adverse conditions, including chronic disease, acute infection, injury, and birth defects (USDHHS, 1990; USDHHS, 1994; USDHHS, 1995). *Healthy People 2000* was a landmark indicator-driven project with specific objectives set for preventive

care. Objectives include, for example: increasing the number of participants in physical activity from 23% currently to at least 30% of the population; decreasing the percentage of smokers from 29% to no more than 15%; and decreasing the percentage of the overweight population from 25% to 20%.¹

The recommended objectives have been well received. Embraced throughout public and private agencies, they are being used extensively in establishing goals and directing interventions at national and local levels. The most recent publication with updated national objectives is *Healthy People 2010* (USDHHS, 2000). Before this newest report was published, public comments were solicited for updates and revisions. An exceptionally strong protest was voiced by many regarding the lack of attention focused on the pronounced differences in levels of acceptable health indicator levels for different racial and ethnic groups. In *Healthy People 2000*, for example, Objective 2.1 required deaths from coronary heart disease be reduced to no more than 100 per 100,000 population. This objective, however, was qualified for Blacks, with a higher level of acceptable coronary heart disease deaths for Blacks of 115 per 100,000 population (USDHHS, 1995).

Eliminating disparities would, at its most fundamental level, require more equitable access to health care for all people, regardless of income, gender, age, insurance coverage, or race/ethnicity (Cowie, Harris, Silverman, Johnson, & Rust, 1993; Gary, Ford, & Crum., 2000; Lubben, Wilder, & Chi, 1989). Scientific research dedicated to understanding the

¹Guidelines for overweight have been revised since the publication of *Healthy People 2000* and the objectives have been revised accordingly.

social pathways, including socioeconomic status, access to medical services, role integration, and lifestyle variations linked to particular ethnic statuses, would enhance understanding of the way in which social factors mediate the effects of race/ethnicity in the respective physical and psychological outcomes. Therefore, identifying the groups most at risk should lead to greater effectiveness of interventions and improved health for the overall population.

Of the chief potentially fatal chronic conditions, diabetes has had the most persistent overrepresentation within minority groups. Over 16 million Americans have diabetes, a number predicted to double within the next 15 years. Diabetes, the fourth leading cause of death from chronic disease, affects the body's ability to produce and/or respond to insulin, reducing the ability of cells to use blood glucose to produce energy (ADA, 2000).

Complications from diabetes include blindness, kidney failure, circulatory problems, and lower extremity amputations. General risk factors for developing diabetes include age, family history of diabetes, lower socioeconomic status, and membership in a minority ethnic group. Other than age, each of these risk factors is most probably "a reflection of underlying causal factors" (Harris, 1995, p. 4). Four major lifestyle risk factors for diabetes and its complications are obesity, smoking, alcohol consumption, and physical inactivity.

Diabetes and Minority Groups

This research focuses on Blacks and Hispanics, guided by two prominent competing hypotheses, the social characteristics hypothesis and the minority group status hypothesis. Members of the Black minority comprise 14% of the total population, with poorer health than the rest of the population in almost every category of acute and chronic conditions. Increases in life expectancies for Blacks have consistently lagged behind those for the general population, a discrepancy widened during the 1980s (USDHHS, 2000; Kitagawa & Hauser, 1973). Currently, Blacks live an average of 6.5 fewer years than Whites (Health Care's Better if You're White, 1999). Black Americans, in fact, suffered nearly 60,000 excess deaths in 1979 and in 1980.² No firm evidence has emerged to account for the disproportionate burden of disease among most minority groups.

Black Americans

Black (African) Americans are the largest minority group found in the U.S. Oddly, prevalence rates of diabetes among Black Americans have tripled during the past 30 years. Black Americans are 1.7 times more likely to have diabetes than non-Hispanic Whites, with at least 1.3 million Black Americans currently having diabetes (Tull & Roseman, 1995). If the number were to include those yet undiagnosed, it would increase to 2.3 million, or 10.8% of all African Americans (ADA, 2000; Harris, 1993).

²Excess deaths, in this instance, is defined as the difference between number of deaths observed in the Black population and the number of deaths that would be expected had that population had the same age- and gender-specific death rates as the White population (USDHHS, 1995).

Data from the National Health Interview Survey (NHIS) indicate that prevalence of diabetes decreases with increases in levels of education and household income for both Blacks and Whites. However, the prevalence of diabetes of Blacks supersedes that for Whites at each level of education and income, suggesting that, even with socioeconomic status controlled, diabetes rates among Blacks exceed those for Whites (Tull & Roseman, 1995). Data focusing specifically on diabetes-related complications among Black Americans are limited. Available data, however, show Blacks to be persistently more likely than Whites to suffer from complications (Otten, Teutsch, Williamson, & Marks, 1990; Potter, 1991). Prevalence of blindness from diabetic retinopathy (a catch-all term used for all abnormalities of the small blood vessels of the retina, such as weakening of vessel walls or leakage from blood vessels caused by diabetes) is twice as high for Blacks as it is for Whites. Rates of diabetic nephropathy in the Black population range from 2.6 to 5.6 times more than those for Whites. Lower-extremity amputation rate for Blacks is 8.2 per 1,000 Black diabetic population; the rate for White diabetics is 6.9 per 1,000 (Tull & Roseman, 1995).

Some evidence suggests racial discrimination possibly occurring in the health system. For instance, Blacks are less likely to receive invasive cardiac treatment, a major complication of diabetes. Even after controlling for insurance and health care delivery system, this condition holds true (Escarce & Epstein, 1993).

Hispanic Americans

Members of the Hispanic population constitute the second largest minority group in the United States. There is considerably less national-level health and mortality information for the Hispanic population than for the Black population. Furthermore, the wide variation in the Hispanic population makes national data difficult to interpret. The term "Hispanic" is often used for convenience to label non-Whites who are not Black (Johnson, 1986). The population includes people from widely varied backgrounds, including Mexicans, Puerto Ricans, Cubans, Brazilians, Colombians, Chileans, Argentineans, Salvadorans, and Nicaraguans.

Prevalence rates for diabetes are two to three times higher in the Hispanic population than in the non-Hispanic population (Aspen, Burge, & Moreno, 1991; Stern & Mitchell, 1995). As are Blacks, Hispanics are more likely to be in lower socioeconomic strata than Whites. Yet studies portray a favorable mortality and morbidity situation for most Hispanic groups. The "Hispanic paradox" or "Markides paradox" addresses the phenomenon of morbidity and mortality patterns among Hispanics being consistently more similar to those among Whites despite their socioeconomic positions being more similar to that among Blacks (Hays-Burista, 1992; Markides & Coreil, 1986; Sorlie, Backlund, & Keller, 1995; Sorlie, Backlund, Johnson, & Rogat, 1993; Sorlie, Rogat, Vega, & Amaro, 1994).

This phenomenon is particularly perplexing in light of Hispanics having high rates of obesity (Williams & Collins, 1995; Winkleby, Fortmann, & Rockhill, 1993). Hispanics

have lower rates of death from cardiovascular disease and cancer, unexplainable by their lifestyle risk factors (Espino, Burge, & Moreni, 1991; Markides, et al., 1989). Raynard Kington at the National Center for Health Statistics proposes that the explanation of this paradox may lie in part to generally high levels of family support and/or to the large number of Hispanic immigrants who have yet to adopt certain unhealthy American customs (National Center for Health Statistics [NCHS], 1992; NCHS, 1994; Health Care's Better if You're White, 1999).

Perhaps this issue of acculturation and health among Hispanics is one of the most ambiguous. In line with Kington's suggestion, the "healthy migrant" effect suggests that immigrants, to begin with, are a selective group and tend to have better health than those who do not migrate. On the other hand, a substantial proportion of Hispanics who have entered the United States in recent years have immigrated for family reunification purposes; the majority of these immigrants is poorly educated, unskilled, and poor (Borjas, 1994; Robinson, 1998; Sabogal, Martin, Otero-Sabogal, Marin, & Perez-Stable, 1987; Vega & Rumbaut, 1994). One study examined the relationship between assimilation and diabetes rates; as Hispanics assimilated more into mainstream America, they were actually less likely to develop diabetes (Stern & Mitchell, 1995).

Three dimensions were used to test acculturation levels of Hispanics residing in San Antonio, Texas: functional integration with mainstream America; values placed on preserving Mexican cultural origin; and attitude towards traditional family structure and sex-role orientation. Hispanics with higher levels of acculturation had significantly reduced rates of diabetes, independent of socioeconomic status. Moreover, within the

Hispanic community, the expected inverse relationship of socioeconomic status and diabetes is maintained. Rates of diabetes tend to be higher among Hispanics with less than a high school degree and lower incomes than the rest of the Hispanic population (Marshall, Cook, & Marshall, 1993).

Ethnic Variations in Health

A great deal of concern in the health industry is centered on eliminating or reducing the disproportionate prevalence of diabetes among minority groups. The goal to eliminate racial disparities demands more research dedicated to improving the understanding of associations between health and both processes and pathways leading to such disparities (USDHHS, 2000). This pertains not only to the differential likelihood of developing a chronic disease. Of equal importance are varying patterns, across ethnic groups, of disease progression in terms of onset and timing of various physical and psychological sequelae. Also important is how this ongoing process might be mediated across various ethnic subgroups through differential possession of important financial and informational resources, access to health care, and engagement in healthy lifestyles.

Two competing hypotheses have sought to describe the fundamental causes of racial/ethnic disparities in health. Both of these hypotheses were initially used to evaluate ethnic differences in fertility levels, but their applications have been expanded to migration research, and, more recently, to the area of health, including mortality. One postulate is generally referred to as the social characteristics hypothesis; a competing premise is the minority group status hypothesis.

Broadly stated, the social characteristics hypothesis posits that the social and behavioral characteristics associated with membership in a minority group are the main factors leading to health differentials between that and other groups. If the characteristics of the minority and the dominant populations were the same, the differentials would disappear. This idea has wide acceptance in the health field, as low socioeconomic status and associated lifestyle factors appear to be underlying causes in many health problems experienced by members of minority groups (USDHHS, 1995). Some studies have found that racial and ethnic differences disappear when socioeconomic status is controlled (Keil, Sutherland, Knapp, & Tayler, 1992; Rogers, 1992) others, however, have not seen this effect (Stern & Mitchell, 1995).

The minority group status hypothesis posits that minority group members face a climate of prejudice and discrimination which empirically produces a "minority status" effect, independent of differences in characteristics between the minority and majority groups. These disadvantages are reflected in higher levels of mortality and morbidity. Berkman and Mullen (1997) have recommended that health researchers take a closer look at conditions related to social class and environmental factors, as well as the stressful experiences related to racial discrimination.

Several studies provide strong documentation how, as immigrants become assimilated into their new location and adopt the resident lifestyles, they begin to exhibit health characteristics similar to long-time residents. The rise in rates in diabetes parallels increases of western lifestyles. For example, diabetes was virtually unknown among the Yemenite Jewish population during the first half of this century. As Yemenite Jews began

to migrate to Israel, their diets changed from one of unrefined, natural foods to one similar to native Israelis, high in refined carbohydrates. Within 25 years after arriving in Israel, about one in eight Yemenite Jews had diabetes, approximating the rates of their modern neighbors. Similarly, the diabetes rates among the Pima Indians in Arizona, where 50% of the adults have diabetes, reflect the impact of lifestyle changes associated with westernization. Their genetically similar kin in Mexico have rates of diabetes that are essentially nil (Atkins, 2000; Bennett, Burch, & Jiles, 1971).

Diabetes is a chronic condition with a complex etiology. Broadening evidence points to an overwhelming influence of lifestyle in the manifestation of the disease. The pronounced racial and ethnic differences cannot be explained by genetic makeup alone. (See also Hummer, 1996, for a detailed critique of the "genetic" explanation for ethnic mortality differentials.) Clearly, environmental and behavior factors play a substantial role.

The next section examines in more detail the various factors hypothesized to underlie racial/ethnic differences in diabetes prevalence. Although the present investigation is focused on delineating factors affecting processes to diabetes rather than its onset, a discussion of factors underlying onset is important to lay the groundwork for analyzing subsequent disease progression. This is especially important given the limited knowledge of the degree and manner in which the disease and its sequelae unfold among various minority groups.

Genetics

A considerable amount of research has been devoted to finding genetic links to chronic conditions. For example, while not a focus of this study, hypertension is both a

risk factor for and a complication of diabetes, as well as a significant cause of heart disease and stroke. Higher rates of hypertension in Blacks is a well-known throughout the health field. The "thrifty gene" hypothesis is a popular explanation: Populations exposed to periodic famines, as are present in Africa, develop a high frequency of genes for survival to protect them from starvation through efficient energy conservation and fat storage (Tull & Roseman, 1995). However, genetic differences between Blacks and Whites do not provide a sufficient explanation of the wide difference in levels. West African Blacks, who have retained a more primitive lifestyle, have extremely low rates of diabetes. Strong evidence supports the importance of environmental factors. Genes may determine propensity to develop a condition, but environmental influences determine the severity and frequency of illness (Pettitt, Bennett, Knowler, Baird, & Aleck, 1985).

While accumulating evidence points to the possibility of the existence of a "diabetic gene," to date none has been found (Harris, 1995). Furthermore, comparison studies of Black and White populations indicate that even with lifestyle risk factors controlled (including being overweight, having low levels of education, and low levels of physical activity), the differences in diabetes rates between Blacks and Whites prevail (Manton & Stallard, 1997).

Even though Hispanics are more likely to have genetic-based risk factors for diabetes than are Whites, including higher body mass index, body fat distribution, and tissue resistance to insulin, members of the Hispanic population are still almost twice as likely (1.9 relative risk) to develop diabetes as are Whites with these factors controlled (Flegal, et al., 1991). Attributing racial and ethnic differences in rates of diabetes to

genetics is difficult because there is considerable genetic variation within ethnic categories, and caveats in interpretation must be employed because of variations in methodologies used and the potential for confounding factors.

Access to Health Care

Over one in ten health care dollars are spent on diabetes in the United States (USDHHS, 1999). More striking, one in every four Medicare dollars, for people age 65 and over, is spent on diabetes. Over half (57.4%) of people with diabetes are covered by a government-financed health insurance program (Medicare, Medicaid, or other public assistance program) (Ghodes, 1995). Because of the prohibitive costs involved in treating diabetes-related complications, ensuring that people with diabetes have adequate preventive health care is a major concern among health care administrators.

Studies conducted to determine whether the presence or absence of health insurance coverage is related to an increased risk of complications from diabetes have been mainly inferential. The 1989 NHIS survey found that lack of coverage was associated with low income, but not with increased prevalence of complications. Results from the San Antonio Heart Study, however, found private health insurance coverage to be associated with fewer complications in the Hispanic population (Stern & Mitchell, 1995). One study of inner-city diabetics with full third-party reimbursement for care was associated with increased rates of emergency room visits, but not with hospital admissions or use of outpatient clinics (Nordberg, Barlow, Chalew, & McCarter, 1993).

Tighter control of insulin levels and blood glucose are known to reduce complications from diabetes (G. Williams, 1994). However, tight control requires liberal

access to medical care. Because the uninsured poor have less opportunity to seek medical care for preventable conditions, they are more likely to seek treatment for diabetic complications that could have been avoided with earlier intervention (Escarce & Puffer, 1997; Trevino, 1999).

Access to health care is often a function of socioeconomic status (King & Williams, 1995). While employer-provider insurance is routine in the United States, those in low-status occupations are less likely to have health insurance as a benefit. Over half of those who have no health insurance coverage work full-time (Eckholm, 1994). Many of those noncovered employees are minorities. Employed Blacks and Hispanics are only one-fifth as likely as Whites to have employment-related health insurance coverage. Without insurance, people are likely to put off seeing a doctor until a condition becomes critical. In 1996, one-sixth of the population under age 65 in the United States had no health insurance (Eckholm, 1994). Differences in access to treatment and the quality of care are a large part of the reason rates of death from some diseases are higher among Blacks than among Whites (Freeman & Payne, 2000).

Blacks are more likely than Whites to report lack of health care coverage or inability to see a doctor during the preceding year because of the cost. Among those with coverage, Blacks are more likely to report their plans not covering the cost of preventive services (Tull & Roseman, 1995). Blacks are less likely to have a primary care physician and more likely to use the emergency room for nonemergency care. In 1992, there were twice as many avoidable hospitalizations among Blacks as there were among Whites (Health Care's Better if You're White, 1999).

Even having insurance coverage does not guarantee equitable treatment between Blacks and Whites. Blacks are less likely than Whites to receive systemic therapy or discretionary surgeries (Manton & Stallard, 1997). Cardiologists are less likely to refer a Black woman for cardia-catherization than a White woman, even when symptoms and risk factors are identical (Escarce & Epstein., 1993). Despite being at higher risk for ischemic stroke than Whites, Black patients are substantially less likely than White patients to receive invasive procedures, such as carotid endarterectomy, a procedure that is effective in preventing strokes (Honer, Oddone, & Matchar, 1995). Both ischemic heart disease and strokes are serious complications of diabetes that, in large part, are avoidable with adequate care.

Honer et al. (1995) suggest three plausible explanations for the underuse of invasive procedures by Blacks. First, Blacks and Whites have different beliefs about the causes and prevention of cardiovascular disease. While an overgeneralization, the results of one study indicated that Black culture puts greater emphasis on present-time orientation than on the future (Brown, Brody & Stoneman, 2000). Present-oriented people perceive themselves to be less susceptible to consequences of illness. Second, Black patients are more likely to have had previous negative experiences with the health care system (lending support to the minority status explanation). And, third, Blacks are more likely than Whites to see the financial obligations that may be incurred for medical treatment as a substantial barrier to obtaining care.

Black Americans have historically had less access to health care than Whites. Survey data show Blacks to be more likely to experience frequent illness, with

expectations of higher per capita expenditures for medical care. However, medical costs per capita, measured by physician visits and inpatient hospital admissions, are essentially equal between Blacks and Whites. This discrepancy suggests that Blacks are at risk for not obtaining needed, timely medical care (Peek, Coward, Henretta, Duncan, & Dougherty, 1997; Potter, 1991). Minorities are at a disadvantage even in obtaining pain control. Only one out of every four pharmacies in minority neighborhoods has adequate supplies of strong pain relievers, forcing residents to search outside of their neighborhoods to find the necessary medicine, or to go without (Morrison, 2000).

Lack of insurance coverage is yet more critical for Hispanics. Hispanics are more than twice as likely not to have a health plan as non-Hispanics. They are twice as likely as Whites to report costs prohibiting them from seeing a doctor within the prior year (Keenan, Murray, & Truman, 1994). Interestingly, no conclusive evidence has been found indicating a lack of insurance coverage being related to increased risk of diabetes' complications among Hispanics (Pugh, Tuley, Hazuda, & Stern, 1992). This lack of association may be partly explainable: Many have access to a wide supply of pharmaceuticals without physician prescriptions via relatives living in Latin America.

Language gaps are prominent in the United States. As many as 24% of Americans do not speak English as their primary language (Torres, 1998), and at least half do not understand their doctors' orders (Golin, DiMatteo, & Gelber, 1996). Parenthetically, the level of nonadherence does not appear to be related to socioeconomic status.

Behavioral changes usually occur within a cultural context, yet some risky health behaviors are accepted, even encouraged, in certain cultures, reinforcing status quo for

health risks. Obesity, for instance, does not have the stigma within Hispanic populations that it does within the White population. There has been a great deal of emphasis on promoting diabetes awareness and prevention; cultural context has only recently been added to the essential training provided to diabetes' educators and physicians.

The social characteristics hypothesis finds support in both extent of insurance coverage and health care system factors, such as availability of culturally-sensitive practitioners and degree of language barriers. On the other hand, inferential data tend to support the minority status hypothesis, particularly in light of plausible discrimination against minorities in the medical field.

Socioeconomic Status

Nearly one out of eight Americans lives in a household with income below the federal poverty level (USDHHS, 1995). Low income encompasses a variety of social disadvantages, including substandard housing, single-parenthood, and unemployment or underemployment. Poverty is linked to poor diet and limited access to medical care (Amick, Levine, Tarlov, & Walsh, 1995; Health Care's Better if You're White, 1999). Death rates for all causes are twice as high for people in poverty as for those who are not (Amler & Dull, 1987). Health disparities between the poor and nonpoor are pronounced and cross all dimensions of health. The risk of death from heart disease is substantially higher for low-income populations than for the population at large (Salomaa, Miettinen, Ketonen, Marin, & Perez-Stable, 2000). The poor suffer disproportionately from chronic conditions and acute infections (Kammeyer, Ritzer, & Yetman, 1997).

The inverse relationship between socioeconomic status and health is well-established (House et al., 1990, 1992; 1990; Marmot, Bobak, & Smith, 1995; Marmot, Koegevinas, & Elston, 1987). Risk factors associated with poor health, such as obesity, high blood pressure, and smoking, are more common in the lower classes (USDHHS, 2000). While tobacco use has declined over the past 20 years, rate of tobacco use has remained virtually constant for people with less than a high school education (USDHHS, 1995). Rates of disability for major chronic disease, specifically heart disease, arthritis, back problems, and hypertension, are nearly double within poor populations than the rates of the nonpoor (Newacheck, Butler, Harper, Piontkowski, & Franks, 1980). Reasons suggested include poor access to health care, stresses associated with living in poverty, and the practice of health behaviors associated with poor health. The poor are more likely to smoke tobacco and to participate in risky health-related behaviors. They are more likely to have high blood pressure and high levels of cholesterol. Even among smokers, those in upper classes are healthier than smokers in lower classes (D.R. Williams, 1994). Even with risky behaviors (e.g., smoking, sedentary life style, and obesity) controlled, people with lower incomes are at an increased risk of mortality.

Despite programs designed to improve opportunities for the underprivileged classes, the income gap has increased markedly since the 1970s. In 1970, the median income for a Black family was 61% that of White-family incomes. In 1993, average incomes for Black families was only 55% that of Whites (De Vega et al., 1999; Kammeyer et al., 1997). The poverty rate for Black families is nearly three times that for White families; 33% of Black families live in poverty compared to 12% probability for a White

family. Ethnic disparities in net worth are even more dramatic. In 1991, the median net worth of a White household was \$44,408.00. Black households had a median net worth of only \$4,604.00 (Kammeyer et al., 1997).

Individuals who are disadvantaged socially and economically have shorter life expectancies and are more likely to suffer from major diseases such as cardiovascular disease, diabetes, cancer, and hypertension (James, Strogatz, & Hauser, 1987; Williams, 1990; Williams, Takeuchi, & Adair, 1992). Williams & Collins (1995) argue that an understanding of socioeconomic status on health status is critical to effective interventions, stressing how studies which emphasize health behavior and other psychosocial factors address only the superficial causes.

Overall, Blacks have lower incomes than other ethnic groups, with the highest rates of morbidity and premature mortality. Hispanics have rates of morbidity and mortality similar to Whites for all causes, but as a group are more likely to be in lower income brackets and less likely to have health insurance coverage. The lower socioeconomic status associated with membership in a minority group, particularly for Blacks, lends credibility to the social characteristics hypothesis. However, this association appears to be qualified when factors such as obesity are controlled.

According to Williams and Collins (1995), socioeconomic status is a better predictor of health outcomes than race. Navarro (1991) maintains that national research tends to emphasize racial differences in health while minimizing the underlying socioeconomic differences. These substantial differences in financial equity, however, do not fully account for differences in access to medical services nor to the health of ethnic

populations (Johnson & Christenson, 1998), nor are they explained by participation in preventive behavior or abstention from risky behaviors. The ambiguity of the findings suggest that components of socioeconomic status may need to be examined separately for their singular influence on health. The education component of socioeconomic position, for instance, may be more important than the financial aspect. Education has been positively related to self-reported good health (USDHHS, 2000; Idler, 1993; McCallum, Shadbolt, & Want, 1994).

Role Integration

Perhaps a more elusive factor in explanations of disparate health outcomes across ethnic groups is the degree of role integration. There is some debate concerning whether or not the association between roles and health is correlational or causal. While numerous studies have confirmed that participation in social roles is associated with good health, the direction of the relationship is not always clear. Some researchers argue that poor health limits the number of roles in which one is capable of participating; others argue that limited social participation leads to poor health.

Social integration, or membership in social networks, is generally associated with increased stability and control, and social networks enforce the adoption of appropriate roles and behavior (Simon, 1995; Thoits, 1982, 1983). Of considerable interest is the study by Thoits, whose research sought to uncover the underlying factors involved in links between role integration and health. Role relationships, according to Thoits (1986), have the potential to provide a source of positive self-evaluation, a set of identities, and the

basis for a sense of control and mastery. Health may be enhanced if role involvement gives meaning and purpose to one's life.

Although research tends to support the positive view, there are alternative views regarding role participation (Thoits, 1983). In particular, arguments have been made for and against whether participation in multiple roles is beneficial or harmful. There are two major competing hypotheses regarding the health impact of multiple social roles (Rushing, Ritter, & Burton, 1992). One hypothesis posits that multiple roles potentially cause role overload and role strain, which can adversely impact physical and mental health. A study by Reed and Yano (1997) supports this hypothesis. Their findings indicate that deaths among Japanese-Americans from myocardial infarction were higher for those with the greatest number of social contacts. The alternative hypothesis suggests that multiple roles are beneficial, and the healthiest people participate in a high number of social roles. Empirical evidence overwhelmingly supports this latter school of thought (House et al., 1988). Multiple roles have been observed to reduce the risk of dying for both men (Rushing et al., 1992) and women (Foster & Stoller, 1992). Occupying multiple roles has been positively linked to both health and reduced risk of mortality (Berkman & Breslow, 1983; Berkman et al., 1993; House et al., 1988; Moen, Dempster-McClain, & Williams, Jr., 1989).

Severe social isolation has been linked to poor health, but substantial ethnic differentials in the effect of isolation have not been found. The Alameda County study conducted in the mid-1960s and 1970s suggested there were small differences between Blacks and Whites in the percentage who were isolated on a social network index (a scale

composed of marital status, contact with friends and relatives, and church and group memberships). Some differences were notable, however: Blacks were less likely to be married or to report membership in voluntary organizations than Whites, but they were more likely than Whites to belong to church groups and to have more contacts with friends and relatives (Berkman & Breslow, 1983).

The marriage role is by far the most studied role, and likely, the most important role in terms of health outcomes (Thoits, 1987; Verbrugge, 1984; Zick & Smith, 1991). The widely known Framingham Heart Study tracked the health of over 5,000 individuals for over 30 years. One of the major findings of this study was support of the idea that marriage is beneficial to health (Murray, 2000). Immune system function was best among the married, followed by the never marrieds, then the widowed. Divorced or separated people have the lowest immune system functions. Divorce, in fact, appears to be a strong predictor of poor health. Divorced people have higher rates of both physical and mental illness than do married or single people. One interesting study on the adverse effect of divorce claimed that divorce has the same detrimental impact on health equivalent to smoking one pack of cigarettes a day (Morowitz, 1975). Blacks are more likely to be single (never married), divorced, or separated, and less likely to remarry after marital dissolution than Whites. During the last four decades, the proportion of married persons in the Black population has declined dramatically, paralleling the decrease in the probability that Black females will ever marry. Almost one-half, 47%, of Black families are headed by single females.

Family ties in general seem to improve health. Among Hispanics, the importance of family support is well documented (Angel & Hogan, 1991; Basita, 1984; Lacayo, 1992; Markides, Martin, & Gomez, 1983). Parental and family roles are linked to improve immune system functioning and fewer illnesses (Murray, 2000).

In a study of 116 White and 76 Latino married or coupled patients with Type 2 diabetes, family structure was found to be related to successful self-management of the disease, including obtaining HbA1c testing, exercise, and diet. Having a more traditional family structure was positively linked to improved patient outcomes, although more so for male than for female patients (ADA, 2000).

The impact of religious roles has been shown to have a predominant place in health outcomes. Numerous studies have found that individuals who never attend church have the greatest risk of mortality, while those who attend weekly services have lowest risk. (See, for example, Berkman & Syme, 1979; Hummer, 1996; Idler & Kasl, 1992). The positive association of attendance at religious services with health is enhanced by strict adherence to the religious protocol (Jarvis & Northcutt, 1987). Church attendance is empirically related to lower levels of functional impairments (Idler, 1987; Idler & Kasl, 1992; Vanderpool, 1977). Idler also found that, among older women, church attendance improves both physical and emotional well being, even with chronic illness and functional impairments controlled.

Blacks are generally recognized as a religion-oriented group. They have been identified as the most religious subpopulation in the industrialized world and participation in religious activities is a critical source of integration for this group, yet they still

disproportionately experience poor health (Ellison, 2000). Similar intensity of religious participation has also been found in the Hispanic elderly (Markides et al., 1989).

The work role has also been found to be related to health. In general, paid employment is positively associated with health for women (Verbrugge, 1984). Job status, earnings, number of hours worked outside the home, and availability of help at home may be pivotal factors, however. Some studies found employment to provide a positive health benefit for women (Kessler, Price, & Worthman, 1985). Rushing, Ritter, and Burton (1992), using data from the National Longitudinal Surveys of Labor Market Experience, found employment to have the most consistent health-protective effects, particularly for Black women.

Perhaps at least some of the stresses associated with participation in these roles by minority group members may be addressed by the minority status hypothesis. Social status and employment opportunities are, to a large extent, still ascribed on the grounds of race or ethnicity. Roles of minority members are not clearly defined as they participate in fields of the dominant society, and there is a continual conflict between ascribed and achieved roles (Johnson, 1993; Mokherjee, 1998). Conversely, some distinctive patterns of social relations are likely to be the result of a complex interaction of characteristics unique to a population. For example, a good proportion of the Hispanics are actively involved in the Catholic faith and are likely to have large families, social characteristics which have been associated with positive health outcomes.

Lifestyles and Health-Related Characteristics

As already apparent in the previous discussion, lifestyles and practice of preventive behavior play a vital role in minimizing or maximizing the risk of developing a chronic condition. Tobacco use, poor nutrition, and physical inactivity are the three biggest behavioral risk factors in America today (CDC, 1998). Preventive behavior may be classified into two types, primary preventive behavior and secondary preventive behavior (Duelberg, 1992). Primary preventive behavior refers to lifestyle choices made for good health, such as participating in exercise and consuming low-fat diets. Secondary preventive behavior refers to the seeking of medical services used for screening for any serious conditions, such as cholesterol screening and blood pressure checks. Duelberg (1992) studied health behaviors among women, finding substantial variations in preventive behaviors between Black and White women. White women were more likely to participate in primary preventive behavior, whereas Black women were more likely to be overweight, more likely to smoke, and less likely to exercise than White women. Black women were also more likely to participate in secondary preventive behaviors.

Broyles et al. (1996) studied cardiovascular risks among low- and middle-income White and Hispanic children and their mothers in San Diego. Even after adjusting for socioeconomic status, ethnic differences between White and Hispanic families existed, with Hispanic children significantly more at risk for developing cardiovascular disease.

Prior research has shown the four lifestyle variables included in this study to have a strong association with health outcomes, and are particularly strong risk factors for developing diabetes-related complications: smoking, alcohol use, physical inactivity, and being overweight.

Smoking. One in every five deaths in the United States results directly or indirectly from smoking. Smoking accounts for 87% of lung cancer deaths and 82% of deaths from COPD. It is also a factor in deaths from ischemic heart disease and stroke, two major complications of diabetes. Information collected from 2,806 male and female respondents in New Haven, Connecticut, a community of seniors, indicated that older Black men and women were less likely to have ever smoked than Whites. Whites who smoked, however, were significantly more likely to quit smoking than Blacks (Berkman et al., 1986).

Hispanics are only half as likely to smoke as are Whites (USDHHS, 1992; Winkleby, 1994). Among both Hispanics and Whites who smoked, the lack of understanding of the risks involved in smoking paralleled lack of academic education (Latinos up in smoke, 1996). Some evidence of differential ethnic treatment by physicians has been uncovered. Physicians advised 60% of White men with low education levels to stop smoking; only 8% of Hispanic men were similarly advised. Virtually no difference in smoking rates has been found between college-educated Whites and college-educated Hispanics.

Alcohol use. Blacks, especially older Blacks, have exhibited a lesser likelihood of consuming alcohol than Whites. Only 21% of Black women reported that they used alcohol. Almost half, 49%, of the White women reported using alcohol. Among men, reported alcohol use for Blacks and Whites was 50% and 67%, respectively (Berkman et al., 1986).

Physical inactivity. Physical inactivity has known strong predictive power with respect to both the risk of developing diabetes and developing complications. Physical

inactivity works independently of other factors (Tull & Roseman, 1995; Clark, 1997). A substantial proportion, 29%, of Americans report they do not participate in a regular program of physical activity. Men are slightly more likely to exercise than women (Ross & Bird, 1994). No valid data exist on levels of physical activity for the Black population at this time; however, inferential data points to the likelihood that Black females, given their high rates of obesity and diabetes, have lower rates of physical activity than other segments of the population (Tull & Roseman, 1995).

Body mass index. While not a behavior, body mass index reflects primary care behaviors. A high body mass index is a known risk factor for heart disease, diabetes, and other chronic conditions. Obesity increases the risk for numerous conditions, including heart disease, stroke, and diabetes (Verbrugge, 1989). There is a much higher prevalence of obesity among Black women than other race/sex groups (Elo & Preston, 1997; Tull & Roseman, 1995).

Americans are facing an epidemic of obesity. Genetic makeup could not have been altered quickly enough to bring about this epidemic. Increases in sedentary lifestyles with high levels of fat consumption are responsible for the rapid rise in obesity rates in America.

Gender

Women generally report poorer health than men, despite their greater longevity (Idler, 1993; Kaplan, Barell, & Lusky, 1988; Ross & Bird, 1994; Verbrugge, 1984). Women experience more nonfatal-but-chronic disease than men throughout the life course, including anemia, migraine, and arthritis (Verbrugge, 1984). The health advantage among men diminishes in later life, as they suffer more from coronary heart

disease, cancer, cerebrovascular disease, emphysema, cirrhosis of the liver, kidney disease, and atherosclerosis. The average life expectancy is 71.8 years for men, 78.6 years for women (USDHHS, 1992). Of the 15 leading causes of death, diabetes is the only one for which women's rates approach men's (Verbrugge, 1984).

Outcome Variables

Functional Limitations

Limitations in daily activities are associated with increased risk of hospitalization, loss of economic self-sufficiency, and the inability to fulfill normal roles. Complications from diabetes can result in severe restrictions in physical activity. Diabetes is likely to be associated with vision loss, amputation, stroke, and heart problems. Any of these conditions can limit work, household or school activities. In more extreme cases, people with diabetes can experience difficulties with instrument activities of daily living. Because one of most effective ways to maintain proper blood sugar levels is through physical activity, conditions leading to reduction in physical activity are of major concern to health care professionals (Kaplan et al., 1988; Songer, 1995).

Higher rates of diabetes among minority ethnic groups is well established, but racial differences with respect to functional decline are not so clear-cut (Ford, Haug, Jones, Roy, & Folmar, 1990). National level data on differences in ethnic groups is difficult to evaluate due to small sample sizes of minority group and results being contradictory. Several longitudinal studies have indicated that functional declines, in general, are more common for Blacks than for Whites (Anderson, James, Miller, Worley,

& Longino, 1998; Angel, Angel, & Himes, 1992; Clark & Maddox, 1992; Crimmins & Saito, 1993; Crimmins, Hayward, & Saito, 1994). However, at least one study (Rogers, Rogers, & Belanger, 1992) found no differences between Blacks and Whites. Angel et al., (1992) reported that rates of functional decline among Hispanics were intermediate between those found for Blacks and Whites.

CES-D Emotional Symptomatology

A common test for measuring depression is the Center for Epidemiological Studies Depression (CES-D) Scale. The CES-D captures several dimensions of depression, including emotional affect, psychosomatic symptoms, and interpersonal problems (Kohout, Berkman, Evans, & Cornoni-Huntley, 1993). This was the measure selected for the HRS because it provides an adequate measure of affective functioning (Wallace & Herzog, 1995). An increase in CES-D scores has been associated with an increased risks of mortality, stroke, and myocardial infarction (Weissman et al., 1985).

Depression has known neuroendocrinological and immunologic effects. Depression can lead to increased risk of premature death (including suicide), dysfunction, and medical and mental morbidity (Eisbenberg, 1992; Ritsner & Pohizovsky, 2000). It has also been found to be associated with Parkinson's Disease, stroke, hypothyroidism, stroke, Alzheimers, hypertension, cardiovascular disease, neurological disorders, sensory loss, and arthritis, as well as decreased levels of physical activity, higher levels of smoking, and altered lipid metabolism (Cantor, 1983). A positive association exists between depression and increased likelihood of stroke. Depressed men with high blood pressure are twice as

likely to have a stroke than hypertensive men who are not depressed. Women generally report their levels of depressive symptoms more than men report (Dean, Kolody, Wood, & Matt, 1992; Keith, 1993; Krause & Golderhar, 1992; Krause & Liang, 1993).

Over 15% of people with diabetes have been diagnosed with depression. This rate of diabetes prevalence is well above the national prevalence rates of 3 to 4%. Studies have found that the degree of depression suffered is not necessarily related to the seriousness of complications from diabetes (Lustman & Gavard, 1995).

CES-D Psychosomatic Symptomatology

Somatization refers to a patient's physical symptoms that are manifested during periods of times of psychological distress. It describes a person's feeling physical symptoms in the absence of disease or out of proportion to a given condition. As many as 80% of healthy people have symptoms not rooted in physical disease (Closure & Lustman, 1989). Some cultures stress that feelings of anxiety and depression are signs of weakness, therefore symptoms are somatized — expressed through physical manifestations — to be socially accepted. Blacks and Hispanics are more likely to somatize than other groups (Harvard Mental Health Letter, 2000).

Physicians may overlook serious psychological causes that may be associated with physical illness. Numerous chronic diseases and disability may be present in depressed elderly persons, evidenced by cardiovascular disease, neurological disorders, sensory loss, and arthritis, but the roots of the illness may actually be in depression.

No conclusive evidence exists to support that depression among people with diabetes is linked either to duration or the severity of the condition. Studies have found a significant association between depression and duration (Litem, Meehan, Procci, & Zeidler, 1991; Rathman, Haastert, Roseman, & Giani, 1999). A different study found no such association (Lustman, Griffith, Closure, & Cryer, 1986).

Education and income have been shown to be inversely related to the likelihood of developing depression (Gallo & Cooper-Patrick, 1998). Ulbrich, Warheirt, and Zimmerman (1989) found that this inverse relationship appears to be conditioned by race. Blacks with high levels of education have fewer depressive symptoms than Whites. Blacks with low levels of education have more depressive symptoms than Whites.

Subjective Health Status

Researchers have generally found self-reported health to be a valid predictor of survival, independent of objective health status indicators (Mossey, Mossey, & Shapiro, 1982; Roberts, 1999; Wolinsky & Johnson, 1992). Subjective health captures knowledge and perceptions of health that are not incorporated into more objective health measures (Wallace & Herzog, 1995). This form of measurement appears to be particularly reliable for individuals who report their health as fair or poor (Idler, Kasl & Lemik, 1990; McCallum, Shadbolt, & Want, 1994). Almost half of all people with diabetes rate their health as fair or poor (Songer, 1995).

Racial variation in self-reported health has been noted. Blacks at all ages are more pessimistic about their health than are Hispanics or Whites (Ferraro, 1987, 1993; Ford,

Haug, Jones, Roy, & Folmar, 1990; Krause, 1987; Mutran and Ferraro, 1988, 1987, 1993). However, there has been debate as to whether or not Blacks are being pessimistic or simply being more realistic (Anderson, Mullner, & Cornelius, 1987).

Summary

To summarize, there are many gaps and inconsistencies in studies addressing ethnic variations in health. Part of the explanation for inconclusive evidence lies in methodological issues and cross-sectional data. Nevertheless, the questions as to whether these variations could be due to membership in a minority group or to the characteristics associated with belonging to that group remain unanswered. Good physical and mental health appear to be associated with higher socioeconomic status, higher levels of role integration, access to health care, and healthy lifestyle characteristics. Little is known, however, as to whether or not minority status has an independent effect on these outcomes, or whether these factors mediate the effect of minority group membership on health. Also, little is known as to the degree and manner in which these factors mediate any observed effects of minority group membership on changes in various outcomes over time, or the extent to which these dynamics vary across health outcomes for various minority subgroups. These specific issues are addressed in this research.

Study Hypotheses

The following specific hypotheses are being evaluated herein. The first hypothesis (H1) relates to a traditional characteristics explanation, whereas the next hypothesis (H2)

relates to a traditional minority status explanation for race/ethnic variations in changes in health outcomes. The lack of an initial bivariate effect would signify no support for either hypothesis. That is, changes in relevant outcome variables are similar for Blacks (or Hispanics, as the case may be) as for Whites. In other words, both hypotheses require an initial significant effect. The difference lies in whether that significant effect is explained by the complement of mediating characteristics (reduced below statistical significance) or is not explained. Each hypothesis is a strong version of its respective explanatory hypothesis; that is, each contends that whatever pattern is observed, the pattern will be the same for Blacks and Hispanics, and invariant across health outcomes. It should not matter whether one is observing Blacks or Hispanics or functional limitations, depression, or self-reported health status. The pattern is expected to be the same.

The third hypothesis extends the traditional explanations by focusing on the specific manner in which the mediating variables operate. It contends that the patterning of the mediating effects will be the same for Blacks and Hispanics, and invariant across health outcomes. That is, there will be consistency in the manner in which the mediating variables operate, assuming an initial significant race/ethnic status effect. To clarify, if socioeconomic status is the pivotal mediating factor among Blacks, it will also be the pivotal mediating factor among Hispanics. Similarly, if socioeconomic status mediates an initial race/ethnic status effect on changes in functional limitation, the same pattern will be observed for each of the remaining three outcomes. Conversely, if it takes all the mediating variables to eliminate a race/ethnic status effect on changes in functional limitations, then this pattern will be maintained for all the remaining outcomes as well.

Altogether, the third hypothesis stresses race/ethnic group similarity in the underlying processual dynamics surrounding race/ethnic group variations in health outcome changes. Counterfindings would suggest diversity in terms of how these dynamics transpire between Blacks and Hispanics, and across an array of health outcomes.

H1: Being Black and being Hispanic have no effect on changes in health outcome, independent of socioeconomic status, gender, role integration, health care access, and health-related lifestyles, regardless of health outcome. (Social Characteristics Hypothesis)

H2: Being Black and being Hispanic have an effect on changes in health outcome, independent of socioeconomic status, gender, role integration, health care access, and health-related lifestyles, regardless of health outcome. (Minority Group Status Hypothesis)

H3: The patterning of potential mediating effects does not vary between Blacks and Hispanics or across health outcomes.

CHAPTER III

METHODS

This chapter contains a discussion of the data source, measurement procedures, and analysis techniques. The data source section focuses on both the sampling procedures of the health and retirement study as well as the subsample of persons with Type 2 diabetes used in this analysis. The measurements procedures section presents operationalization procedures including such topics as variable collapsing and scale construction. The final section of the chapter is centered on the descriptive and multivariate statistical techniques employed in the analysis.

The analyses for this study will be centered on a sample of middle-age Americans who have been diagnosed with diabetes. They will comprise an examination of four outcomes focused on the nature of the linkage between racial/ethnic status and changes in a set of physical, psychological, and behavioral outcomes over a four-year period, extending from 1992 to 1996. In particular, the research aims to isolate the extent to which race/ethnicity has an independent effect on outcome or is mediated by other characteristics and, if so, then to establish the manner of mediation, and whether the patterning of these effects does or does not vary across outcomes. Each outcome will be analyzed separately through a series of additive models. The various potential mediating factors will be introduced in blocks. Each outcome will be first regressed on ethnicity. Then the effect of socioeconomic status, as exogenous, will be added to the model. Third, number of roles and gender will be added simultaneously to represent the endogenous block. Fourth, lifestyle characteristics will be added. Access to health care will be the

final block added to the model. Creating models in this fashion allows the opportunity to see the effects of each of the factors as new ones are introduced while controlling on the effects of the outcome variable at Time 1.

Research Questions

Two primary questions will be addressed in this secondary analysis of panel data on a subsample of Americans diagnosed with Type 2 diabetes prior to baseline:

1. What is the independent impact of ethnic status on changes in self-reported physical mobility, emotional symptomatology, psychosomatic symptomatology, and global health status over time?

2. In what manner do socio-lifestyle factors (access to health care; socioeconomic status, role integration, and lifestyle risk factors) impact the independent association of ethnic differentials on the changes in physical mobility, emotional well-being, and global health status over time?

Data Source

The Health and Retirement Study Sample

Data for this study were drawn from the first (1992) and third (1996) waves of the Health and Retirement Study (HRS), a panel study conducted by the University of Michigan that will be continued every two years for at least 20 years. The intent of this study is to examine changes in health outcomes over time. The latest data available for the study at this time are from 1996. The HRS data are rich in information concerning both

mental and physical health conditions of middle-age individuals between 51 and 61 who will be tracked over time. In addition, detailed comprehensive structural location factors, including work circumstances, income, net worth condition, number of roles, and lifestyle characteristics, are available.

The target population for the first wave of the HRS was all adults in the contiguous United States born during the years 1931-1941. Institutionalized persons (i.e., those in prisons, jails, nursing homes, long-term, or dependent care facilities) were excluded from the survey population, but sampled individuals who are subsequently institutionalized will be followed. In total, 12,654 respondents were interviewed for the first wave of this project. However, the full sample includes spouses of age-eligible respondents. This number includes some individuals who were not in the 51-to-61 age range at the time of the first interview. There were 9,824 who fit the criterion for being age-eligible for this study.

The HRS sample design parallels the multi-stage designs used for major federal survey programs such as the Health Interview Survey (HIS) and the Current Population Survey (CPS). The HRS sample was selected using a multi-stage area probability sample design with four distinct selection stages. The primary stage of sampling involved probability proportionate to size (PPS) selection of U.S. Metropolitan Statistical Areas (MSAs) and non-MSA counties. This stage was followed by a second stage sampling of area segments (SSUs) within sampled primary stage units (PSUs). The third stage of sample selection was preceded by a complete listing (enumeration) of all housing units (HUs) that were physically located within the bounds of the selected SSU. The third

sampling stage was a systematic selection of housing units from the HU listings for the sample SSUs. The fourth and final stage in the multi-stage design was the selection of an age-eligible person within a sample HRS (HRS, 1995).

There were 84 primary sampling units across the United States for this survey, which comprises the first stage of the SRC National Sampling Design. This sample lends itself particularly well to the studies concerned with minority ethnic groups. The largest two minority groups in the U.S., Blacks and Hispanic, were oversampled. About 10% of the sample should have included an age-eligible Black respondent. Within the primary stage strata, census tracts with Black populations of 10% or greater density (as indicated by 1990 Census data) were selected. This process increased the probability that a Black would be included in the sample. An increase in Black units, from 10% to 18.6%, of the total HRS sample was anticipated.

HRS administrations used estimates from the Current Population Survey to determine the expected percentage of Hispanic respondents. Estimates indicate that 5% of the HRSs sampled would include a respondent of Hispanic origin. The strategy for oversampling the Hispanics was two-fold. First, areas determined to have density of 10% or more Hispanics were oversampled. Second, PSUs were added to the sample, located primarily in the West and Southwest. This strategy increased the Hispanic representation in the sample from 5.0% to 8.6% of the total sample. In addition to the core sample, the HRS design includes oversamples of residents of the state of Florida.

The sample design specifications called for an 80% response rate. This rate was met or exceeded by all sample components except the Hispanic supplement, which has a response rate of 71% and a person-level response rate of 77%.

The Modified Sample Used in This Study

The focus of this study is limited to HRS respondents who reportedly had been diagnosed with Type 2 diabetes mellitus or high blood sugar prior to the first wave. Respondents who were diagnosed with diabetes prior to the age of 30 were considered to have Type 1 diabetes and were eliminated from the analysis. In total, 625 respondents, or 6.5 % of the age-eligible sample, were determined to have Type 2 diabetes prior to Time 1. An additional 159 respondents reportedly had high blood sugar at Time 1 but had not yet been formally diagnosed with diabetes. Of those, 119 were formally diagnosed with diabetes by Time 2. These 119 respondents were likely to have had Type 2 diabetes at Time 1, but were improperly diagnosed. Criteria for diagnosing diabetes are constantly under revision. Currently, there are three different criteria used to diagnose diabetes: fasting plasma glucose, casual plasma glucose, and oral glucose tolerance test. There is a considerable amount of variation in physician practices, leading to a strong possibility of underdiagnoses for these respondents (Larsen & Ralls, 2000). These respondents were considered to have been likely to have had diabetes at Time 1, and were therefore eligible for inclusion in this subsample. This brought the total sample size to 744 respondents. In total, respondents who had Type 2 diabetes at Time 2 and who had diabetes or high blood sugar at Time 1 were included in the analyses.

Outcome Variable Measurement Procedures

The variable measurement procedures discussion will center on the measurement of the four outcome variables, the main independent variables, the various mediating variables, and the control variables. Each of the outcome variables was measured at Time 1 and Time 2. The Time 2 measures constitute the dependent variables in this study, whereas the Time 1 measures serve as control variables. (See below under control variable measurement procedures.) However, the procedures for both the Time 1 and Time 2 measures are discussed herein, as they are connected.

Physical Mobility

Respondents were asked to report whether or not a certain activity was difficult to perform or not. Seventeen functional limitation questions were asked of respondents at Time 1. Some of the questions concerned activities of daily living (ADLS) or instrumental activities of daily living (IADLS), and mobility. Respondents were asked to exclude activities in which they expected to participate for less than 3 months. Some of these questions had such low response rate, they were unusable. For example, almost all respondents reported no difficulty when asked a question such as, "How difficult would you say it is to eat without help?" The questions asked were modified between rounds of the panel study, and a perfect match between the two waves was not possible. However, there was sufficient consistency among the questions to create weighted nine-point mobility index. This index included responses to the following questions: (1) "How

difficult is it for you to climb one flight of stairs?" (2) "How difficult is it for you to climb several flights of stairs?" (3) "How difficult is it for you to walk one block?" (4) "How difficult is it for you to walk several blocks?" (5) "How difficult is it for you to walk across the room?" (Time 1) and "How difficult is it for you to walk?" (Time 3).³

Respondents were asked to choose from one of five categories of difficulty: "Not at all difficult; a little difficult; somewhat difficult; very difficult; or something you can't do at all." These five categories were collapsed into a dichotomy; very difficult = 1, else = 0. Responses were then weighted according to level of difficulty. The most difficult questions—Question (2) "How difficult is it for you to climb several flights of stairs?" and Question (4) "How difficult is it for you to walk several blocks?"—were each assigned a weight of 1. Question (1)—"How difficult is it for you to climb one flight of stairs?" and Question (3) "How difficult is it for you to walk one block?"—were each assigned a weight of two. Question (5)—"How difficult is it for you to walk across the room?" (Time 1) and "How difficult is it for you to walk?" (Time 3), as the least difficult activity—was assigned a weight of 3. A physical mobility index was then created by summing the scores, ranging from 0 (no functional limitations) to 9 (all functional limitations).

Responses were summed across all limitations to yield a composite functional limitation score. At Time 1, Cronbach's alpha was .71. At Time 2, Cronbach's alpha was unchanged, .71.

³Data on functional limitations for the third round of the HRS study were not yet available for public release. Special permission to use a preliminary release version of these data was applied for and obtained.

Emotional Symptomatology

A composite scaled variable was used, including four CES-D measures: "For much of the time during the past week, I felt lonely; I felt happy (coding reversed); I enjoyed life (coding reversed); and I felt sad." Issues regarding the creation of this scale are discussed below in conjunction with the psychosomatic symptomatology scale.

Psychosomatic Symptomatology

A composite scaled variable was used, including four CES-D measures: "For much of the time during the past week my sleep was restless; everything was an effort; I had a hard time getting going; and I had a lot of energy (coding reversed)."

There was considerable change in both the number of questions and the formatting of questions for CES-D factors between the first and third waves of the surveys. Questions in Wave 1 asked the respondents to state the frequency during the past week of feeling a certain way. A typical question, for example, was phrased, "How often, during the past week, did you feel everything was an effort?" Respondents were asked to select from one of four categories: "All or almost all of the time; most of the time; some of the time; none or almost none of the time." Feedback from respondents prompted a change in the phrasing of the questions by Wave 3. At that time, the question was rephrased as: "During much of the past week, would you say everything was an effort?" Respondents responded either yes or no. In order to maximize consistency between the two waves, questions from Wave 1 were recoded so that the first two categories, "all or almost all"

“or most of the past week,” were combined into a single category. This combined category was set equal to one; all other responses were set to 0. For Wave 3, answering yes to the question was coded as 1; other responses were set to 0.

While there were a significant number of questions in both waves aimed at tapping mental health, only eight items were comparable between the two waves: “For much of the time during the past week, would you say: Your sleep was restless; You were happy; You felt lonely; You enjoyed life; You felt sad; You could not get going; You had a lot of energy; Everything was an effort.” These eight items were subjected to principal components factor analyses with varimax rotation. In both waves, four items consistently loaded on each of two factors. Any result less than .40 was considered not to load. The first factor had high loading on the following items: “felt happy, felt lonely, felt sad, enjoyed life.” These factors were then used to construct the Emotional Symptomatology scale. The second factor had high loadings on four psychosomatic conditions (“was restless; couldn’t get going; had a lot of energy; felt that everything was an effort”) and was labeled the Psychosomatic Symptomatology scale.

Two scales were created from these components based on the preceding factor analysis. All positive responses that the respondent had “felt that way for much of the past week” were set equal to one and all other responses were set equal to 0. A 5-point scale, ranging from 0 (“felt that way for none of the items during the past week”) to 4 (“felt that way for all four items during the past week”) was created for Emotional Symptomatology and Psychosomatic Symptomatology. The scores for the Emotional scale ranged from 0

to 4 in 1992 and in 1996. Similarly, the scores for the Psychosomatic scale ranged from 0 to 4 for both time periods.

Subjective Health Status

Respondents were asked at both time intervals to report their current health status on a 5-point scale: excellent; very good; good; fair, and poor. Scores were assigned ranging from 1 (excellent) to 5 (poor).

Independent Variable Measurement Procedures

The main independent variables for this analysis consisted of two dichotomous dummy variables tapping ethnic status, Black and Hispanic. Unfortunately, the number of cases for Asian Americans and Native Americans was too small to produce valid results. The emphasis in this study, therefore, was placed on two minority groups: non-Hispanic Black and Hispanic. Hispanic includes a group that was approximately 66.7% Mexican-American, 9.4% Puerto Rican, 7.3% Cuban, and the rest other-Hispanic. These were coded according to ethnicity, Hispanic. Two dummy variables were created: Black coded as 1; not Black coded as 0; and Hispanic coded as 1, not Hispanic coded as 0. Creation of these two dummy variables allows examination of the impact of being in either minority group, relative to being White, the reference category.

When the 1990 Bureau of the Census attempted to separate race and ethnicity, there was considerable confusion regarding the inclusion of an ethnic origin question being asked with the race question (McKenney, 2000; Jackson, 1989; Cooper, 1984). The HRS

questionnaire in this study was designed to minimize misreporting. In this study, respondents were first asked to state whether or not they considered themselves to be Hispanic or not. If they identified themselves as Hispanic, then they were asked whether or not they were Mexican-American, Cuban, Puerto Rican, or other type of Hispanic. Once ethnicity was obtained, the respondents were then asked to report whether they saw themselves as primarily White, Black, Asian-American, Native American, or of a Hispanic origin other than Mexican-American, Cuban, or Puerto Rican.

Mediating Variables Measurement Procedures

Access to Health Care

Current insurance status was used to measure this factor. Insurance coverage could be either private or public. No health insurance was coded as zero and having at least one type of health insurance coverage (employer-based, public, or supplemental) was coded as one.

Role Integration

This factor is a 5-point scale based on number of roles, with scores ranging from 0 to 4. Four roles were used to create this scale: marital role, parental role, work role, and religious role. Respondents were assigned score of 1 for each role they occupied and a 0 for each role that was not occupied, and the scores for each role summed to form a role integration index. Thus, the higher the score, the higher the role integration. Marital role was defined by self-reported marital status at the time of the interview. Characteristics or

respondents who reported not being married, but living with a partner, were examined. No remarkable differences were found between these respondents and those who reported being married, so living with a partner was defined as being currently married. Thus, those respondents who reported either being currently married or currently living with a partner were assigned a score of 1; having no such relationship was assigned a score of 0. Parental role was assigned a score of 1 if at least one child under the age of 18 was living in the home; having no children less than 18 at home was assigned a 0. The work role was assigned a score of 1 if the respondent actively participated in the labor force at least part-time; no such participation was assigned a score of 0. Religious role was a composite variable: if the respondent reported being affiliated with a religious organization and attended services at least two to three times a month, a score of 1 was assigned; otherwise, a score of 0 was assigned.

Age was included as a control factor, and this will help to account for differences in number of roles that might be related to age, such as participation in the labor force or having children under age 18 in the home. There was no weighting of importance of roles.

Health-Related Lifestyles

Four health-related life styles are included. These four lifestyle variables are measured as follows:

Current smoking: a composite variable defined as having smoked at least 100 cigarettes in one's lifetime and currently smoking was equal to 1; otherwise, 0.

Current drinking: drinking one or more alcoholic drinks per day was coded as 1; less than one per day was 0.

Physical inactivity: participation in vigorous physical exercise or sports, such as aerobics, running, swimming or bicycling, three or more times a week was assigned a score of 0. Lack of participation was coded as 1.

Weight status: measured as a metric variable using the body mass index. The formula for body mass index is kilogram/meters-squared.

Socioeconomic Status

This concept was measured by education, income, and net worth. Education was included as a metric variable using the highest grade of schooling completed. Scores ranged from 0 (no formal education) to 17 (some graduate work or graduate degree). Income was defined as annual pretax income from wages and salaries, bonuses, tips, commissions, pensions and annuities, military reserves, unemployment compensation, workman's compensation, and veterans' benefits. Net worth consisted of the sum of housing equity, other real estate equity, business equity, Individual Retirement Accounts and Keoghs, vehicles, bonds, and liquid assets. Values were recorded only on records for primary respondents, necessitating additional data merging to add this information to the records for secondary respondents. Aggregate income and net worth variables were created, using person identification number as the break variable. A new file was created containing the person identification number and the two aggregate variables. This new file was then merged with the original data set, matching on person identification number,

placing the income and net worth information on the secondary respondents. Close to 12% of the information was missing on the income and net worth variables, and it was determined that these variables should be assigned using the series mean.

The income and net worth variables were considerably skewed (6.2 and 5.5, respectively). Logging the variables is the standard method of correcting for skewness. However, the net worth variable had 49 cases with values less than or equal to 0. The income variable had no negative values, but did have four cases with values of 0. Because values of 0 or lower cannot be logged, it was necessary to convert these values to values greater than 0. The net worth variable was reconstructed using a manner similar to that used by Hayward, Crimmins, Miles, and Yang (1999). The greatest negative value, -\$64,300, was assigned a value of 1 (computed by adding \$64,301 to -\$64,300). The 0 values in the income variables were recoded equal to 1. The two variables were then logged using the natural log. The skewness for income was reduced to -4.4 and for net worth to -4.1.

Gender

Gender was measured as a dichotomy with male = 1 and female = 0.

Control Variables

Two control variables are included in the analysis: age and severity of diabetes.

Age

Age was measured as a metric covariate, 50 to 62. (Respondents were selected according the year of birth, 1931 to 1941. Because some 51-year-old respondents were interviewed prior to turning 51 in 1992, and some were interviewed after turning 62 in 1992, a very few respondents fell outside of the age range of 51 to 61, but were still eligible for this sample because their years of birth were between 1931 and 1941).

Disease Severity

A composite variable was used, including insulin usage, oral medications usage, comorbidity, and length of time since being diagnosed with diabetes. Comorbidity was defined as having at least one of the other major potentially fatal diseases: heart disease, cancer, and/or lung disease, with 0 indicating no other chronic condition, and 1 indicating having at least one chronic condition in addition to diabetes. Regarding the remaining items, a person was assigned a score of 1 for each of the following items: insulin usage, oral medications usage, and being diagnosed with diabetes at least 10 years or more prior to the first round of the survey. Items were then summed to create a 4-point index ranging from 0 (met none of the criteria) to 4 (met all of the criteria). The higher the score, the higher the presumed severity.

Analytical Approach

Data on chronic disease are generally presented as cross-sectional analyses or as prevalence rates. Cross-sectional data provide a snapshot of a current situation, but they

do not allow for any life-course exploration of the processes that affect health status. Longitudinal analyses provide strong evidence that health declines over time. Prior studies have found declines in terms of both objective measures and self-reported health (Manton, Corder, & Stallard, 1993; Peek et al., 1997). Cross-sectional studies, however, are limited in their ability to take into account the initial health status of respondents (Peek et al., 1997). A major weakness of studies using repeated cross-sectional analyses is the inability to determine whether or not declines in health over time reflect selectivity, i.e., being in poorer health at the initial time point or baseline as opposed to real changes. In addition, and perhaps more importantly, they lack the ability to remove that portion of a variable's effect on an outcome at a subsequent time point that is attributable to its effect on that outcome at the initial time point.

Longitudinal studies, when short time intervals are employed, have shown that the health ratings of many older adults do not change (Peek, et al., 1997). Using lag-time regression analysis provides greater insight into the processes of change over time. In this study, such analysis will permit exploration of the impact of socio-behavioral factors on health outcomes as they relate to race/ethnicity.

Lag-time analysis is an effective method for using non-experimental data to make causal inferences (Allison, 1990; Licht, 1995; Burr & Nesselroade, 1990). Essentially, this type of analysis measures the same variable at two points in time. If the purpose of an analysis is to show that X causes Y, where Y1 is the initial state of the dependent variable, and Y2 is the outcome of the dependent variable, there is considerable merit in examining the relationship between X and Y2 while controlling for Y1 (see Bland, 1996; Phillips,

1971). The point of controversy in this method deals not with the validity of the design, but with the proper way to control for Y_1 . The two most commonly used methods of controlling for Y_1 are the change score method and the regressor variable method.

In the change score method, $Y_2 - Y_1$ is regressed on X . This value is assigned a unique status based on its calculated results. According to Allison (1990), the change score method is appropriate when the independent variable(s) are temporally subsequent to Y_1 and are uncorrelated with any components of Y_1 . Two major criticisms have arisen against the change score method. First, change scores tend to be less reliable than the component variables. Second, the pretest and posttest scores tend to regress towards the mean.

In the regressor variable method, Y_2 is regressed on both Y_1 and X . In this method of continual change analysis, Y_1 is treated as any other control variable. Using the regressor variable method helps to “disentangle difficulties with causal ordering” (Musick, Herzog, & House, 1999, p. S222). Because the primary purpose of this study is to examine the “effects” of certain conditions on change in health outcomes, the regressor variable was used in the analyses.

The analysis for this study uses the first (1992) and third (1996) waves of the HRS. In this analysis, they are referred to as Time 1 and Time 2. Because the ages of the respondents range from 51 to 61, it is anticipated that the majority of the respondents were 65 or under at Time 2 and still eligible for employment in the labor force.

The analysis comprised several major stages. First, a descriptive analysis of the basic data at the two time points was conducted. Second, in a series of bivariate-level

analyses (which focused on the relationships between the main independent variable), the mediating variables and the dependent, or outcome variables, were analyzed. Finally, five models were assessed for each outcome variable measured at Time 2, using linear regression techniques. Various blocks of variables were entered in stages. The Time 1 measure of the outcome variable, age, and the severity index were included as controls in all stages. Thus, regression coefficients measured the net impact on the change in a specific outcome variable over the 4-year period. Each model emphasized the effect of being in a minority group as opposed to not being in a minority group among people with diabetes. The first model evaluated the respective effects of being Black or Hispanic on the selected outcome variable. The second model adds socioeconomic status, gender, and the role integration index to assess the degree and manner in which they mediate any observed significant bivariate effect of the two ethnic status dummy variables on each of the Time 2 outcome variables. The third model accomplishes the same thing for health insurance coverage, the measure of health care access. The fourth model examined the extent and nature of the mediating effect of the four health-related lifestyle variables. The final model assesses the extent and manner of mediation of all variables included. All variables were tested for multi-collinearity. None of the bivariate correlation coefficients for the independent variables was above four, a commonly used cut-off limit for multi-collinearity.

The five models are presented below for each of the outcome variables.

Evaluation of the first two hypotheses, i.e., the social characteristics and minority status hypotheses, involved an inspection of the results for Models I and V for Blacks and

Hispanics vis-a-vis Whites across each outcome variable. Basically, the focus is the extent to which there were any initial effects for Blacks and Hispanics (Model I) and whether they remain when all mediating variables are simultaneously included (Model V). This is done for each of the Time 2 outcome variables. Assessment of the results of Models II, III, and IV for each Time 2 outcome variable provides an indication of the manner in which each specific potential mediating variable does or does not actually mediate any initial impact of being Black or Hispanic on each health outcome variable. Finally, assessment of whether or not these underlying dynamics vary across health outcomes was made.

Models

Model Set for Functional Limitation:

Model I: $\text{FUNCLIM2} = f(\text{FUNCLIM1}, \text{BLACK}, \text{HISPANIC}, \text{CTLS})$

Model II: $\text{FUNCLIM2} = f(\text{FUNCLIM1}, \text{BLACK}, \text{HISPANIC}, \text{ROLES}, \text{SES}, \text{GENDER}, \text{CTLS})$

Model III: $\text{FUNCLIM2} = f(\text{FUNCLIM1}, \text{BLACK}, \text{HISPANIC}, \text{INS}, \text{CTLS})$

Model IV: $\text{FUNCLIM2} = f(\text{FUNCLIM1}, \text{BLACK}, \text{HISPANIC}, \text{LIFESTYLES}, \text{CTLS})$

Model V: $\text{FUNCLIM2} = f(\text{FUNCLIM1}, \text{BLACK}, \text{HISPANIC}, \text{ROLES}, \text{SES}, \text{GENDER}, \text{INS}, \text{LIFESTYLE}, \text{CTLS})$

Model Set for Emotional symptomatology:

Model I: $\text{EMOSYM2} = f(\text{EMOSYM1}, \text{BLACK}, \text{HISPANIC}, \text{CTLS})$

Model II: $\text{EMOSYM2} = f(\text{EMOSYM1}, \text{BLACK}, \text{HISPANIC}, \text{ROLES}, \text{SES}, \text{GENDER},$

CTLS)

Model III: EMOSYM2 = f(EMOSYM1, BLACK, HISPANIC, INS, CTLS)

Model IV: EMOSYM2 = f(EMOSYM1, BLACK, HISPANIC, LIFESTYLE, CTLS)

Model V: EMOSYM2 = f(EMOSYM1, BLACK, HISPANIC, ROLES, SES, GENDER,
INS, LIFESTYLE, CTLS)

Model Set for Psychosomatic Symptomatology:

Model I: PSYSYM2 = f(PSYSYM1, BLACK, HISPANIC, CTLS)

Model II: PSYSYM2 = f(PSYSYM1 BLACK, HISPANIC, ROLES, SES, GENDER,
CTLS)

Model III: PSYSYM2 = f(PSYSYM1 BLACK, HISPANIC, INS, CTLS)

Model IV: PSYSYM2 = f(PSYSYM1 BLACK, HISPANIC, LIFESTYLE, CTLS)

Model V: PSYSYM2 = f(PSYSYM1 BLACK, HISPANIC, ROLES, SES, GENDER,
INS, LIFESTYLE, CTLS)

Model Set for Self-Reported Health Status:

Model I: GLHLTH2 = f(GLHLTH1, BLACK, HISPANIC, CTLS)

Model II: GLHLTH2 = f(GLHLTH1, BLACK, HISPANIC, ROLES, SES, GENDER,
CTLS)

Model III: GLHLTH2 = f(GLHLTH1, BLACK, HISPANIC, INS, CTLS)

Model IV: GLHLTH2 = f(GLHLTH1, BLACK, HISPANIC, LIFESTYLE, CTLS)

Model V: GLHLTH2 = f(GLHLTH1, BLACK, HISPANIC, ROLES, SES, GENDER,
INS, LIFESTYLE, CTLS)

CHAPTER IV

FINDINGS

This chapter contains the results of the various descriptive and multivariate analyses. First, a description of the sample is presented. The specific focus is on a Time 1-Time 2 comparison of the outcome measures as well as a review of the mediating characteristics and the control variables. Second, a correlation matrix illustrating bivariate correlations between variables is introduced. This matrix provides data that are used to amplify the multivariate results presented subsequently. Third, the results of the multivariate regression analyses for the four outcome variables are presented and reviewed. This section is the crux of the study and encompasses the multivariate results for the five models introduced earlier for each of the outcomes, in turn. Special attention is given to differences and similarities between Blacks and Hispanics. The final segment provides a comparative summary, emphasizing differences and similarities across the four outcome variables. It is specifically aimed at assessing the degree to which the results are invariant across the outcome variables.

Table 1 shows the means and standard deviations for the demographic and social characteristics of the sample. There were 213 Black respondents (28.6%) and 93 Hispanics (12.5%). Of the Black respondents, 134 (62.9%) were female and 79 (37.1%) were male, or a ratio of 1.7 males for every female. Nationally, the ratio of Black males to Black females is 1.3 (, 2000), so this study is biased towards females for Blacks.⁴ Of the

⁴In 1992, there were 1,075,607 Black males and 1,355,591 Black females between the ages of 51 and 61.

Table 1

Means and Standard Deviations for Study Variables Measured at Time 1

| Study variables | Mean | Standard deviation |
|--|----------|--------------------|
| <i>Independent variables</i> | | |
| Black (=1) | .29 | .45 |
| Hispanic (=1) | .13 | .33 |
| <i>Mediating variables</i> | | |
| Number of roles (0 to 4) | 2.01 | .92 |
| Education (0 to 17) | 11.10 | 3.50 |
| Income (0 to 597,600) ^b | 27650.55 | 40254.87 |
| Net worth (- 64,300 to 2,740,000) ^b | 37930.00 | 293232.64 |
| Male (=1) | .46 | .50 |
| Insurance (Covered =1) | .57 | .50 |
| BMI (15.57 to 58.35) | 30.54 | 6.00 |
| Currently smoking (=1) | .22 | .49 |
| Currently drinking (=1) | .41 | .42 |
| Currently physically inactive (=1) | .50 | .50 |
| <i>Control variables^a</i> | | |
| Age (50 to 62) | 56.50 | 3.14 |
| Disease severity index (0 to 4 [high]) | 1.48 | .92 |

^a See Table 2 for Time 1 control variables

^b Median income and median net are shown (Missing cases not reassigned)

Hispanics, there were 61 (65.6%) females and 32 (34.4%) males, with a ratio of almost 2:1.0

Four roles were examined in this study: marriage, parenthood, religion, and work. Almost one in 20 (5.1%) participated in no roles. Twenty-six respondents (3.5%) participated in all four roles. The average number of roles participated in was 2.01. The greatest percentage reported participating in the marriage role, 529 respondents (71.1%). The second most frequently cited role was the religious role, 420 respondents (42.0%). Work role had the third greatest percentage, with 352 respondents (47.3%) working full-time or part-time. Finally, 196 respondents (47.3%) reported participating in the parental role.

The average level of education was less than a high school graduate, 11.1 years. The average annual household income for the sample was \$37,225.22, while the average net worth was \$120,795.19. The sample had 345 (46.4%) males and 399 (53.6%) females. Over half (57.0%) reported that they had at least one type of health insurance coverage.

Almost one-fourth of the respondents (22.3%) reported that they were smokers at the time of the interview, and two-fifths (41.3%) reported drinking at least one alcoholic beverage daily. Over half (50.5%) reported that they did not participate in vigorous or moderate activity at least three times a week for 30-minute intervals. The average body mass index was 30.6. A body mass index of 30 or above is considered to be obese. Data are not shown, but 346 respondents (46.5%) were obese. Another 289 (38.8%) were

moderately overweight (body mass index between 25.0 and 29.9). Only 109 respondents (14.7%) were not overweight.

A description of the means and standard deviations of the age and severity index variables may also be seen in Table 1. The average age of the respondent was 56.1 years. The severity index was based on the four measures: insulin usage, oral medication usage, duration of diabetes, and comorbid condition. On the index, ranging from 0 to 4, 13.8% ($n = 103$) had a score of 0. Over one-third ($n = 287$) scored 1, and one-third ($n = 259$) scored 2. Over one in ten respondents ($n = 85$) scored 3 on the index, and just over one in 100 ($n = 10$) had a score of 4. The average score was 1.48.

The means for Time 1 and Time 2 for the outcome variables can be seen in Table 2. The mean score for functional limitations, which ranged from 0 to 9, was .94 at Time 1. At Time 2, the mean score had almost doubled, increasing to 1.82. The mean score for emotional symptomatology, which ranged from 0 to 4 at Time 1, was .26, increasing more than two and one-half fold, to .68 at Time 2. Psychosomatic symptomatology also almost doubled between Time 1 and Time 2, with mean scores of .73 and 1.41, respectively. There was only minimal change over the four-year period in personal health assessment. In particular, the score for self-reported health, ranging from 1 (Excellent) to 5 (Poor), was 2.47 at Time 1 and 2.49 at Time 2.

Table 4 shows the correlation matrix illustrating the bivariate associations between the intercorrelations among independent and control variables. This table will be referred to for amplification of the multivariate results for the four outcome variables. For

Means and Standard Deviations for Outcome Variables at Time 1 and Time 2

| Outcome variables | Mean | Standard deviation |
|--|------|--------------------|
| Functional limitations (0 to 9 [high]) | | |
| Time 1 | .94 | 1.08 |
| Time 2 | 1.82 | 2.32 |
| Emotional symptomatology (0 to 4 [high]) | | |
| Time 1 | .27 | .71 |
| Time 2 | .68 | 1.11 |
| Psychosomatic symptomatology (0 to 4 [high]) | | |
| Time 1 | .72 | 1.11 |
| Time 2 | 1.41 | 1.34 |
| Self-reported health (1 to 5 [poor]) | | |
| Time 1 | 3.52 | 1.08 |
| Time 2 | 3.51 | 1.11 |

Table 3

Bivariate Correlations for Outcome Variables at Time 1 and Time 2

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--|------|------|------|------|------|------|------|
| 1 Functional limitations Time 1 | | | | | | | |
| 2 Functional limitations Time 2 | .41* | | | | | | |
| 3 CES-D emotional component Time 1 | .28* | .16* | | | | | |
| 4 CES-D emotional component Time 2 | .26* | .32* | .33* | | | | |
| 5 CES-D psychosomatic component Time 1 | .43* | .31* | .52* | .29* | | | |
| 6 CES-D psychosomatic component Time 2 | .26* | .41* | .23* | .51* | .33* | | |
| 7 Self-reported health Time 1 | .44* | .40* | .23* | .30* | .40* | .37* | |
| 8 Self-reported health Time 2 | .33* | .44* | .22* | .30* | .37* | .42* | .63* |

now, only the Time 1-Time 2 correlations for each of the outcome variables will be addressed.

Interpretation of bivariate correlation coefficients incorporates the assumption that the relationship between two variables is linear. All correlations between the Time 1 and Time 2 variables were positive. The bivariate correlation between functional limitations at Time 1 and Time 2 was .41 ($p \leq .05$). The correlation for emotional symptomatology at Time 1 and Time 2 was .31 ($p \leq .05$). For psychosomatic symptomatology, the correlation value for Time 1 and Time 2 was .26 ($p \leq .05$). The highest bivariate correlation value was for self-reported health at Time 1 and Time 2 .63 ($p \leq .05$).

Because of the different units of measurements used in the independent variables, these analyses used standardized regression scores as opposed to unstandardized in order

Table 4

Bivariate Correlations for Independent and Control Variable at Time 1

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|-----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|------|
| Black (=1) | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | |
| 2 Hispanic (=1) | -.24* | | | | | | | | | | | | |
| 3 Roles | .05 | .01 | | | | | | | | | | | |
| 4 Education | -.05 | -.41* | .10* | | | | | | | | | | |
| 5 Income | .10* | -.13* | .36* | .25* | | | | | | | | | |
| 6 Net worth | -.15* | -.12* | .16* | .22* | .32* | | | | | | | | |
| 7 Gender (male=1) | -.12* | -.09* | -.07* | .17* | .18* | .18* | | | | | | | |
| 8 Insurance status | .01 | -.04 | -.12* | .15* | -.03 | -.11* | .03 | | | | | | |
| 9 Body mass index | .13* | -.02 | -.11* | -.01 | -.08* | -.03 | -.12* | -.10* | | | | | |
| 1 Smoking | .01 | -.04 | -.16* | .00 | -.03 | .12* | .09* | .01 | -.10* | | | | |
| 1 Drinking | -.04 | -.09* | -.01 | .19* | .12* | .08* | .22* | .07 | .03 | -.00 | | | |
| 1 Physical inactivity | .01 | .00 | -.06 | -.05* | -.04 | .06 | -.01 | -.05 | .12* | -.03 | .00 | | |
| 1 Age | -.05 | -.50* | -.06 | -.07* | .02 | .12* | .02 | -.13* | -.11* | -.09* | .04 | .00 | |
| 1 Severity index | .08* | .02 | -.15* | -.12* | -.10* | -.14* | -.09* | .03 | .09* | -.03 | -.11* | .04 | .08* |

to make comparisons among the variables. Standardized regression coefficients will always be between positive and negative one in linear relationships.

Models I and V will first be examined with regard to whether or not the characteristics or minority status hypothesis is supported. Model I provides information regarding whether there was or was not a statistically significant effect associated with being Black or Hispanic with the three control variables, Time 1 outcome, age, and severity index, included). Model V shows the result for the full model, comprising all independent, mediating and control variables. These results in Model V, when compared with significant race-ethnic status effects in Model I, show whether a significant effect in Model I was reduced below statistical significance or maintained with all the mediating variables, i.e., socioeconomic position variables, number of roles, the measure of role integration, health insurance coverage, the measure of health care access, and lifestyle characteristics as well as the initial three control variables), simultaneously included. Models II, III, and IV permit a more thorough analysis regarding the specific manner in which the various mediating variables affect changes in each outcome variable over time. Thus, Models II, III, and IV, as well as Model V, permit an assessment of Hypothesis 3, centered on the extent to which there is consistency between Blacks and Hispanics across outcomes in the underlying dynamics, i.e., the specific patterning of mediation as opposed to whether or not there is mediation in the first place Hypotheses 1 and 2). All models have controls for the Time 1 functional limitations index, age and severity index. In this and in all models for all outcomes, the Time 1 variable and the severity index were

statistically significant. Age was not statistically significant for any of the models in the four outcomes.

The multivariate regression analysis results for the functional limitations index, measured at Time 2, are shown in Table 5. First, Models I and V will be discussed, involving a test of the characteristics and minority status hypotheses, respectively. Model I illustrates the independent effects of being Black and being Hispanic on changes in the functional limitation index between Time 1 and Time 2. Being Black has a statistically positive impact on increases in the functional limitation index between Time 1 and Time 2 ($\beta = .100, p \leq .01$). The standardized regression coefficient for Hispanics is also positive ($\beta = .035$), but is not statistically significant.

Model V shows the results for the full model, comprising all independent, mediating, and control variables. The effect of being Black is no longer statistically significant in this model while there continues to be a noneffect associated with being Hispanic. Therefore, we find divergent patterns for Blacks and Hispanics regarding changes in the functional limitations index over time. In particular, the results for Blacks support Hypothesis 1, i.e., the Characteristics Hypothesis, as there is no statistically significant effect once all of the other characteristics are included. For Hispanics, in contrast, there is no initial or subsequent effect, suggesting that changes over time in functional limitations do not vary between Hispanics and Whites even with just the controls included. Hence, in contrast to Blacks, there is no support for either the characteristics or the minority status hypothesis for Hispanics.

Standardized Coefficients from Multivariate Regression of Analysis of Functional Limitations Among Adults Ages 51-61 in 1992

| Variables | Model I | Model II | Model III | Model IV | Model V |
|--------------------|---------|----------|-----------|----------|----------|
| <i>Independent</i> | | | | | |
| Black | .100** | .077* | .100** | .085* | .062 |
| Hispanic | .035 | -.001 | .037 | .038 | -.001 |
| <i>Mediating</i> | | | | | |
| Roles | | -.065 | | | -.041 |
| Education | | -.037 | | | -.052 |
| Income | | -.044 | | | -.048 |
| Net Worth | | -.012 | | | -.011 |
| Gender | | -.122*** | | | -.118*** |
| Insurance | | | .037 | | .035 |
| BMI | | | | .147*** | .129*** |
| Smoking | | | | .040 | .041 |
| Drinking | | | | .003 | .033 |
| Exercise | | | | .009 | .012 |
| <i>Controls</i> | | | | | |
| Time 1 | .359*** | .320*** | .356*** | .330*** | .299*** |
| Age | -.011 | -.014 | -.006 | .009 | .007 |
| Severity | .159*** | .141*** | .159*** | .155*** | .141*** |

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

A focus on the results for Models II, III and IV, as well as a more detailed look at Model V in Table 3, permits a more illustrative analysis regarding how specific variables mediate the findings for Blacks. In Model II it can be seen that being Black retains a significant positive effect on changes in the functional limitations index over time. In this analysis Blacks are significantly less likely to be male ($r = -.12$); however, being male actually reduces the increase in functional limitations in Model II ($\beta = -.122$; $p \leq .001$). Thus, the fact that Blacks are more likely to be male offsets the otherwise positive effect linked to being Black. Nonetheless, although reduced somewhat, the positive effect of being Black remains statistically significant in Model II.

It is apparent in Model III that health insurance coverage exercises no mediating effect. In fact, health insurance coverage exerts no statistically significant effect on changes in functional limitations over time. The fact that there is no significant correlation between being Black and having health insurance coverage further weakens any effective mediating role for health insurance coverage in Model III. Model IV illustrates the mediating role of the lifestyle variables. Their inclusion lessens somewhat the positive effect of being Black on changes in functional limitations over time; however, the effect of being Black remains statistically significant. The main reason for the slight reduction appears to lie with the role of the BMI. Blacks are more likely to have a higher BMI ($r = .13$; $p \leq .05$) and a higher BMI yields a greater increase in functional limitations over time ($\beta = .15$; $p \leq .001$). As already mentioned, being Black no longer has a statistically significant impact on changes in functional limitations over time when all mediating variables (as well as control variables) are simultaneously included in Model V. It is

It is interesting to note that being male and the body mass index both have statistically significant, but opposite, effects on changes in the functional limitations index. The size of the two coefficients, however, is somewhat reduced compared to their effects in Models II and IV, respectively. With the prior discussions of Models II and IV in mind, some further inferences regarding the reduction in statistical significance in Model V associated with being Black can be drawn. Blacks exhibit increased functional limitations because of excess weight which itself increases the rise in functional limitations over time. Furthermore, the tendency for being Black to increase the amount of positive change in functional limitations is reinforced because they are less likely to be male, which, in turn, is actually linked to a reduction in the amount of positive change over time. Thus we have two mediating variables reinforcing each other in Model V, although their joint effect is to reduce the significant impact of being Black. Furthermore, recall that neither one of these variables reduced the initial statistically significant effect of being Black on changes in the functional limitations index. It is only when all of the mediating variables are included in Model V that the impact of being Black is reduced below statistical significance.

The multivariate regression results for changes in emotional symptomatology are shown in Table 6. As in the prior model, there are divergent patterns for Blacks and Hispanics regarding their respective effects on changes in emotional symptomatology over time. As can be seen in Model I, there is an initial statistically significant positive effect on

Table 6

Standardized Coefficients from Multivariate Regression of Analysis of Emotional Symptomatology Among Adults Ages 51-61 in 1992

| Variables | Model I | Model II | Model III | Model IV | Model V |
|--------------------|---------|----------|-----------|----------|----------|
| <i>Independent</i> | | | | | |
| Black | .032 | .007 | .033 | .030 | .007 |
| Hispanic | .115*** | .080* | .118*** | .120*** | .084* |
| <i>Mediating</i> | | | | | |
| Roles | | -.087* | | | -.063 |
| Education | | -.047 | | | -.059 |
| Income | | -.012 | | | -.018 |
| Net Worth | | -.054 | | | -.033 |
| Gender | | -.099** | | | -.116*** |
| Insurance | | | .053 | | .059 |
| BMI | | | | .015 | -.008 |
| Smoking | | | | .107** | .099** |
| Drinking | | | | .001 | .029 |
| Exercise | | | | .042 | .042 |
| <i>Controls</i> | | | | | |
| Time 1 | .302*** | .263*** | .299*** | .293*** | .259*** |
| Age | -.066 | -.066 | -.059 | -.055 | -.053 |
| Severity | .140*** | .111** | .138*** | .141*** | .117** |

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

changes in emotional symptomatology between Time 1 and Time 2 among Hispanics but not Blacks. In particular, being Hispanic significantly increases emotional symptomatology over time vis-a-vis Whites in Model I ($\beta = .115$; $p \leq .001$). In contrast, while likewise positive, the standardized regression coefficient for Blacks is not statistically significant. Thus, Blacks do not exhibit changes in emotional symptomatology dissimilar from that for Whites in Model I. In Model V, the statistically significant effect for Hispanics observed in Model I is retained ($\beta = .084$; $p \leq .05$), despite the inclusion of all the mediating variables as well as the initial control variables. This latter finding supports the minority status hypothesis for Hispanics. The results for Blacks, in sharp contrast, support neither the characteristics nor the minority status hypothesis.

Because there was no initial impact of being Black on increases in emotional symptomatology, we focus this next discussion on manner of mediation on Hispanics only, neglecting a specific comparison with Blacks. The statistically significant positive effect linked to being Hispanic observed in Models I and V is, as would be expected, also evident across Models II, III, and IV. Likewise, the noneffect for Blacks is also observed in the latter three models. Being male is linked to a statistically significant decline in the amount of increase in Model II. However, Hispanics are less likely to be male in this analysis ($r = -.09$; $p \leq .05$); hence, they do not benefit from this otherwise offsetting effect. Also, occupying a greater number of roles significantly reduces the amount of increase in emotional symptomatology; however, there is no significant bivariate linkage between being Hispanic and the number of roles occupied ($r = .01$).

As in the results for functional limitations, health insurance coverage plays no noteworthy mediating role in Model III for Hispanics. Health insurance coverage is not significantly linked to being Hispanic ($r = -.04$, ns) and does not significantly impact changes in emotional symptomatology over time in Model III. In Model IV, which adds the lifestyle variables, we observe a statistically significant positive effect for currently smoking ($\beta = .107$; $p \leq .01$). However, the correlation between being Hispanic and currently smoking is negative and, in any event, not statistically significant ($r = -.04$; ns).

In Model V, the positive coefficient for Hispanics is reduced somewhat below what it was in Model IV; however, the effect remains statistically significant. In Model V, the final model, we see that being male continues to significantly reduce increases in emotional symptomatology over time relative to females ($\beta = -.116$; $p \leq .01$) while smoking at baseline vis-a-vis not smoking increases emotional symptomatology over time ($\beta = .100$; $p \leq .01$). As can be seen, the effects of these two variables on changes in emotional symptomatology vary. Moreover, as mentioned previously in the discussions of Models II and IV, Hispanics are actually less likely to be male in this analysis, thus not benefitting from the reduction associated with being male. Hispanics are less likely to be currently smoking, as noted previously, and therefore this would tend to lower to some extent the increase in emotional symptomatology among Hispanics.

Table 7 shows the multivariate regression results for changes in psychosomatic symptomatology over time. As can be seen in Model I, both being Black and being Hispanic increase psychosomatic symptomatology over time (β s = .058 and .016, respectively); however, in both cases the effects are not statistically significant. In Model

Table 7

Standardized Coefficients from Multivariate Regression of Analysis of Psychosomatic Symptomatology Among Adults Ages 51-61 in 1992

| Variables | Model I | Model II | Model III | Model IV | Model V |
|--------------------|---------|----------|-----------|----------|---------|
| <i>Independent</i> | | | | | |
| Black | .058 | .029 | .058 | .050 | .024 |
| Hispanic | .016 | -.023 | .017 | .018 | -.021 |
| <i>Mediating</i> | | | | | |
| Roles | | -.107** | | | -.095* |
| Education | | -.049 | | | -.058 |
| Income | | -.003 | | | -.005 |
| Net Worth | | -.054 | | | -.049 |
| Gender | | -.137*** | | | .141*** |
| Insurance | | | .024 | | .033 |
| BMI | | | | .060 | .037 |
| Smoking | | | | .028 | .021 |
| Drinking | | | | -.012 | .021 |
| Exercise | | | | .064 | .064 |
| <i>Controls</i> | | | | | |
| Time 1 | .292*** | .237*** | .291*** | .270*** | .220*** |
| Age | -.057 | -.060 | -.055 | -.048 | -.052 |
| Severity | .168*** | .139*** | .168*** | .165*** | .139*** |

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

V, although the standardized coefficient for Hispanics becomes negative, neither this coefficient nor the one for being Hispanic significantly increases emotional symptomatology over time vis-a-vis Whites in Model I ($\beta = .115$; $p \leq .001$). In contrast, while likewise positive, the standardized regression coefficient for Blacks is statistically significant. Thus both Blacks and Hispanics experience changes in emotional symptomatology similar to Whites. In effect, there is no support for either the characteristics or minority group status hypothesis in the case of both Blacks and Hispanics. As there are no initial statistically significant effects for either Blacks or Hispanics, there is no need to gauge the manner of mediation for this outcome. What is interesting, however, is the consistent statistically significant effect of disease severity, one of the control variables. In other words, for psychosomatic symptomatology the greater the degree of severity at baseline the greater the increase in this outcome measure. It could be the case that this control variable had initially reduced effects for Blacks and Hispanics below statistical significance. What this pattern suggests is that Blacks, Hispanics, and Whites react to disease severity in the same manner. That is, the greater the disease severity at baseline the greater the increase in psychosomatic symptomatology over time for each of the above subgroups. Being male, conversely, reduces the amount of increase. A greater number of roles also is linked to a lowering of the amount of increase in Model II, and is still statistically significant in Model V.

Finally, results from the multivariate regression analysis of changes in self-reported health between Time 1 and Time 2 are shown in Table 8. In Model I, the effect of being Hispanic has a statistically significant positive effect on changes in self-reported health

Table 8

Standardized Coefficients from Multivariate Regression of Analysis of Self-Reported Health Status Among Adults Ages 51-61 in 1992

| Variables | Model I | Model II | Model III | Model IV | Model V |
|--------------------|---------|----------|-----------|----------|---------|
| <i>Independent</i> | | | | | |
| Black | .019 | .006 | .013 | .018 | -.002 |
| Hispanic | .090** | .042 | .083** | .095*** | .047 |
| <i>Mediating</i> | | | | | |
| Roles | | -.069* | | | -.056 |
| Education | | -.111** | | | -.104** |
| Income | | -.020 | | | -.025 |
| Net Worth | | -.025 | | | -.026 |
| Gender | | -.022 | | | -.028 |
| Insurance | | | -.043 | | -.037 |
| BMI | | | | .029 | .025 |
| Smoking | | | | .102*** | .092* |
| Drinking | | | | -.029 | -.014 |
| Exercise | | | | .015 | .013 |
| <i>Controls</i> | | | | | |
| Time 1 | .580*** | .515*** | .578*** | .555*** | .496*** |
| Age | .009 | -.006 | .009 | .021 | .007 |
| Severity | .091** | .087** | .093** | .097** | .096** |

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

(beta = .090; $p \leq .01$). In other words, being Hispanic is associated with increasingly poorer self-reported health over time. Being Black is also associated with poorer health over time; however, the effect is not statistically significant (beta = .019). In Model V, with all the mediating variables included, the statistically significant positive impact of being Hispanic observed in Model I is reduced below statistical significance. Among Blacks, in Model V, there continues to be no statistically significant effect. Thus the result for Hispanics supports the Characteristics Hypothesis, as there was no statistically significant effect once all of the other characteristics were included in the model. In sharp contrast, the finding for Blacks supports neither the characteristics nor the minority status hypothesis.

Given the foregoing results we focus our attention now on a more detailed discussion of how the effects for Hispanics are mediated. We immediately observe a reduction to below statistical significance in Model II. The major contributor to this reduction appears to be level of education. The greater the level of education the lower the decreases in self-reported health over time (beta = -.11; $p \leq .01$). Moreover, there is a significant inverse effect between being Hispanic and level of education ($r = -.41$; $p \leq .05$). Overall, Hispanics experience significantly poorer health over time because they have significantly lower levels of education, and therefore do not benefit from the health improving benefits of higher education. An increasing number of roles, on the other hand, yields poorer health over time. However, being Hispanic is not significantly associated with number of roles.

As with the previous outcomes, health insurance coverage plays no major mediating role in Model III; hence, the significantly positive effect associated with being Hispanic is retained ($\beta = .083$; $p \leq .01$). There is no significant relationship between health insurance coverage and either self-reported health status or being Hispanic. The statistically significant positive effect associated with being Hispanic is also retained in Model IV ($\beta = .100$; $p \leq .001$). Current smoking yields poorer self-reported health over time ($\beta = .100$; $p \leq .001$), but there is no significant relationship between being Hispanic and smoking ($r = -.04$; ns). Turning to Model V, we observe, as initially reported, that the statistically significant positive effect of being Hispanic is reduced below statistical significance. It would appear, given our earlier discussions and particularly those discussions centered on Model II, that education is the pivotal mediating variable. To reiterate, Hispanics have poorer levels of education; and, poorer levels of education are linked to worsening self-reported health over time. The smoking effect on self-reported health is weakened among Hispanics since being Hispanic exhibits no significant relationship with smoking.

The discussion now turns to an integrative summary among the four outcome variables. For Blacks, the only hypothesis supported among any of the outcome variables was for functional limitations (Table 5). Support for the characteristics hypothesis was observed when, once all variables were added to the model, the initial positive significant effect of being Black on increases in functional limitations was reduced below statistical significance. In terms of emotional symptomatology, psychosomatic symptomatology, and self-reported health, declines in self-reported ratings were no different for Blacks than for

Whites; hence, neither the minority status nor the characteristics hypothesis was supported for these outcomes for Blacks.

For Hispanics, neither the minority status nor the characteristics hypothesis was supported when functional limitations were examined. However, the minority status hypothesis was supported for emotional symptomatology. The effect of being Hispanic on increases in emotional symptomatology remained statistically significant even when all other social and lifestyle factors (and control variables) were included in the model. In other words, membership in a minority group had a greater effect on increases in emotional symptomatology than did the characteristics associated with being in that group. In contrast, increases in poorer self-reported health ratings do appear to be more a function of the characteristics associated with being Hispanic than having minority group membership. As discussed earlier, once all characteristics were controlled, the effect of being Hispanic on increases in poor health self-ratings was reduced below statistical significance. As found for Blacks, increases in psychosomatic symptomatology were similar to those for Whites.

Role participation decreased the level of the poorer outcomes for all four variables, and it was statistically significant for all outcomes except functional limitations. The physical and psychological benefits of participating in multiple roles are documented throughout the literature (see for example, Verbrugge, 1984). At least for this study, the effect of role participation has a greater effect for perceptions of health than membership in a minority group, particularly for psychosomatic symptomatology.

When the impact of roles were examined singly in a regression model, without the influence of other potentially mediating but with the initial measure of each outcome included, a pattern of impacts similar to that found in the full models emerged. Being Black was statistically significantly related to increases in functional limitations over the four-year period ($B = .08$; $p \leq .05$). Two roles emerged as predictors in reducing the increases in functional limitations, the work role ($B = -.14$; $p \leq .01$) and the marriage role ($B = -.08$; $p \leq .05$). For increases in emotional symptoms, being Hispanic was related to increases over time ($B = .09$; $p \leq .05$). Again, the two roles linked to decreases in emotional symptoms were the work role ($B = -.11$; $p \leq .01$) and the marriage role ($B = -.14$; $p \leq .01$). Being Black or Hispanic was not associated with increases in psychosomatic symptoms, but the same two roles, the work role ($B = -.12$; $p \leq .001$) and the marriage role ($B = -.11$; $p \leq .01$), were statistically associated with reduced increases in emotional symptoms. For declines in self-reported health, being Hispanic was associated with increased declines ($B = .08$; $p \leq .01$) and participation in the work role was associated with reduction in increases in poorer health ratings ($B = -.09$; $p \leq .01$).

Being female, in some instances, is considered to be a minority position that functions in the same manner as being Hispanic or Black. Results for this study were consistent with that phenomenon. While only statistically significant for two of the outcome variables, functional limitations and emotional symptomatology, the effect of being female was consistently linked to poorer outcomes for all four of the variables.

Higher levels of body mass index were associated with poorer health outcomes, but the relationship is not so clear cut as those for role participation and being female.

Body mass index was positively associated with poorer health outcomes across all models for all four variables except in one instance. While not statistically significant, body mass index had a negative effect on increases in emotional symptomatology over time. The effect of being overweight was only statistically significant in the instance of functional limitations. The three other outcomes tended to be couched in perceptions of health or at least had a subjective component attached to them. Perhaps this finding points to the possibility that body mass index is a better indicator of poor objective health than subjective health.

Smoking, on the other hand, appeared to have a stronger effect when the outcomes had a more psychological attribute. Smoking was positively statistically significantly related to poorer health outcomes when the outcome variable was emotional symptomatology and self-reported health. Significant effects of smoking were not found for functional limitations nor psychosomatic symptomatology. The effect of smoking was statistically significant in both Model IV (lifestyles) and Model V (full model).

Education was statistically significantly associated with decreasing poorer health outcomes only for Hispanics and only for changes in self-reported health. As stated previously, among the mediating variables, education appears to have the strongest influence on changes in self-reported health for Hispanics. In particular, education, in combination with role participation, reduces the statistically significant effect of being Hispanic in poorer self-reported health. In the full model, however, it can be observed that the effect of roles is reduced below significance once the effect of smoking is controlled. The beneficial effect of education, however, retains its statistical power.

The surprising findings in these results are the variables that lack statistical import. Neither income nor net worth, believed by most health researchers to be the hallmarks predictors of poor or good health, did not achieve statistical significance for any of the outcomes. Separating socioeconomic status into the three components, i.e., education, income, and net worth, provided an opportunity to isolate the effects of each. Education was the most prominent of the socioeconomic status measures for these health outcomes. Also surprising was that in no instance did physical inactivity or alcohol consumption achieve a statistically significant impact. Exercise has been linked to improvements in both subjective and objective health and it is a critical component in diabetes management. At the bivariate level, physical inactivity is positively associated with body mass index ($r = .12$; $p \leq .05$), and negatively associated with number of roles ($r = -.06$; ns) and smoking ($r = .03$; ns), neither of which is statistically significant. In other words, number of roles and smoking were positively, but not statistically significantly, linked to exercise participation.

In the same light, health insurance coverage was not linked to any of the outcome variables. At the bivariate level, health insurance coverage was significantly linked only to number of roles ($r = .12$; $p \leq .05$) and to net worth ($r = .11$; $p \leq .05$). No statistically significant correlation was found between being Black ($r = .01$; ns) and having health insurance, nor between being Hispanic ($r = -.04$; ns) and having insurance.

CHAPTER V

SUMMARY AND CONCLUSIONS

This chapter contains an overview of the problem statement and study objectives, major findings and conclusions, as well as limitations and suggestions for future research.

Overview

Inequalities in health are pronounced in the United States, but the disparities are most obvious when examined by racial and ethnic group (Harris, 1995). Addressing the health needs of minorities requires more information than can be provided by descriptive data. In order to fully understand the links between minority group membership and poor health, multivariate causal analysis should be conducted. This type of approach should not just involve the identification of prominent risk factors among minority groups and their linkage to chronic disease. In addition, the approach should seek to document the nature of the connection between minority group membership and the likelihood of various sequelae for various chronic diseases and the pathways along which sequelae unfold. It is also important to examine the degree to which there are variations across minority groups in outcomes. Finally, it is imperative that these issues be examined for a variety of outcomes over time.

No chronic condition has greater discrepancies among ethnic minority groups than diabetes. Differences exist not only in terms of prevalence rates but also for diabetes-related complications among minority groups (Harris, 1995; Stern & Mitchell, 1995). Diabetes is the fourth leading cause of death from chronic disease in the United States,

costing close to \$100 billion annually in lost wages and medical care. Most diabetes-related complications are preventable. Unfortunately, the distribution of prevention of these complications appears to have an esoteric effect, leaving members of the minority populations more susceptible.

This study focused on Blacks and Hispanics. Blacks comprise the largest minority group in the United States. They make up a relatively young population, and have lower levels of education and incomes. Age-adjusted mortality rates due to diabetes are 50% higher for Blacks than for Whites (Beckles, Blount, & Jiles, 1994). The Hispanic population is also at a high risk for developing diabetes and its complications. As for Blacks, Hispanics also have lower levels of income and education; however, many members of the Hispanic population must also overcome language barriers and acculturation issues. The dramatic rise in prevalence rates of diabetes and diabetes-related complications presents a major health issue.

This investigation, centered on tracing out the dynamics underlying four potential outcomes of Type 2 diabetes among Blacks and Hispanics, sought to address the above salient issues in the following ways. First, the subsample and data were drawn from the Health and Retirement Study, a national panel survey of midlife Americans. Second, the survey oversampled Blacks and Hispanics, two groups at high risk of diabetes and related complications. Third, the design was explicitly longitudinal, i.e., a national panel survey, enabling analyses of the sequelae of diabetes from two rounds conducted in 1992 and 1996. Taking advantage of the longitudinal data, lag-time multivariate regression techniques were employed devoting specific attention to the interplay between

membership in one of two minority groups, i.e., Blacks or Hispanics, and a set of potential mediating characteristics and their relationships to changes in four outcomes among the two race/ethnicity subgroups and a set of potential mediating characteristics.

The investigation was focused on two prominent hypotheses in minority group studies, the social characteristics and minority group status hypotheses. The social characteristics hypothesis, employing assimilationist reasoning, posits that the roots of racial and ethnic disparities are traceable to variations in their respective characteristics. The minority group status hypothesis, on the other hand, maintains that poorer health status is more a function of the ascription of minority status, whereby minority status has an effect on selected outcomes, independent of variations in majority-minority characteristics.

The study focused on four physical and subjective health outcomes, namely, functional limitations, emotional symptoms, psychosomatic symptoms, and self-reported health status. Lag-time regression analysis was used to delineate the interplay of a set of independent and mediating variables on changes in each of these measures over a four-year period of time. This type of regression, including the baseline measure of a particular outcome, permitted an evaluation and comparison of the extent to which being Black or Hispanic impacted changes over time in each of the four outcomes as well as the manner in which other variables mediated any observed effects. In particular, the inclusion of various alternative social positions, access to health care, and an array of health-related lifestyles as potential mediating variables in the analyses enabled the testing of whether the changes appeared to be more a function of minority status or social characteristics, as well

as whether certain mediating variables were more prominent than others in explaining initially observed statistically significant effects for either Blacks, Hispanics, or both on changes in the various outcomes.

In summary, the specific study objectives were:

1. To evaluate and compare the extent to which race/ethnicity (being Black or Hispanic) impacted changes over time in functional limitations, emotional symptoms, psychosomatic symptoms, and self-reported health independent of other occupied social positions (in addition to being a member of a minority group), access to health care, role integration, and health-related lifestyles.

2. To evaluate and compare the specific manner in which other occupied social positions, role integration, access to health care, and health-related lifestyles mediated any observed initial effects of race/ethnicity (i.e., being Black or being Hispanic) on changes over time in functional limitations, emotional symptoms, psychosomatic symptoms, and self-reported health.

Major Findings

The analyses for this study were designed so that the focus was on changes in health outcomes over time for Blacks and Hispanics, with Whites as the reference group. A subsample of 744 White, Black, and Hispanic respondents aged 51-61 who had been diagnosed with diabetes or high blood sugar at baseline (1992) was selected for study. The empirical part of the study comprised an initial descriptive analysis of study variables

followed by a series of multivariate time-lagged regression analyses conducted in three phases and aimed at assessing three hypotheses.

Three blocks of variables were used as mediating factors: social position (number of roles, socioeconomic status, and gender); access to health care (health insurance coverage); and health-related lifestyles (body mass index, smoking, drinking, and physical activity). The hypotheses were tested by first isolating and identifying the initial effects of whether being Black or Hispanic exerted an effect on a particular health outcome, including only controls on the Time 1 measure of the specific outcome, age, and degree of disease severity. This step was followed by an examination of whether or not the effects of race/ethnicity on the health outcome were the same or different with the simultaneous inclusion of the mediating social characteristics. This was done through the use of four models: (1) three models (Models II, III, and IV) wherein the potential mediating effects of variables tapping other social positions and role integration, health care access, and health-related life styles were separately considered; and (2) a complete model (Model V) that included the two race/ethnicity variables, the three control variables, and all of the mediating characteristics.

The first two hypotheses, focused specifically on an assessment of the characteristics and minority group status hypotheses, were tested through a direct comparison of the results of Models I and V. If an initial significant effect in Model I, for either being Black or Hispanic (with no instances of dual effects), disappeared in Model V, the social characteristics hypothesis was considered to be supported. If there was an initial significant relationship between being Black or being Hispanic and the outcome

variable (Model I), and if that effect remained significant with all the mediating social characteristics included (Model V), then the minority status hypothesis was considered to be supported. The lack of an initial statistically significant effect was considered to be evidence of a lack of support for either hypothesis.

The second major focus was on the manner in which the mediating variables impacted initial significant effects of race/ethnicity on each selected health outcome, especially concentrating on those effects that were reduced below statistical significance. Here, the focus was on Models II, III, and IV, as well as Model V. The precise interplay of the mediating variables with the particular ethnic group effect was traced in order to observe how specific mediating variables or combinations of said variables yielded reductions below statistical significance. The three blocks of mediating social characteristics were introduced separately in Models II, III, and IV. First, in Model II, the block of social position variables was introduced including number of occupied roles (marital, parental, work, and religious), education, income, net worth, and gender. Second, in Model III, the mediating effect of health insurance coverage, the measure of health care access, was separately considered. Third, the block of variables tapping health-related lifestyles was introduced in Model IV, including body mass index, tobacco use, alcohol use, and physical inactivity. Model V was then examined in more detail than previously, particularly to observe whether various combinations of variables from the separate blocks were operant in bringing about reductions in significant effects.

The final hypothesis of the investigation was centered on an evaluation of the degree of consistency across outcomes. To be more specific, were the observed patterns

similar or dissimilar across the four health outcomes? Basically, this involved a comparative assessment of results across the four outcomes.

The social characteristics hypothesis was supported in two instances, changes in functional limitations and self-reported health status. However, the major finding was that there was distinct variation across the two race-ethnic status subgroups in the specific outcome impacted. In particular, the social characteristics hypothesis was supported in the instance of changes in functional limitations among Blacks, whereas among Hispanics, it was supported in the case of changes in self-reported health status. Being Black was associated with an initial significant increase over time in functional limitations vis-a-vis Whites, which was subsequently reduced below statistical significance when all the mediating characteristics were simultaneously included. Among Hispanics, this patterning was evident for changes in self-reported health status.

The minority status hypothesis was supported in the case of changes in emotional symptoms, but only for Hispanics. In other words, being Hispanic significantly increased emotional symptoms over time independent of all the mediating characteristics vis-a-vis Whites. There was no empirical support for either the social characteristics or minority status hypotheses in the case of changes in functional limitations for Hispanics and changes in emotional symptoms and self-reported health status for Blacks. Finally, there was no support for either hypothesis for both Blacks and Hispanics in the instance of changes in psychosomatic symptoms. That is, there was no initial statistically significant effect with just the three control variables included. Change in psychosomatic symptoms over time for Hispanics and Blacks paralleled that of Whites.

A highly complex portrait of the dynamics underlying changes in health outcomes over time among persons with Type 2 diabetes emerged in this study. The foundation for this portrayal revolved around both race/ethnicity and the specific outcome considered. In other words, there was a high degree of selectivity along these lines. In particular, there did not appear to be a universalistic pattern that could be generalized across the two minority groups and across the health outcomes. This was this case regarding both support for either the social characteristics or minority status hypotheses as well as the manner in which specific mediating factors actually operated. This suggests that neither minority status nor social characteristics associated with racial/ethnic subgroups provide an overarching explanation for variations in health outcomes.

In sum, there was no consistent pattern across the two race/ethnic subgroups, except for changes in psychosomatic symptoms, where there was no statistically significant effect for either subgroup. Moreover, the specific degree of effect, when all potential mediating effects were included, varied across the set of health outcomes. Being Black exhibited no initial effect for each outcome, excepting functional limitations. In the latter case, there was no statistically significant effect when all of the mediating variables were simultaneously included. The pattern for Hispanics was even more divergent across outcomes. There was no initial statistically significant effect in the case of functional limitations and psychosomatic symptoms, an independent effect when all mediating variables were included, and a reduction in statistical significance in the full model in the case of self-reported health status.

Conclusions

Addressing ethnic disparities is a major public health challenge. Racial and ethnic differences persist despite public and private attempts to close the gaps. Interventions, to be effective, must attempt to address the ultimate root causes of the poorer health among members of minority groups, and particularly, the nature of disease manifestation over time, and factors related thereto. Health status inequalities are best understood when they are couched within a contextual framework of social factors, health care access, and health-related lifestyles.

Some interesting findings emerged from this research. First, as already indicated, no full mediation was observed for Blacks in the case of functional limitations until Model V, when all of the mediating variables were included. The main pathways were centered around gender and the body mass index. Specifically, part of the significant positive effect for Blacks on changes in functional limitations was due to the fact that being Black was linked to a higher body mass index, which, in turn, was connected to a greater amount of increase in functional limitations over time. At the same time, in this subsample of diabetic persons, Blacks were less likely to be male and being male was linked to reduced levels of functional limitations over time. Phrased differently, Blacks were more likely to be female and being female was linked to augmented levels of functional limitations over time. These two effects were initially seen operating in Models II and IV, respectively. Nonetheless, it was only when they were both simultaneously included in Model V that the initial statistically significant effect was reduced below statistical significance.

The other set of pathways surrounding reduction in initial significant effect concerned Hispanics in the case of self-reported health status. In this instance, the initial significant effect was reduced below statistical significance already in Model II. Both greater number of roles and higher levels of education were associated with reduced increases in poorer self-reported health in Model II. However, although there was no statistically significant impact of being Hispanic on number of roles, being Hispanic was significantly connected to lower levels of education. Thus, the pivotal reason for the decline in the initial statistically significant positive effect in Model II was due to Hispanics having significantly lower levels of educational attainment. This pattern was reinforced in Model V. Although no reduction in the statistically significant effect of being Hispanic was observed in Models III and IV, there was a reduction in statistical significance in Model V. In this model, both educational attainment and currently smoking exerted statistically significant, but opposite, effects on changes in self-reported health status. That is, higher levels of education were linked to improvements in poorer health over time, while currently smoking was linked to poorer health over time. Smoking, however, was not significantly associated with being Hispanic. Moreover, number of roles was significantly related neither to being Hispanic nor changes in self-reported health status in Model V. In sum, the pivotal mediating variable was educational attainment. Being Hispanic was associated with increasingly poorer health over time because Hispanics had a generally lower level of education, which, in turn, was linked to poorer health over time.

The minority status hypothesis was supported in one instance. Among Hispanics, there was an initial effect of being Hispanic on increases in emotional symptoms (i.e.,

feelings of loneliness and despair), and this effect was maintained even with all social characteristics controlled. This finding suggests that perhaps the Markides paradox, which posits that the social characteristics evident in the Hispanic population makes them more likely to have health ratings similar to Whites, may be better suited to objective measures of health, but is less appropriate for more subjective (i.e., emotional) measures.

The findings for this study are consistent with the findings from an earlier study by Ferraro (1993). Blacks are more likely to experience higher rates of morbidity and functional limitations than Whites, yet they are less likely to see their health as problematic. In this study, Blacks reported higher levels of changes in functional limitations than Whites, yet they reported levels of emotional symptoms, psychosomatic symptoms, and self-reported health similar to those of Whites. The significant increase in functional limitations for Blacks is consistent with findings from prior studies. Blacks are more likely than Hispanics or non-Hispanic Whites to report higher levels of functional limitations (Beckles et al., 1994; Escarce & Puffer, 1997). Other than being overweight, none of the lifestyle factors provide significant mediation between being Black and increases in functional limitations. Blacks were more likely to be overweight than Whites, but no significant racial differences were found between Blacks and Whites either for smoking, exercising, alcohol intake, or social connections. Conversely, on the average, Blacks experienced a slight improvement in self-reported health over the four-year period. This result is inconsistent with prior findings, which report Blacks more likely to report poorer assessments of health (see, for example, Berkman & Mullen, 1997; Escarce &

Puffer, 1997). These studies were cross-sectional, however, and the study herein explores changes in self-reported health between Time 1 and Time 2.

This study also has some surprising findings. While Blacks are generally found to have poorer health outcomes in general (Berkman & Mullen, 1997; Escarce & Puffer, 1997), in the study herein they were only poorer than Hispanics and Whites in one outcome, namely, functional limitations. This was the most objective of the four measures of health used in this study. For two more subjective outcomes, emotional symptoms and self-reported health, they fared better than Hispanics. Perhaps this reflects the lower propensity of Blacks to see their health problems as problematic (Bailey, 1991; Ferraro, 1993). Despite the greater decline in functional ability, it appears as though Blacks did not react to this type of health decline with feelings of depression or with worsening perceptions of health.

When changes in psychosomatic symptoms were examined, neither the minority status hypothesis nor the social characteristics hypothesis was supported for either group. Specifically, changes in manifestations of psychosomatic symptoms for being Blacks or being Hispanic were effectively the same as those for being White.

Physical activity is one of the major recommendations in the protocol for diabetes management. Restrictions in activity are a Catch-22 phenomenon for people, both as a cause of poor control over diabetes and a symptom of poor control. People with diabetes have a high risk for activity restrictions because diabetes leads to those very things that restrict mobility, including vision loss, amputations, and damage to nerves, making even walking a painful experience. Clearly, the need to address social characteristics linked to

physical limitations is an important consideration in ensuring proper care for this subgroup. These findings point to the need for interventions, particularly among Blacks. Being overweight is in itself linked to reductions in physical activity (Ralls, 2000). Interventions must involve a way to break the cycle of obesity and physical inactivity.

At least part of the explanation for observed increasing emotional symptoms over time among Hispanics in this study, even with a variety of potential mediating factors included, could lie in their perception of perceived powerlessness and social inequities of their minority status, perceptions that have been associated with poorer health outcomes (Berkman & Mullen, 1997). This sense of inequity may be augmented by their lower levels of education, which prohibits upward mobility in the labor force. Even though the effect of education was controlled in the analyses, and even though Hispanics were more likely to have lower levels of education, this nonetheless did not account for the significant effect. Language skills, often considered to be an indicator of human capital in research on immigrant groups, may serve to compound their inability to improve their social position.

Similarly, depression is a serious problem among people with diabetes. This problem appears to be particularly troublesome for members of the Hispanic community. The beneficial social effects, including their greater participation in roles, did not appear to alter the effect of minority group status for Hispanics in terms of depression. While participation in social networks did appear to reduce the disparaging effect of minority status for Hispanics on increases in emotional symptoms somewhat, the effect was not strong enough to counteract the negative effect of being in a minority group. The

weakness of this association suggests that, as stated previously, the Markides paradox may more accurately reflect objective measures of health than measures of a more subjective nature.

Finally, self-reported health encompasses multiple dimensions of health, including subjective and objective health and quality of life (Rakowski, Fleishman, Mor, & Bryant, 1993). Because this measure is multidimensional, changes in self-reported health may be the most critical of the four outcomes considered for this study. Both subgroups used in this study, Hispanics and Blacks, were more likely to rate their health as fair or poor than non-Hispanic Whites. The Hispanic population experienced significantly poorer self-reported health over time, but this appeared to be traceable to social characteristics. Declines in self-reported health among the Hispanic subgroup were due mainly to their lower levels of education. While not a focus of this study, depression has been shown to be linked to poorer assessments of subjective health (Markides & Mindel, 1987). Declines in health assessments among Hispanics may be linked to declines in emotional well-being. Conversely, part of the explanation for the lack of increases in poorer health ratings among Blacks may be related to the lack of increase in either emotional or psychosomatic symptoms for this subgroup.

In particular, low levels of education and use of smoking tobacco appear to have the strongest impact on the increase in poor health ratings over the period. Hispanics were less likely to smoke than non-Hispanic Whites, although this association was not statistically significant. Hispanics, as a rule, are less likely to smoke than other subgroups of the American population (Keenan et al., 1994). Community interventions targeting the

Hispanic populations should bear in mind the need to recognize the lower levels of education within the Hispanic community as well as the language barrier experienced by a good proportion of this population.

In sum, ascribed minority status has some impact on changes in health among people with diabetes, particular in terms of depression and emotional well-being. However, this study has shown complex configurations across both race/ethnicity and type of outcome. Social and lifestyles characteristics also play an important role; in particular, gender, education, social networks, obesity, and smoking have the most important mediating effects in changes in health over time. However, the degree and manner of mediation varied across subgroups and health outcomes.

Limitations of This Study and Recommendations for Future Research

This final section discusses the limitations of the current study and provides suggestions for future research. This study used data from a national sample of individuals aged 51 to 61. Using national data has inherent costs and benefits. National level data on health issues for minorities are limited, particularly for the Hispanic population. Therefore, this study provided some much needed general information for minorities on a national level. On the other hand, there is an adage popular among those who work in health policy: General solutions cannot always address specific problems.

Defining and classifying respondents as Black or Hispanic raised some operationalization issues. The questionnaire in this study was designed to minimize misreporting. In this study, respondents were first asked to state whether or not they

considered themselves to be Hispanic or not, and then they were asked to identify themselves as members of a certain racial group. Such self-reporting reduced missing information and perhaps, because individuals categorized their race themselves, enhanced the accuracy of the classification.

The impact of minority status was measured by inference as no data were available on individual perception of being in a minority status. In the same light, there was no opportunity for qualitative input from the respondents in this study, leading to a strong possibility that there may be issues driving the ethnic disparities that were inadvertently omitted. Obtaining qualitative information on perceptions of minority group membership in future research may provide some invaluable insight into the ultimate causes of ethnic disparities in health.

The number of people with diabetes in this study was rather small ($N = 744$). While this study made full use of the benefits of panel data, having a larger sample size would reduce the potential risk of case attrition in future studies. The number of cases for data on other minority groups, e.g., Asian, Pacific Islanders, and Native Americans, was too small to warrant their inclusion in the analyses. Findings for these groups may have been dramatically differed from the findings for Blacks and Hispanics. This is particularly unfortunate for Native Americans, who are particularly at risk for diabetes-related complications. But prevalence data are limited because those living on reservations are often excluded from national health surveys (Ghodes, 1995). Because it is likely that there will be an increase in the number of Native Americans in this study diagnosed with diabetes in future waves, the number of cases for Native Americans is expected to increase

dramatically. Similarly, a larger sample size would enable researchers to identify variations within the Hispanic communities, e.g., Puerto-Ricans, Cubans, and Mexican-Americans. A retrospective study seeking to identify factors linked to developing diabetes will then be possible. One possibility would be the impact of cultural assimilation on development of diabetes-related complications. For example, as immigrants adopt American lifestyles, the likelihood that they will develop diabetes and its related complications increases (Stern & Mitchell, 1995). On the other hand, Hispanics who are less acculturated tend to have lower rates of depression than those who are more assimilated (Moscicki, Locke, Rae, & Boyd, 1989). Research to date, focused primarily on the Hispanic and Asian populations, is limited and inconclusive. This study, however, provides insight into the relative importance of social characteristics on outcome, laying groundwork for additional studies.

This study dealt only with minority members who had physician-diagnosed diabetes. Recent documentation indicates that one-third to one-half of all people with Type 2 diabetes have not been diagnosed (Harris, 1995). With the higher proportion of minority members who do not have health insurance, and the tendency for those who do to use fewer medical services, compared to Whites, the possibility exists that the number, equal to or exceeding the number in this sample, of Hispanics and Blacks with undiagnosed diabetes will not be identified until subsequent rounds of the sample.

In the same light, insurance coverage did not have the expected mediating effect. The measures used in this study did not involve complications of diabetes, but were centered on subjective and emotional interpretation of health, plus functional limitations.

Had the outcome variables used been actual complications of diabetes, such as diabetic retinopathy or lower-extremity amputations, the effect of insurance might have been substantial. Using the same independent variables and control variables in future studies would be worthwhile endeavors. For this study, however, because the majority of respondents had only been recently diagnosed with diabetes, the number of respondents with complications would be too small to use for a valid study.

In addition, the measure itself may lack construct validity. Health insurance coverage was used in this study as a proxy for access to health care. Perhaps other measures would have provided a better reflection of access, such as language barriers, culturally sensitive or same-language physicians, and familiarity with the medical care system. While measures were in place to control for other potentially fatal conditions, it was not possible in this study to determine whether or not the declines were due to diabetes-related conditions or to another condition.

While gender differences in diabetes and its related complications are usually minimal, the male-female differences were substantial when the underlying processes in changes in health outcomes were explored. In three of the four outcomes studied, gender had a statistically significant effect on changes in the outcome, even with all other factors controlled. Interesting is the fact that gender was related to increases in functional limitations, and for both measures of depression used in this study. Women in general are more likely to report feeling depressed (Mendes de Leon & Markides, 1988). Because depression is so closely related to the ability to maintain the regimen required for diabetes

self-management among people with diabetes, its presence may represent a critical component in developing complications (Carny, 1998; Robin & Peyrot, 1992).

There were both data and measurement issues which may have affected the results, somewhat. The age group of the sample was limited to those 51 to 61 at baseline. The possibility exists, again, that the results may have been much different if younger and older age groups had been available for analyses. However, Type 2 diabetes generally develops over a period of several years. It is most often diagnosed when people are in their late forties and early fifties, so limiting the study to this age group provides the opportunity to study a highly concentrated pool of individuals soon after diagnosis. Another issue is no history of the respondents' early childhood background included in the analysis. Many health researchers believe that the roots of chronic disease originate during childhood (Geronimus, 1996). Interventions aimed at reducing risk factors for Type 2 diabetes at younger ages may be the most effective method of prevention. The severity index included four measures: insulin usage, oral medication usage, duration of diabetes, and comorbidity. The inclusion of additional measures in this index may have provided a better reflection of disease severity. For example, neuropathy among people with diabetes can create a tremendous amount of pain, the inclusion of which undoubtedly would have had some effect on the outcomes. The decision was made, however, not to include pain as a measure in the severity index because there was no way to determine whether the cause of the pain was from a diabetes-related condition or from some other source. There was also some debate as to whether or not to use pain as an outcome variable. Again, using pain in this manner may have led to biased results as the pain could have originated

from a source other than diabetes or any of the other potentially fatal comorbid conditions included in the index (e.g., arthritis).

One additional issue, both a strength and limitation, is how this study focused on a cohort of midlife Americans between the ages of 51 and 61 at Time 1. The findings in this study may be partially due to a cohort effect unique to individuals in this age group. On the other hand, using a cohort allows the investigation of trajectories of health outcomes for a single group across time.

Functional limitations, emotional well-being, and perceived health status are key indicators of health-related quality of life. Declines in these indicators are also closely associated with access to and use of medical services (Miech & Shanahan, 2000). Declines in these indicators are greater for members of minority racial/ethnic groups than for non-Hispanic Whites. A limited number of studies have examined whether or not these greater declines are due to membership in a minority group or to social factors associated with membership in a minority group (e.g., Musick et al., 1999; Peek et al., 1997). A major portion of this study was dedicated to building on prior studies seeking to determine whether these declines are due to factors other than race/ethnicity. This study adds to the prior research via looking at four health outcomes by two minority groups, Blacks and Hispanics.

This study reveals some important discrepancies in declines in health among Blacks, Hispanics, and Whites. Specifically, Blacks were more likely than Hispanics or Whites to report declines in the more concrete declines in quality of life, functional limitations, while Hispanics were more likely to report declines in emotional health and

self-reported health than Blacks or Whites. There was no difference among any of the groups for increase in psychosomatic symptoms.

Nevertheless, the results of this study do provide some interesting information pertinent to developing interventions for minority groups. Programs will have limited effectiveness if interventions do not address issues pertinent to the minority communities, such as role networks, lower literacy and education levels, and participation in risky behaviors such as smoking. Isolating the factors that have the greatest impact on health outcomes will greatly assist strategic efforts aimed at understanding and addressing the causes of racial disparity in health. Culturally sensitive interventions are essential if there is to be any substantial reduction in risk factors among minority groups. Programs must address the barriers faced by minority groups, including language barriers, low levels of income and education, and environmental issues that prohibit their obtaining sufficient medical care, such as lack of opportunity to obtain employer-based medical insurance and transportation to medical facilities. Effective programs are critical for successful interventions that will ultimately improve the health and quality of life among members of ethnic minority groups.

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APPENDIX

| <i>Means and Standard Deviations for Outcome Variables at Time 1 and Time 2</i> | | | | |
|---|---------------------------|---------------------------|--------------------|---------------------------|
| <i>Outcome Measure</i> | <i>Diabetes Subsample</i> | | <i>Full Sample</i> | |
| | <i>Mean</i> | <i>Standard Deviation</i> | <i>Mean</i> | <i>Standard Deviation</i> |
| <i>Functional Limitations (0 to 9 [high])</i> | | | | |
| <i>Time 1</i> | .94 | 1.08 | .53 | 1.45 |
| <i>Time 2</i> | 1.82 | 2.32 | .82 | 1.71 |
| <i>Emotional Symptomatology (0 to 4 [high])</i> | | | | |
| <i>Time 1</i> | .27 | .71 | .16 | .56 |
| <i>Time 2</i> | .68 | 1.11 | .39 | .89 |
| <i>Psychosomatic Symptomatology (0 to 4 [high])</i> | | | | |
| <i>Time 1</i> | .72 | 1.11 | .46 | .89 |
| <i>Time 2</i> | 1.41 | 1.34 | .80 | 1.14 |
| <i>Self-Reported Health (1 to 5 [poor])</i> | | | | |
| <i>Time 1</i> | 3.52 | 1.08 | 2.64 | 1.16 |
| <i>Time 2</i> | 3.51 | 1.11 | 2.60 | 1.21 |

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