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HEALTH DISPARITIES IN ACCESS TO HEALTH CARE  
FOR OLDER PEOPLE WITH DISABILITIES

presented by

Jae Chul Lee

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of the requirements for the

Ph.D. degree in Rehabilitation Counselor  
Education

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**HEALTH DISPARITIES IN ACCESS TO HEALTH CARE  
FOR OLDER PEOPLE WITH DISABILITIES**

**By**

**Jae Chul Lee**

**A DISSERTATION**

**Submitted to  
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## ABSTRACT

### HEALTH DISPARITIES IN ACCESS TO HEALTH CARE FOR OLDER PEOPLE WITH DISABILITIES

By

Jae Chul Lee

Given the substantial number of individuals with disabilities and the sheer rapid growth of U.S. aging population, research on health disparities of older people with disabilities is vital for improving quality of life for society in general, as well as people with disabilities. Nonetheless, there has been a great lack of research on health disparities for older individuals with disabilities in the literature. To reduce and further eliminate health disparities of older people with disabilities, as well as to provide effective interventions and policies for eliminating and preventing health disparities, it is imperative to investigate the existence of health disparities of this older population and elucidate mechanisms in which health disparities occur.

The purpose of this study was to investigate the existence of health disparities in access to health care between older people with and without disabilities and to what extent such disparities could be accounted for by the behavioral model variables. Health disparities in access to health care were examined in the following areas: cost barrier to health care, health care provider, and routine physical checkup. In examining mechanisms of health disparities, Andersen's (1995) behavioral model variables—predisposing characteristics, enabling resources, and perceived and evaluated health needs—were used. Given a lack of research employing a national data set for health

disparities of older persons with disabilities, this study examined older people aged 65 and over in 50 states and the District of Columbia from the BRFSS for 2006 employing chi-square tests and binary and multinomial logistic regression.

Chi-square tests found that significant disparities existed in access to health care between older individuals with and without disabilities in the three aspects of health disparities. In addition, hierarchical multivariate logistic regression analyses revealed that such disparities occurred through intricate mechanisms; the mechanisms for the three aspects of health disparities showed intricate patterns, respectively. In addition, the extent of the effect of the behavioral model variables on the disparities was various in each mechanism. The limitations of this study and suggestions for future studies are also presented.

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To my late father, Yong Heon Lee; my mother, Seong Nam Jang; my wife, Hyun Ju Jun;  
and my daughters, Hyewon and Hyein Lee.

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# HEALTH DISPARITIES IN ACCESS TO HEALTH CARE FOR OLDER PEOPLE WITH AND WITHOUT DISABILITIES

## CHAPTER 1

### INTRODUCTION

Health assumes a critical and fundamental role in actualizing people's dreams and maximizing their lives, whether they have a disability or not. Since Friedrich Engels (1845/1958) raised an issue of society inequalities in health in *The Condition of the Working Class in England* in 1845, one and a half centuries have passed. However, it is well documented that health disparities prevail in the United States (e.g., Smedley, Stith, & Nelson, 2003; Thomson, Mitchell, & Williams, 2006; U.S. Department of Health and Human Services, 2006; Ver Ploeg & Perrin, 2004). In efforts to reduce and eliminate health disparities, the U.S. has placed a primary focus on racial and ethnic minorities (Braveman, 2006; Goldberg, Hayes, & Huntley, 2004; Ver Ploeg & Perrin, 2004). In a stark contrast, people with disabilities have been given meager attention in health disparities research, despite the sheer large number of people with disabilities and their marginalized social status.

According to the U.S. Census Bureau (2005), as of July 2003, 35.9 million people who are 65 and older accounted for 12 percent of the total U.S. population. The number of older people is projected to be 72 million in 2030, representing 20 percent of the total population (U.S. Census Bureau, 2005). The dramatic increase of the older population in the U.S. becomes more evident, when compared to 3.1 million for the same age group in 1900. Regarding life expectancy, in 2003, that of Americans reached 77.6 years for both sexes with 74.8 years for male and 80.1 years for females (Hoyert, Kung, & Smith,

2005). When it comes to individuals with disabilities, they can be expected to live as long as those without disabilities due to enhanced medical practice and advanced science and technology.

In 2000, 49.7 million people with some kind of long-lasting condition or disability represented 19.3 percent of 257.2 million non-institutionalized civilians age 5 and older (U.S. Census Bureau, 2003). In addition, 14 million older people with disabilities age 65 and older accounted for 41.9% of 33.3 million people in the same age range in 2000 (U.S. Census Bureau, 2003). Moreover, National Center for Health Statistics (2006) indicates that increased longevity is accompanied by increased prevalence of chronic diseases and conditions that are positively associated with aging. Furthermore, the “oldest-old” population age 85 and older is the fastest-growing subset of the older population in the United States (Himes, 2002). This oldest-old group is more likely to have various physical or mental illnesses and disabilities.

These statistics and studies show that a significant portion of the U.S. population is living with a disability. Further, they indicate that the number of older people will continuously increase in the future and that the older population is more apt to have illnesses and disabilities whether physical or mental. In sum, given the mounting older people, their increased life expectancy, and their high likelihood of having illnesses or disabilities, health disparities of older individuals with disabilities warrant rigorous and extensive research.

The sheer growing number of older people poses great challenges for society. The graying of society requires our preparation for unexperienced issues pertaining to economic well-being, health, and long-term care (Clark, Burkhauser, Moon, Quinn, &

Smeeding, 2004). Given the further health issues for people with disabilities and society's unpreparedness for the issues, extensive and thorough research on the health of older people with disabilities is of critical importance.

Research on health disparities involves ethical judgment because health disparity includes determination of whether a disparity is avoidable, unjust, or unfair (Braveman, 2006; Carter-Pokras & Baquet, 2002; Whitehead, 1990). Health disparities deal with social values pertaining to distributive justice and human rights (Braveman, 2006; Hunt, 2006; Universal Declaration of Human Rights, 1948; World Health Organization, 1946). This approach to health disparities in terms of social justice and human rights indicates that the disparities should be broadly addressed and well applied to people with disabilities. However, the U.S has focused its main attention on racial and ethnic groups to ensure them enhanced quality of life. Nevertheless, given the fact that people with disabilities are the biggest minority group in the U.S.—almost one in five U.S. residents age 5 and over has a disability (U.S. Census Bureau, 2003)—it is a true irony that it was not until recently that health disparities of people with disabilities started to be investigated. In particular, since *Healthy People 2010* included disability and secondary conditions in its 28 focus areas (USDHHS, 2000), more studies on the health disparities of people with disabilities have been conducted (e.g., Drum, Krahn, Culley, & Hammond, 2005; Havercamp, Scandlin, & Roth, 2004; Ouellette-Kuntz, 2005; USDHHS, 2002a, 2005).

Health disparities have been typically measured through comparisons between disadvantaged and advantaged groups (Bravemen, 2006), such as majority population and minority population in terms of specific health indicators (e.g., Minority Health and

Health Disparities Research and Education Act of 2000; Satcher, 1999). In this study, health disparities in access to health care of older people with disabilities were investigated through comparisons with their counterparts without disabilities. To render policies further effective to eliminate and prevent health disparities, scientific understanding of determinants of health disparities is important (Adler, 2006). This can be reflected in recent health disparities studies that place their foci on examining determinants of health disparities rather than simply the existence of health disparities (e.g., Baum, Garofalo, & Yali, 1999; Brunner & Marmot, 1999; House, 2002; House & Williams, 2000; Kaplan, 1999; Kuh & Ben-Shlomo, 1997). In this study, the determinants of health disparities of older population with disabilities were examined in access to health care.

### *Conceptual Framework for the Study*

Because a wide array of factors plays a role in health disparities, clarifying determinants of health disparities is demanding and challenging. For the development of a conceptual framework for health disparities in access to health care, main attention was focused on the behavioral model of health services use, specifically the phase 4 of the model (Andersen, 1995), given its comprehensiveness and long-term use in health care access research (Phillips, Morrison, Andersen, & Aday, 1998; Ricketts & Goldsmith, 2005). This behavioral model was developed and has been evolved by Andersen and colleagues (Aday & Andersen, 1974; Andersen, 1995; Andersen & Newman, 1973; Davidson, Andersen, Wyn, & Brown, 2004).

In the behavioral model of health services use (Andersen, 1995), population characteristics are composed of three main elements: 1) predisposing characteristics, 2)



enabling resources, and 3) need. The predisposing characteristics consist of the following factors: a) demographic factors, such as age, gender, or marital status, b) social structure, such as education, race/ethnicity, occupation, or religion, and c) health beliefs, such as attitudes toward health services, knowledge about disease, and values about health and illness. These predisposing characteristics influence enabling resources in person, family, and community. Personal/family enabling resources include knowledge about access to and use of health care and means to access health care, whereas community enabling resources incorporate available health personnel and facilities. These enabling resources affect one's perceived and evaluated health need. Perceived health need refers to how people think of their health status, whereas evaluated health need indicates professional judgment about people's health conditions or illnesses and their need for medical treatment.

The aforementioned population characteristics—predisposing characteristics, enabling resources, and health need—impact one's health behavior: personal health practices and use of health services. Finally, one's health behavior affects health outcomes: (perceived and evaluated) health status and consumer satisfaction. In the phase 4 of the behavioral model (Andersen, 1995), environmental factors—health care system and external environment—were newly added, and these factors influence the population characteristics and health outcomes.

It needs to be noted that the processes of health service utilization in the behavioral model are not simply linear but dynamic and recursive (Andersen, 1995). That is, health outcomes—the final stage of the model—affect population characteristics and health behavior, whereas health behavior influences population characteristics.

Moreover, environmental factors influence not only population characteristics but also health outcomes. Further, population characteristics impact health outcomes directly, as well as through health behavior.

Davidson, Andersen, Wyn, and Brown (2004) present a framework of contextual variables to extend the behavioral model (Andersen, 1995). These contextual variables include social, economic, structural, and public policy environment. This framework was employed in an empirical study toward low-income adults (Brown, Davidson, Yu, Wyn, Andersen, Becerra, & Razack, 2004). The study shows that public policies and community environment impact access to health care for both insured and uninsured adults. Given all the aforementioned factors and the data set of this study, a conceptual framework for access to health care in this study is illustrated in Figure 1.1.

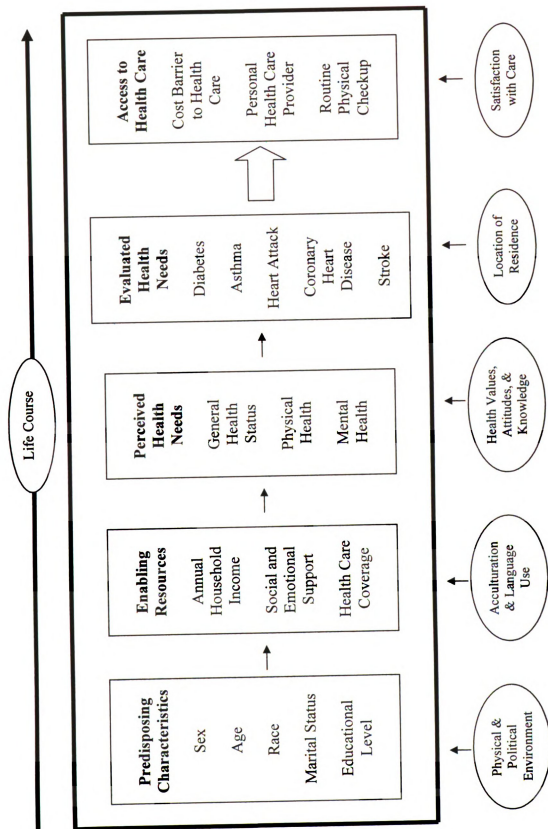


Figure 1.1. Conceptual Framework for Access to Health Care

In this conceptual framework, predisposing characteristics—sex, age, race, marital status, and education level—affect one’s enabling resources—annual household income, social and emotional support, and health care coverage. The enabling resources influence one’s perceived and evaluated health needs, which impact one’s access to health care. More specifically, while perceived health needs are one’s self-rated general health status, evaluated health needs refer to chronic diseases, such as diabetes, asthma, and cardiovascular diseases—heart attack, coronary heart disease, and stroke. In this framework, one’s access to health care was conceptualized as a dynamic process, rather than a one-way process over one’s life course. Therefore, one’s access to health care affects all the aforementioned prior factors: predisposing characteristics, enabling resources, and health needs. In addition, it was conceptualized that one’s access to health care could change over his or her life span in this framework. Thus, changes in many factors can impact one’s access to health care. For example, changes in people’s SES, location of residence, health status, values and attitudes about health and health care services, or health policy can influence whether people can access health care or not.

### *Significance of the Problem*

For individuals with disabilities, studies on health disparities are crucial to maximize likelihood to lead their later life minimizing additional health-related challenges. Moreover, given that people who do not have a disability as youth tend to have illness or disability in their later life, research on health disparities for people with disabilities will increase the quality of life of the general public. In all, given the large number of individuals with disabilities and the rapidly aging U.S. society, research on health disparities of older population with disabilities is essential for enhancing quality of

life for society in general, as well as people with disabilities.

To reduce and ultimately eliminate health disparities of older population with disabilities, it is imperative to investigate the existence of health disparities of this population and elucidate mechanisms in which health disparities occur. Findings from such research as this can provide viable ideas for effective interventions and policies for eliminating and preventing health disparities. Moreover, those findings can promote healthy aging for both people with disabilities and those without disabilities. Given that people with disabilities is one of the most disadvantaged groups in society in terms of education, income, occupation, employment, or living condition, health disparities could be expected to exist, as compared to people without disabilities. In this case, it is vital to find which factors contribute to the health disparities. Despite the importance of the examination of the health disparities, there has been no extensive research focusing on health disparities of people with disabilities, employing a national data set.

This study is expected to spark further interest in health disparities and healthy aging of individuals with disabilities among rehabilitation counseling professionals, disability scholars, and policy makers. Specifically, this study will encourage researchers to discuss how health disparities of people with disabilities should be effectively studied, and which factors should be most critically measured and monitored. More rigorous and extensive research will help society better understand the current picture of health disparities of people with disabilities and their causes. As a result, the elimination and prevention of the disparities of the population and their resultant enhanced quality of life will be expected.

### *Purpose of the Study and Research Questions*

The purpose of this study was twofold: 1) to examine the existence of health disparities in access to health care between older people with disabilities and older people without disabilities, and 2) to investigate the impacts of predisposing characteristics, enabling resources, and health needs on the health disparities, if such disparities exist. To achieve these purposes, the existence and determinants of the health disparities were examined in these areas: cost barrier to health care, personal health care provider, and routine physical checkup. In this study, individuals aged 65 and older were specified as older people, and older people without disabilities served as a reference group. These specific questions were employed to examine the health disparities:

1. Do health disparities in access to health care exist between older people with disabilities and older people without disabilities?
  - 1) Are there significant differences in cost barrier to health care between older people with disabilities and older people without disabilities?
  - 2) Are there significant differences in personal health care provider between older people with disabilities and older people without disabilities?
  - 3) Are there significant differences in routine physical checkup between older people with disabilities and older people without disabilities?
2. If health disparities in access to health care exist between older people with disabilities and older people without disabilities, to what extent are such disparities accounted for by predisposing characteristics, enabling resources, and perceived and evaluated health needs?
  - 1) Cost Barrier to Health Care
    - a) Are predisposing characteristics (sex, age, race, marital status, and

- education level) related to cost barrier to health care? If so, to what extent?
- b) Are enabling resources (annual household income, social and emotional support, and health care coverage) related to cost barrier to health care after predisposing characteristics are accounted for? If so, to what extent?
  - c) Are perceived health needs (general health status, physical health, and mental health) related to cost barrier to health care after predisposing characteristics and enabling resources are accounted for? If so, to what extent?
  - d) Are evaluated health needs (diabetes, asthma, heart attack, coronary heart disease, and stroke) related to cost barrier to health care after predisposing characteristics, enabling resources, and perceived health needs are accounted for? If so, to what extent?

## 2) Personal Health Care Provider

- a) Are predisposing characteristics (sex, age, race, marital status, and education level) related to personal health care provider? If so, to what extent?
- b) Are enabling resources (annual household income, social and emotional support, and health care coverage) related to personal health care provider after predisposing characteristics are accounted for? If so, to what extent?
- c) Are perceived health needs (general health status, physical health, and

mental health) related to personal health care provider after predisposing characteristics and enabling resources are accounted for? If so, to what extent?

- d) Are evaluated health needs (diabetes, asthma, heart attack, coronary heart disease, and stroke) related to personal health care provider after predisposing characteristics, enabling resources, and perceived health needs are accounted for? If so, to what extent?

### 3) Routine Physical Checkup

- a) Are predisposing characteristics (sex, age, race, marital status, and education level) related to routine physical checkup? If so, to what extent?
- b) Are enabling resources (annual household income, social and emotional support, and health care coverage) related to routine physical checkup after predisposing characteristics are accounted for? If so, to what extent?
- c) Are perceived health needs (general health status, physical health, and mental health) related to routine physical checkup after predisposing characteristics and enabling resources are accounted for? If so, to what extent?
- d) Are evaluated health needs (diabetes, asthma, heart attack, coronary heart disease, and stroke) related to routine physical checkup after predisposing characteristics, enabling resources, and perceived health needs are accounted for? If so, to what extent?



Given the questions above, this study employed descriptive statistics, chi-square test and logistic regression. The data for this study were drawn from the Behavioral Risk Factor Surveillance System (BRFSS). This national survey is a collaborative project of the Centers for Disease Control and Prevention (CDC) and U.S. states and four territories. The on-going annual national telephone survey examines health conditions and health risk behaviors mainly related to chronic disease and injury toward non-institutionalized civilian population age 18 and older (CDC, n.d.d).

This study represents a first attempt to investigate health disparities of older people with disabilities employing a national data set. Many studies on people with disabilities have been conducted using the BRFSS (e.g., Brown, Yore, Ham, & Macera, 2005; McGuire, Strine, Okoro, Ahluwalia, & Ford, 2007; Havercamp et al., 2004; Kinne, Patrick, & Doyle, 2004). However, these studies have some limitations. First, most of the studies did not place their primary attention on health disparities. Brown et al. (2005) compared adults with disabilities age 50 and older with their counterparts without disabilities, but they attempted to assess physical activity patterns among the older adults. Moreover, in comparing older people with disabilities age 65 and older with their counterparts without disabilities, McGuire et al. (2007) examined the relationship between healthy lifestyle behaviors and chronic diseases. Further, Kinne and colleagues (2004) investigated prevalence of secondary conditions among individuals with disabilities in the state of Washington. Second, although Havercamp et al. (2004) focused on health disparities and compared adults with developmental disabilities with adults with other disabilities and those without disabilities, their data sets were limited only to North Carolina. Given these limitations, this study addressed data from all 50

states and the District of Columbia. U.S. territories were not included in the study since their unique culture and lifestyle may impact one's health conditions, health behavior and practices, and access to health care.

## CHAPTER 2

### LITERATURE REVIEW

In the previous chapter, it has been clearly pointed out that health takes on great importance in every individual's life. The importance can be further immense for individuals with disabilities. It has been well known that individuals with disabilities have been exposed to marginalized treatment in the U.S., compared to their counterparts without disabilities. Despite the critical significance of health for people with disabilities and their marginalized social status, however, the rehabilitation counseling profession has not given much attention to health disparity issues until now. Society also has not extensively addressed health disparities issues pertaining to people with disabilities. Given the lacking interest in and scanty research on such disparities of people with disabilities, especially in the rehabilitation profession, this chapter deals with major concepts of health disparities, such as their definition, measurement, and determinants. In addition, health disparities of people with disabilities are addressed. In so doing, how the rehabilitation counseling profession has dealt with health issues for people with disabilities is discussed.

#### *Health Disparities*

A difficult task of defining health disparity could be aggravated by confusion from similar words, such as health inequality and health inequity. Whilst the U.S. prefers a term health disparity, other countries more frequently use such terms as health inequity or health inequality (Carter-Pokras & Baquet, 2002). In particular, the term health inequalities are more frequently used in Great Britain and Europe. In addition,

the use of the term health disparities has exponentially increased in the U.S. medical literature in the 2000s (Adler, 2006).

Health disparity includes elements of both health inequality and health inequity (Harper & Lynch, 2005). Inequality is a difference that can be measurable and observable whereas inequity includes an ethical judgment involved in decision of the difference (Harper & Lynch, 2005). According to Whitehead (1990), inequity is differences that are unnecessary, avoidable, unfair, and unjust, so a moral and ethical dimension is involved in the decision of health inequity. As a result, health disparity research involves ethical judgment, and, more specifically, whether a disparity is avoidable and unjust needs to be determined (Carter-Pokras & Baquet, 2002). The ethical determination is about what a society believes is unfair, which is related to many social, political, and ethical issues (Peter & Evans, 2001).

The aforementioned ethical issues on health disparity clearly show that it is a great challenge to reach an unambiguous definition of health disparity. Moreover, the ethical judgment in health disparity necessitates finding determinants of the disparity (Harper & Lynch, 2005). That is, whether we can intervene to avoid health disparity requires us to know what its determinants are. Since definitions and measurement of health disparity are closely related, they are addressed together in the following.

#### *Definitions and Measurement of Health Disparities*

Sociologist Louis Wirth (1945) presented the following definition of a minority group: “a group of people who, because of their physical or cultural characteristics, are singled out from the others in the society in which they live for differential and unequal treatment, and who therefore regard themselves as objects of collective discrimination” (p.

347). This definition shows that although there have been many efforts to reduce and eradicate prejudice and discrimination against people with disabilities and to enhance their social status and participation in society, people with disabilities are still a minority group in the U.S. The marginalized status of this population in society could be reflected in the lack of attention to and extensive research on health disparities of individuals with disabilities. The lacking attention and research may indicate challenges pertaining to measurement of health disparities of population with disabilities, such as what specific areas should be examined for health disparities of people with disabilities, and how the disparities should be measured. A literature review of how previous primary studies defined and approached health disparities could serve as a guideline for overcoming these challenges.

Regarding what specific areas should be examined for health disparities, Smedley, Stith, and Nelson (2003) investigated racial and ethnic disparities from health care quality, as well as access to health care. In addition, Ver Ploeg and Perrin (2004) studied minority health disparities in terms of health and access to health care. Moreover, Thomson, Mitchell, and Williams (2006) approached health disparities of racial and ethnic minority populations from three aspects: health status, health care access and quality, and health outcome. Braveman (2006) also shows through an extensive literature review that a big body of U.S. literature on health disparities centers on two areas for racial and ethnic disparities: health status and health care.

All the aforementioned studies placed main foci on racial and ethnic minorities. In addition, these studies indicate that health disparities research has centered on the following areas: 1) health in health status and health outcome, 2) access to health care,

and 3) quality of health care. However, it should be noted that these approaches could vary due to the focus and goal of research. Since detailed information on health outcomes, such as incidence, mortality, or the severity of diseases, and quality of health care is not available in the core section of the BRFSS, health disparities of older people with disabilities in this study were focused on access to health care. When it comes to the measurement of health disparities of older people with disabilities, reviews of definitions of health disparities should be helpful. Despite a great challenge of finding a clear definition of health disparity, many attempts have been made to clarify what health disparity is. However, these definitions are not all straightforward and explicit. While dealing with definitions of health disparities, measurement issues are also discussed.

First, National Institute of Health (USDHHS, 2002b) presents the following definition of health disparities: “differences in incidence, prevalence, morbidity, mortality and burden of diseases and other adverse health conditions that exist among specific population groups in the United States” (p. 7). In this definition, health disparities among specific population groups are measured in specific health outcomes. The health disparities are not determined through a comparison with the general population or a majority population. Moreover, the magnitude of the differences is not specified in the definition. As a result, the definition does not serve as a clear guideline on how to measure health disparities.

Second, Minority Health and Health Disparities Research and Education Act of 2000 defines health disparity as follows: “A population is a health disparity population if...there is a significant disparity in the overall rate of disease incidence, prevalence, morbidity, mortality, or survival rates in the population as compared to the health status

of the general population” (p. 2498). In this act, a health disparity is a significant difference in health using the general population as a reference group. Therefore, if a specific population has significant differences in health outcomes compared to the general population, the specific population is determined to have health disparities. In the process, the magnitude of the differences must be significant (Harper & Lynch, 2005).

Third, Satcher (1999), who was Assistant Secretary for Health and Surgeon General and became U.S. Surgeon General later, made a comment on the elimination of health disparity, through which the definition of health disparities could be obtained:

For all the medical breakthroughs in the past century, there remain significant disparities in the medical conditions of racial groups in this country—a country that is growing more and more diverse every day. What we have done through this initiative is to make a commitment—really for the first time in the history of our government—to eliminate, not just reduce, some of the health disparities between majority and minority populations. (pp. 18-19)

From the above quotation, health disparities can be defined as differences in health outcomes among racial groups. Satcher (1999) provided six focal areas for the measurement of the disparities: infant mortality, immunization of children and adults, the AIDS epidemic, cardiovascular disease, cancer, and diabetes. Therefore, health disparities are measured as significant differences in the six areas between majority and minority populations.

In contrast to the definition of National Institute of Health (USDHHS, 2002b), the last two definitions employ comparisons between a racial and ethnic minority group and a majority group or the general population. However, these definitions do not clarify

what the minority group and the majority group are. Instead, a racial and ethnic minority group is implicitly indicated as a minority group. Thus, health disparities of racial and ethnic minority populations are determined through comparisons with the majority population or the total population in specific health indicators. Bravemen (2006) corroborates this finding. In his extensive literature review, Bravemen shows that health disparities have been typically measured through comparisons between disadvantaged and advantaged groups.

As compared to people with disabilities, those without disabilities are considered an advantaged group, and, therefore, serve as a reference group in this study. As a result, older people with disabilities were compared with their counterparts without disabilities to examine health disparities in access to health care in this study.

It is important to note that the aforementioned definitions of health disparities do not address people with disabilities. Although those definitions present some guideline on the measurement of health disparities, their main attention is focused on racial and ethnic minority groups. In contrast, *Healthy People 2000* and *Healthy People 2010* included disability to reduce and eliminate health disparities.

*Healthy people 2000* (USDHHS, 1995) is a national health promotion and disease prevention initiative, and reducing health disparities was one of three broad goals.

The second goal is to close the gaps in health status and health outcomes between racial and ethnic minorities and the total population. Across many health measures—mortality, morbidity, and health services utilization—the differences between whites and minorities continue to be substantiated. (p. 6)

As indicated above, health disparities in *Healthy People 2000* are differences in



health status and health outcomes between racial and ethnic minorities and the total population. Moreover, *Healthy People 2000* focused on access to preventative services (USDHHS, 1993). In *Healthy People 2000*, people with disabilities were included in risky populations for health problems, with racial and ethnic groups and poor people (USDHHS, 1995). For disabilities, it should be noted, however, that *Healthy People 2000* focused only on diabetes and chronic disabling conditions as priority areas.

Reduction of health gaps set forth as a goal in *Healthy People 2000* was further emphasized in *Healthy People 2010* as indicated in the following: “The second goal of Healthy People 2010 is to eliminate health disparities among segments of the population, including differences that occur by gender, race or ethnicity, education or income, disability, geographic location, or sexual orientation (p. 11).”

Compared to the predecessor, *Healthy People 2010* shows considerable progress in efforts to tackle health disparities. First, *Healthy People 2010* has a goal of eliminating health disparities beyond reducing them. Second, *Healthy People 2010* specifies various factors for differences in health: gender, race and ethnicity, education or income level, disability status, geographic location, or sexual orientation. On the other hand, *Healthy People 2000* specified three risky groups for health, including people with disabilities. However, it is important to note that the aforementioned factors in *Healthy People 2010* do not necessarily cause health disparities (Keppel, Percy, & Klein, 2004). Rather, the second goal of *Healthy People 2010* serves to call attention to differences in health which could be caused by those factors. Third, when it comes to disability, *Healthy People 2010* includes disability and secondary conditions in its 28 focus areas (USDHHS, 2000). In *Healthy People 2010*, individuals are identified as having

disabilities if they have an activity limitation, use special equipment, or perceive themselves as having a disability (USDHHS, 2000). In contrast, *Healthy People 2000* placed its focus on diabetes and chronic disabling conditions as priority areas. Lastly, *Healthy People 2010* focuses on access to quality health care for eliminating health disparities, as well as health status (USDHHS, 2007).

As compared to the previous three definitions, *Healthy People 2000* and *Healthy People 2010* include disability as a risk factor for health. In particular, *Healthy People 2010* deals with disability as a potential factor in health disparity, requiring an attention to the factor. This is a noticeable progress because the U.S. has placed its primary focus on racial and ethnic differences in health or health care in health disparities research (e.g., Kelley-Moore & Ferraro, 2004; Liao, McGee, Cao, & Cooper, 1999; Schoenbaum & Waidmann, 1997; USDHHS, 2005). However, despite its progress in *Healthy People 2010*, the national health promotion initiative still has limitation. Contrary to the other factors mentioned previously, disability status and geographic location are optional characteristics in monitoring selected objectives and subobjectives (USDHHS, 2007). Regarding the measurement of health disparities, the best group rate is employed as a reference in *Healthy People 2010* (Keppel et al., 2004). For instance, the percentage differences obtained through comparisons of the best racial and ethnic group with other racial and ethnic group rates for given characteristics are measured for health disparities (Keppel et al., 2004).

In sum, health disparities were defined in this study as avoidable differences in access to health care between older people with and without disabilities. In addition, the differences in access to health care were measured using older people without disabilities

as a reference group.

### *Determinants of Health Disparities in Access to Health Care*

In this study, health disparities among older people with and without disabilities were examined in access to health care. More specifically, the existence and determinants of such disparities were focused on. In the previous chapter, predisposing characteristics, enabling resources, and perceived and evaluated health needs were conceptualized to impact one's access to health care. In the conceptual framework, the process of access to health care was dynamic and interactive, not as linear. As a result, it should be noted that access to health care itself influences one's predisposing characteristics, enabling resources, and health needs. Nonetheless, more attention is here focused on the linear impacts of the determinants on health care access. Given the intricate and dynamic mechanism of health care access, the determinants of access to health care are broadly addressed in the following areas: 1) sociodemographic characteristics, 2) health care practices and personal lifestyle and behaviors, 3) cultural factors, and 4) other factors. The relationship between health status and access to health care is discussed in describing other determinants.

#### *Sociodemographic Characteristics*

A range of sociodemographic characteristics, such as race and ethnicity, income, employment, social stratification, age, and sex, are involved in access to health care. These sociodemographic characteristics are interconnected with not only one another but also other determinants in different areas. Since health insurance status and coverage issues play a significant role in access to health care and these issues are closely related to other sociodemographic factors, discussion on sociodemographic characteristics is

centered on health insurance issues.

A national healthcare disparities report for 2006 illustrates that health disparities in access to health care remain prevalent, and that racial and ethnic minorities and poor people have less access to health care (USDHHS, 2006). However, this report shows that the access issues tend to be enhanced in older population than their young counterparts due to Medicare provided for almost all older people in the United States. This may suggest that age is positively associated with health care access in the U.S., compared to young counterparts. However, Gluck and Hanson (2001) present a finding that a larger portion of people who rely on Medicare alone reported delaying care due to cost, compared to people with private health insurance coverage. This indicates that the universal coverage of Medicare for older people has limitation to dealing with health disparities issues among the older population and that the impact of age on access to health care merits further examination.

When it comes to sex, a significantly higher portion of females has a specific source of ongoing care than male (USDHHS, 2006). Gender differences impact job tenure, labor force participation, life course patterns, retirement, and self-rated health, to name a few (George, 2001; Henretta, 2001; Moen, 2001). These differences may lead to disparities in access to health care between males and females.

Insurance coverage, race and ethnicity, and income were found to be important for access to health care, and their relationships to access to health care were complex (e.g., Becker & Newsom, 2003; Berk & Schur, 1998; Glaser, 1993; Mueller, Patil, & Boilesen, 1998; Schur & Berk, 1998; Smedley et al., 2003). Mueller and colleagues (1998) examined people under 65 using data from the 1992 National Health Interview

Survey (NHIS) to investigate the impact of health insurance status, race and ethnicity, and place of residence on access to health care. Mueller et al. (1998) demonstrated that insurance status had the biggest impact on utilization of healthcare services. Moreover, Muntaner and Parsons (1996) revealed that sociodemographic variables and social stratification were associated with health insurance. More specifically, people who had full-time employment, a bachelor's degree or more, and higher income households, and worked in larger firms and production industries were more likely to be covered by private health insurance.

In research on health insurance, health care coverage also should be paid careful attention. Using the 1994 Robert Wood Johnson Foundation National Access to Care Survey, Berk and Schur (1998) showed that not only having health insurance but also type of health insurance were associated with access to health care. In this study, people in Medicaid reported half of difficulty of obtaining services compared to people without health insurance. On the other hand, those in Medicaid reported twice more difficulties of accessing services than individuals with private insurance. Millman (1993) noted that undercoverage of health insurance impacts one's access to health care. More specifically, the depth or adequacy of coverage can delay people's utilization of health care or prevent them from accessing and using the care.

Lastly, it is important to note that racial and ethnic minority members have not only poor access to health care but also poor quality of care (Smedley et al., 2003). Low socioeconomic status and lack of health insurance lead to substandard medical care, which in turn affects one's health. Burstin, Lipsitz, and Brenna (1992) demonstrate that people without insurance are exposed to greater risk for medical injury, caused by

substandard medical care. Millman (1993) points out two issues that poor people and minority members are exposed to: difficulty of obtaining services and poor health condition in general, which may be attributable to the content, quality, and continuity of health care they receive, as well as the amount of the care.

In sum, a wide variety of sociodemographic characteristics plays a significant role in one's access to health care. Sociodemographic contributors affect one another and also interact with other determinants in different areas, necessitating a cautious and meticulous approach to investigating determinants of access to health care. In addition, the sociodemographic contributors affect one's health insurance status and coverage as well as quality of health care.

#### *Health Care Practices and Personal Lifestyle and Behaviors*

It is well documented that health care practices, health behaviors and lifestyle—for instance, medical care use, safety practices, cigarette smoking, alcohol and drug use, sexual behavior, exercise patterns, dietary practices, and food consumption—impact health and aging (e.g., Ferraro, 2006; Gross, Quinan, Rodstein, LaMontagne, Kaslow, Saah, Wallenstein, Neufield, Denning, & Gaerlan, 1988; House, 2002; Land & Yang, 2006; Olshansky, Carnes, Rogers, & Smith, 1997; USDHHS, 2000; Young, 2005).

Those impacts on health and aging will in turn lead to one's access to health care.

Young (2005) presents the following primary individual behaviors for diseases and health problems: smoking, diet, alcohol and drug use, physical activity, and safety practice.

Smoking, the most important lifestyle determinant of health, increase risks of developing certain cancers and respiratory diseases, as well as issues pertaining to pregnancy and child growth retardation (Young, 2005). Additionally, alcohol and drug use can cause

diseases and injuries to the users, and also bring social and economic losses to the users' families, community, and society in general (Hanson, Venturelli, & Fleckenstein, 2005).

Good nutrition and physical activity are vital for successful aging, as well as health and quality of life (USDHHS & U.S. Department of Agriculture, 2005). More specifically, a nutritious diet and regular physical activity will more likely promote health and reduce risk for main chronic diseases, such as cardiovascular disease, type 2 diabetes, hypertension, osteoporosis, and certain cancers, as well as overweight and obesity (Kumanyika, 1997; USDHHS & USDA, 2005). Conversely, a poor diet and physical inactivity are primary risk factors for developing those diet- or weight-related chronic diseases and conditions. Moreover, malnutrition is associated with impaired immune function, poor wound healing, and involuntary weight loss (Fischer & Johnson, 1999).

Simple as they may sound, a nutritious diet and regular physical activity are connected with other sociodemographic and environmental factors. Poverty, living alone, inadequate or poor social network and social relationships, or loneliness influence one's food access and a proper diet (Kumanyika, 1997). In addition, an unsafe environment can restrict individuals' regular exercise, as indicated previously.

It should be noted that culture is involved in one's health. Acculturation can play a role in one's health through westernized diet and access to health care (Ver Ploeg & Perrin, 2004). In addition, cultural aspects are involved in dietary practices, behavior, lifestyle, and family environment, and, therefore, culture should be taken into account for one's health (Kumanyika, 1997; Ver Ploeg & Perrin, 2004). Furthermore, cultural norms and family socialization early in life may affect the formation of health promoting

and risky behaviors among individuals (Thomson et al., 2006). These cultural aspects highlight their role on one's health. However, it is obvious that culture also takes a big role in one's access to health care, which is addressed in the next subsection.

As with the impacts of sociodemographic contributors to access to health care, the aforementioned studies reveal that health care practices and personal lifestyle and behaviors are intricately involved in one's access to health care. In particular, those factors impact health care access through their influences on health status. In addition, culture can play a part in the complex mechanism of health care access.

### *Cultural Factors*

Various aspects of culture impact one's access to health care and quality of health care. Culture forms one's belief and attitude about health and access to and utilization of health care. Fiscella, Franks, and Clancy (1998) reveal that attitude toward care system impacts people's access to health care. In particular, given the more and more racially and ethnically multicultural U.S. society and continual influx of immigrants into the U.S., the cultural aspects need to be given more weight in health care access research. For instance, it is well known that culture plays a role in immigrants' help-seeking behavior and attitudes about mental health problems (e.g., Shin, 2002; Vega, Kolody, & Aguilar-Gaxiola, 2001; Yi, 2005).

First, Vega et al. (2001) investigated help-seeking patterns for mental health problems among immigrant and U.S. born Mexican Americans. The study found that Mexican immigrants had limited experiences and knowledge about mental health services due partly to stigma. This was corroborated by a fact that public health insurance did not increase utilization of mental health services for Mexican immigrants.



Second, Shin (2002) examined Korean immigrants' help-seeking behaviors for depression using 70 Korean immigrants in New York City through focus group discussions and in-depth interviews. Shin suggested that traditional Asian practices and prolonged care within family served to deter and delay the participants from seeking mental health services for their depression. In the study, the following seven factors were found as barriers to obtaining mental health services: stigma; gender (less willingness of males); intervention focusing on explicit, overt and open communication; lack of available services with bilingual and bicultural therapists; finances; lack of information about available services; and geographic proximity.

The studies above show that although many immigrants were struggling with mental health problems, their utilization rates of mental health services were low, which could not be accounted for just by financial issues. This clearly suggests that these challenges are associated with immigrants' cultures toward mental health problems, and that this cultural aspect can be differently manifested depending on individual characteristics, such as level of acculturation and sociodemographic factors.

Language use and proficiency also affect people's access to, utilization of, and quality of health care (e.g., Fiscella, Franks, Doescher, & Saver, 2002; Perez-Stable, Napoles-Springer, & Miramontes, 1997; Ver Ploeg & Perrin, 2004; Yi, 1995). Ver Ploeg and Perrin (2004) indicate that acculturation and language use can impact one's health through access to and quality of health care. Compared to language use, acculturation has broader impact on one's health. Culture influences various dimensions of one's life, such as behavior, diet, and family environment (Ver Ploeg & Perrin, 2004). In contrast, language use and proficiency can affect one's health through

access to, utilization of, and quality of health care.

### *Other Factors*

Other determinants of health care access can be generally divided into environmental factors and individual factors. First, environmental factors can primarily affect one's access to health care. Whether people live in rural areas or urban areas influences an individual's health care access (Committee on the Future of Rural Health Care, 2005; Hartley, 2004; Thomson et al., 2006). Thomson et al. (2006) show that people who live in disadvantaged neighborhoods and rural locations as well as the poor have health disparities in access to health care. Lack of transportation also can be a barrier to gaining access to health care (Millman, 1993). Location of residence and socioeconomic status may be involved in the transportation issue. Furthermore, available health personnel and facilities can impact one's access to health care (Andersen, 1995). This issue is more likely to be encountered in rural areas and less affluent community. Lastly, public policies and community environment impact access to health care for both insured and uninsured adults (Davidson et al., 2004).

Second, various individual factors are associated with health care access. Perceived and evaluated health status and consumer satisfaction affect one's access to health care (Andersen, 1995). Moreover, Fiscella et al. (1998) reveal that attitude toward health care system impact people's access to health care. Many individual factors can be related to cultural aspects, which was previously mentioned.

### *Health Disparities of People with Disabilities*

A plethora of research has documented that people with disabilities suffer from unemployment, underemployment and, as a result, economic distress (e.g., Kaye, 1998;

Lustig, Strauser, & Donnell, 2003; Rehabilitation Research and Training Center on Disability Demographics and Statistics, 2005; Stapleton & Burkhauser, 2003). This economic distress for people with disabilities more likely leads to living in unhealthy living conditions and environments, as well as poor diet and stress. Unsafe neighborhoods make it difficult to regularly do exercises (Sallis, Johnson, Calfas, Caparosa, & Nichols, 1997; Weinstein, Feigley, & Pullen, 1999). All these aforementioned factors are potent contributors to poor health. This indicates that people with disabilities have great risk factors for health.

The economic distress for people with disabilities also impacts their access to and quality of health care. Related to health insurance, individuals with disabilities can be further burdened with the following issues: exclusion waivers for preexisting health conditions, higher premiums, and denials (Millman, 1993). That sociostructural factors affect health status and access to health care for people with disabilities deserves careful scrutiny of health disparities for older population with disabilities.

Nonetheless, there has been no publication on health disparities of people with disabilities, whether young or old, in three primary rehabilitation counseling journals: *Rehabilitation Counseling Bulletin*, *Journal of Rehabilitation*, and *Journal of Applied Rehabilitation Counseling*. Given these limitations, how the rehabilitation counseling profession has addressed health-related issues for people with disabilities are discussed in greater detail to have a deep understanding of necessity and urgency of research on health disparities of people with disabilities. Even beyond the rehabilitation counseling profession, the U.S. has focused scanty attention to health disparities of this population, compared to other populations, especially racial or ethnic minorities. Therefore,

reviews of health disparities for people with disabilities are not restricted to older individuals with disabilities and access to health care for health disparities.

### *Rehabilitation Counseling*

Overlooked interest in and attention to health and its sociostructural factors in the rehabilitation counseling profession can be reflected in a lack of extensive and empirical research on healthy aging in the aforementioned major rehabilitation counseling journals. In 1981, *Journal of Rehabilitation* dealt with rehabilitation of older people in its special issue (Volume 47, issue 4). This special issue approached aging and older individuals with disabilities from comprehensive areas: ageism, rehabilitation process for older population with disabilities, legislation, and aging-related issues such as leisure, sexuality, independent living and employment. For health, this issue had an article on loss of physical function and disability of older population (Jernigan, 1981). However, the article simply presented an overview of physical health issues for older people, focusing on quality of life and activities of daily living. Therefore, this special issue did not sufficiently address health, despite its comprehensive approach to aging issues.

Recently, *Journal of Rehabilitation* published another special issue featuring contemporary issues that aging Americans face (Volume, 69, issue 2, 2003). This special issue dealt with a variety of challenges and concerns related to older population and their implications for rehabilitation counseling. However, the special issue approached aging centering on mental health, employment, and service delivery. As a result, the issue did not go further to comprehensively address healthy aging of the older population, not to mention health disparities.

*Rehabilitation Counseling Bulletin* also addressed aging issues in a special issue

(Volume 29, issue 2, 1985). This special issue adopted a life span perspective, and discussed transition and disability issues from adolescents to older people. In spite of its unique approach, however, this special issue did not address health issues.

This literature review shows that although the rehabilitation counseling profession made efforts to deal with aging issues of people with disabilities, the profession has not focused its main attention to healthy aging for people with disabilities. This fact also can be corroborated through Mary E. Switzer Memorial Seminars. Until now, three Mary E. Switzer Memorial Seminars have been held on older people with disabilities: in 1987, “the aging workforce: implications for rehabilitation”; in 1991, “Aging, disability and the nation’s productivity”; and in 2003, “the aging American workforce: the impact on persons with disabilities.” As the themes of these seminars clearly indicate, those seminars restricted their attention to the population’s employment issues. This may demonstrate that the rehabilitation counseling profession has maintained its primary focus on productivity and employment issues for older people with disabilities.

Nevertheless, the literature review above does not necessarily mean that the rehabilitation profession has had skimpy attention to aging and health issues. As a matter of a fact, a multitude of topics pertaining to aging and health for individuals with disabilities were addressed in the three major rehabilitation counseling journals: meaning of aging and ageism (Bearden & Head, 1986; Benedict & Ganikos, 1981; Reiner, 1974; Saxton & Spitznagel, 1992); grave aging issues for the general public and older people with disabilities (Lewis, 1989; Zola, 1989); aging-related psychological issues (Fromm, 1966; Kivnick, 1985); promoting cognitive functioning (Abramson & Wehman, 1975); loss of physical function (Jernigan, 1981); physical education for people with significant

disabilities (Rizzo & Kloepping, 1976); health promotion (Brandon, 1985; Taegue, Cipriano, & McGhee, 1990; Tate, 1987; Wong & Neulicht, 1994); and health and wellness (Putnam, Greenen, Powers, Saxton, Finney, & Dautel, 2003).

Of the above literature, studies on health merit further extensive review, because they indicate that the rehabilitation counseling profession has made efforts to maintain and promote health for people with disabilities, including older population with disabilities. First, Brandon (1985) addressed health promotion and wellness, but he simply discussed how those concepts could be applied to rehabilitation services and what principles were applicable for health promotion and wellness. Second, Tate (1987) dealt with health promotion, but she addressed it in the contexts of disability management and workplaces. Thus, Tate approached health promotion to make workforce healthy. Third, Teague et al. (1990) stressed comprehensive health promotion for health maintenance and enhancement of people with disabilities. Although Teague and colleagues recognized that health care was oftentimes overlooked for people with disabilities, they did not go further to address what caused the lack of health care for the population. Instead, they just discussed models and concepts of health promotion and their applicability in the rehabilitation profession. Fourth, Wong and Neulicht (1994) addressed a definition and model of health promotion, and presented barriers to health promotion. Their focus was placed on discussing application and utility of health promotion to people with disabilities. Finally, Putman and colleagues (2003) dealt with barriers and facilitators to health and wellness of individuals with disabilities. Through a qualitative study, Putman et al. revealed how people with long-term disabilities defined and conceptualized health and wellness.

This extensive literature review shows that even though many studies in rehabilitation counseling have addressed health promotion and wellness for individuals with disabilities, they have several limitations. First, not all these studies focused specifically on older individuals with disabilities; studies on health promotion put their focus on the general population with disabilities (Brandon, 1985; Teague et al., 1990; Wong & Neulicht, 1994). Additionally, health promotion was not discussed in a comprehensive and continual framework, from childhood or youth to old age. Second, those studies put their main focus on enlightening rehabilitation counseling professionals on the significance of health issues and presenting the concepts and models of health promotion. As a result, most of the studies did not empirically examine health and wellness issues. Third, although some studies (e.g., Putman et al., 2003; Wong & Neulicht, 1994) identified barriers to health and wellness of people with disabilities, they did not extensively investigate what factors could contribute to the obstacles to health maintenance and promotion. Most studies placed their primary focus on individual factors, rather than on sociostructural factors. However, given the interconnectedness of individuals and society, and the long history of stigma, prejudice, and discrimination against individuals with disabilities, health issues of people with disabilities need to be approached more broadly and comprehensively beyond individual levels. Therefore, comprehensive and empirical research on health disparities is crucial.

To sum up, the rehabilitation counseling profession has traditionally placed its focus on employment issues for people with disabilities, which may have served to divert its attention from health. In addition, attention to health and health promotion in rehabilitation counseling did not go beyond individual factors to investigate

sociostructural factors. This fact could be one of the reasons that there has been greatly lacking research on health disparities for people with disabilities in rehabilitation counseling. Given the great dearth of health disparities research in the rehabilitation counseling profession, the following discussion on health disparities of individuals with disabilities moves beyond rehabilitation counseling.

### *Health Disparities for People with Disabilities*

It has been mentioned earlier that people with disabilities have been marginalized in society, and that they have been exposed to great disadvantage in many aspects of life, such as employment, income, education, or marriage. Further, individuals with disabilities are more likely to encounter health issues, which impact their socioeconomic status, and vice versa. In spite of the fact that people with disabilities sustain poor health status caused by preventable secondary conditions, they may be the largest underserved subpopulation (Drum et al., 2005). Given the big impact of health insurance status and coverage on access to health care (e.g., Berk & Schur, 1998; Millman, 1993; Mueller et al., 1998; Muntaner & Parsons, 1996), marginalized social status can bring about great barriers to health care access for people with disabilities. Therefore, people with disabilities are more likely to have health disparities in health status and access to, utilization of, and quality of health care.

There exist compelling data suggesting that individuals with disabilities sustain poor health status and secondary health conditions, which are preventable (e.g., Campbell, Sheets, & Strong, 1999; Turk, Geremski, Rosenbaum, & Weber, 1997; USDHHS, 2000). Turk et al. (1997) show that although women with cerebral palsy in the community think of themselves as healthy, they have various secondary conditions, such as pain, bowel



and bladder problems, or poor dental health, all of which were independent of participants' type of cerebral palsy.

In addition, employing the data from the Aging with Disability (AwD) study and the 1994-1995 NHIS, Campbell et al. (1999) show that people aging with polio, rheumatoid arthritis, and stroke, who are 45 to 64 years old at the measurement and randomly selected from a county rehabilitation hospital and a community pool, have clearly distinct disparities, compared to their counterparts without disabilities. More specifically, those from the AwD study have appreciably higher rates of secondary health conditions, such as arthritis, diabetes, high blood pressure, digestive disorders, and respiratory disorders, than population estimates for the same-age cohort from the NHIS.

Furthermore, USDHHS (2000) shows that people with disabilities have health disparities in health status and access to health care. Specifically, compared to people without activity limitation, those with disabilities have more days of depression and fewer days of vitality, as well as lower rates of physical activity and higher rates of obesity. Regarding health care access, many individuals with disabilities have poor access to health services and medical care.

USDHHS (2002a) clearly indicates that people with mental retardation suffer from health disparities in health status and access to basic health care. Health disparities for people with mental retardation are further serious not only because access to basic health care is taken for granted for people without disabilities but also because the unmet needs of those with mental retardation are too oftentimes overlooked (USDHHS, 2002a). According to USDHHS (2002a), these issues are further exacerbated by the following issues. First, most of health care providers are not trained to appropriately treat people

with mental retardation. Second, even for those providers with adequate training, they are faced with few incentives from the present health care system to provide adequate health care services for individuals with mental retardation.

Disability is a significant risk factor to access to preventative, primary, and secondary health care (e.g., Chan, Doctor, MacLehose, Lawson, Rosenblatt, Baldwin, & Jha, 1999; Fisher, 2004; Iezzoni, McCarthy, Davis, & Siebens, 2000; Sutton & DeJong, 1998). First, through an extensive literature review, Fisher (2004) shows that people with mental retardation sustain health disparities in wide areas: general health screening and care for physical symptoms, mental health, women's care, dental services, health maintenance, and prevention.

In addition, Chan and colleagues (1999) investigated preventative services of Medicare patients with disabilities, using the 1995 Medicare Current Beneficiary Survey. In the study, women with most significant disabilities reported fewer rates of mammograms and Pap smears. Thus, disability was a significant risk factor to those preventative services. It is important to note, however, that severity of disability is not directly associated with receipt of certain preventative services (Diab & Johnston, 2004). Thus, the relationship between the severity of disability and preventative health services is not simple and linear (Diab & Johnston, 2004).

Using the 1994 NHIS and supplements from the NHIS-D, and *Healthy People 2000*, Iezzoni et al. (2000) also show that people with mobility impairments—difficulty walking, climbing stairs, or standing for extended period—are not given much attention to screening and preventive services. Given the findings from the aforementioned studies, it is not surprising that people with disabilities face great challenges to access to

preventive, primary, and secondary health care services (Sutton & DeJong, 1998).

In relation to barriers to access to health care, people with disabilities face a variety of challenges, which are distinct from those for counterparts without disabilities. Using focus group, O'Day, Dautel, and Scheer (2002) show that people with mobility impairments—spinal cord injury, cerebral palsy, multiple sclerosis, and arthritis—encounter the following hurdles for their access to health care: physical access to doctors' offices and office equipment; establishing trusting relationships with physicians; physicians' lacking knowledge and sensitivity to disability; coverage of durable medical equipment, medications, and rehabilitation; and negotiating managed care system to get wanted service when they need it.

While Kroll, Jones, Kehn, and Neri (2006) employed focus group in examining utilization of primary preventative services for individuals with physical disabilities, they corroborated the aforementioned challenges to access to health care, except for the negotiation with managed care system. Additionally, Kroll et al. (2006) found a short appointment issue and extended the lack of professional behavior and sensitivity beyond physicians to include the issue from other health care providers. Furthermore, Iezzoni et al. (2000) pointed out that shortened appointment time, inaccessible physical environment, and inadequate equipment could keep people with mobility impairments from utilizing preventive care services.

In sum, people with disabilities have suffered from health disparities in health status and access to health care, compared to people without disabilities. Individuals with disabilities still face an accessibility issue to physical environments, despite the passage of Americans with Disabilities Acts (ADA) in 1990. In addition, even in the

doctors' offices, those with disabilities encounter inaccessible medical equipments and health care providers with insensitive and unprofessional attitude and demeanor. Coupled with these barriers to health care access, socioeconomic factors due to marginalized social status of people with disabilities adversely impact their health status. Their poor health status could then result in unemployment or underemployment, or serve as an obstacle to gain and maintain quality employment. Low socioeconomic status due to the employment issues will limit access to and quality of health care for people with disabilities through health insurance status and coverage. Last but not least, health disparities of people with disabilities have not been addressed rigorously and comprehensively. Many studies merely explored health disparity issues, using a convenient sample (Turk et al., 1997), focus groups (Kroll et al., 2006; O'Day et al, 2002), or literature review (Fisher, 2004; Ouellette-Kuntz, 2005). In particular, determinants of the health disparities have not been extensively investigated, in spite of widespread health disparities of people with disabilities.

## CHAPTER 3

### METHODOLOGY

For eliminating and preventing health disparities in access to health care of older people with disabilities, this study investigated the existence and determinants of the health disparities. For health care access, this study examined these factors: cost barrier to health care, personal health care provider, and routine physical checkup. To achieve the purposes of this study, the following questions were employed:

1. Do health disparities in access to health care exist between older people with disabilities and older people without disabilities?
  - 1) Are there significant differences in cost barrier to health care between older people with disabilities and older people without disabilities?
  - 2) Are there significant differences in personal health care provider between older people with disabilities and older people without disabilities?
  - 3) Are there significant differences in routine physical checkup between older people with disabilities and older people without disabilities?
2. If health disparities in access to health care exist between older people with disabilities and older people without disabilities, to what extent are such disparities accounted for by predisposing characteristics, enabling resources, and perceived and evaluated health needs?
  - 1) Cost Barrier to Health Care
    - a) Are predisposing characteristics (sex, age, race, marital status, and education level) related to cost barrier to health care? If so, to what

extent?

- b) Are enabling resources (annual household income, social and emotional support, and health care coverage) related to cost barrier to health care after predisposing characteristics are accounted for? If so, to what extent?
- c) Are perceived health needs (general health status, physical health, and mental health) related to cost barrier to health care after predisposing characteristics and enabling resources are accounted for? If so, to what extent?
- d) Are evaluated health needs (diabetes, asthma, heart attack, coronary heart disease, and stroke) related to cost barrier to health care after predisposing characteristics, enabling resources, and perceived health needs are accounted for? If so, to what extent?

2) Personal Health Care Provider

- a) Are predisposing characteristics (sex, age, race, marital status, and education level) related to personal health care provider? If so, to what extent?
- b) Are enabling resources (annual household income, social and emotional support, and health care coverage) related to personal health care provider after predisposing characteristics are accounted for? If so, to what extent?
- c) Are perceived health needs (general health status, physical health, and mental health) related to personal health care provider after

predisposing characteristics and enabling resources are accounted for?

If so, to what extent?

- d) Are evaluated health needs (diabetes, asthma, heart attack, coronary heart disease, and stroke) related to personal health care provider after predisposing characteristics, enabling resources, and perceived health needs are accounted for? If so, to what extent?

3) Routine Physical Checkup

- a) Are predisposing characteristics (sex, age, race, marital status, and education level) related to routine physical checkup? If so, to what extent?
- b) Are enabling resources (annual household income, social and emotional support, and health care coverage) related to routine physical checkup after predisposing characteristics are accounted for? If so, to what extent?
- c) Are perceived health needs (general health status, physical health, and mental health) related to routine physical checkup after predisposing characteristics and enabling resources are accounted for? If so, to what extent?
- d) Are evaluated health needs (diabetes, asthma, heart attack, coronary heart disease, and stroke) related to routine physical checkup after predisposing characteristics, enabling resources, and perceived health needs are accounted for? If so, to what extent?

*Data Set of the Study*

The Behavioral Risk Factor Surveillance System (BRFSS) is a collaborative project of the CDC and all U.S. states and territories. State health departments conduct the cross-sectional telephone survey monthly in accordance with a protocol with technical and methodological assistance from the CDC, and each state submits monthly collected surveillance data to CDC for editing and summary updates (CDC, 2003). At the end of a year, CDC's Behavioral Surveillance Branch (BSB) and states publish analyses of data (CDC, 2003). BSB is involved in a yearly distribution of nationwide summaries of state-specific risk-factor prevalence estimates and state-specific response rates, as well as risk-factor prevalence estimates for statewide core and optional module data and state-specific, standard cross-tabulations of responses (CDC, 2006a).

Since 1984, the BRFSS has collected information on health conditions and behavioral risk factors mainly related to chronic disease and injury in the adult population age 18 years and older (CDC, n.d.d). More specifically, this annual national surveillance system examines health status, health conditions, health risk behaviors, as well as preventative health practices and access to health care. In 1984, only 15 states participated in collecting the surveillance data, but all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam have participated in this surveillance system since 2001 (CDC, n.d.d).

In this cross-sectional national survey, the information is collected through random-digit telephone interview of civilian non-institutionalized adults using computer-assisted telephone interviewing. The BRFSS uses a probability sample of all households with a telephone, and one adult per household is recruited. But the BRFSS does not employ a proxy respondent in telephone interviews. These types of household



are considered negligible in the BRFSS: group homes, institutions, and homes in which household members do not live for more than 30 days per year (CDC, 2006a).

Telephone numbers used to conduct the survey are provided to each state by CDC, which purchases the telephone numbers from a database company (CDC, 2003). In the database, the sampling frame used for the BRFSS is ensured to have a non-zero probability of being selected (CDC, 2003). For managing quality of the BRFSS, each state needs to submit to CDC a record for all telephone numbers actually called by the data collector, and the telephone numbers not used for the survey since they were pre-identified as non-working or business by the sample provider (CDC, 2003). In addition, when states submit complete or incomplete data record to BSB, since data year 2003 the following information must be included, as applicable, for quality assurance studies, data weighting, and analyses of sample quality: the number of sample records selected from a stratum by the sample provider, the number of telephone numbers in the stratum from which the sample was selected, annual sequence number, replicate number, replicate depth, number of attempts, precalling identification status, and density strata (CDC, 2003).

Regarding a sampling design, the BRFSS employs a disproportionate stratified random sampling since the 2003 data year. That is, the BRFSS uses stratification by density of residential telephone numbers, which are divided into two strata: high-density and medium-density. Telephone numbers in the high-density stratum are oversampled (CDC, 2006a). Aside from the density strata, some states have geographic strata. In the BRFSS for 2006, all U.S. states and territories employed a disproportionate stratified sample design except for Puerto Rico and the U.S. Virgin Islands, which used a simple

random sample design (CDC, n.d.d). In 2006, Guam did not participate in the data collection (CDC, n.d.c).

When it comes to the BRFSS questionnaire, it consists of three parts: core component section, optional modules, and state-added questions. The questionnaire is annually constructed through the collaboration of CDC and states. More specifically, program representatives from National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP) and other parts of CDC propose additional and emerging BRFSS questions for the core component and optional modules to BSB, and states provide their input and feedback on the proposed content (CDC, 2006a). All states and territories must ask core questions in the core component section in its entirety, without modification. However, states and territories can ask any, all, or none of the optional modules and state-added questions only after the core questions are asked (CDC, 2006a). The optional modules consist of several units of standardized questions on specific topics, which states can include in their questionnaire. If a module chosen is not used in its entirety or modified in any way, those questions are considered state-added questions (CDC, 2006a). In this study, only core questions were employed.

For the quality of the BRFSS data sets, many studies demonstrate that the BRFSS data sets are reliable and valid. Nelson, Holtzman, Bolen, Stanwyck, and Mack (2001) comprehensively review and summarize more than 200 studies on reliability and validity of measures on the BRFSS. They conclude that the BRFSS measures, including those in the core component section, are of moderate to high reliability and validity.

In addition, the BRFSS measures respondents' perceived health status: general health status, physical health, mental health, and usual activity limitation. The last three

aspects of health are examined through health-related quality of life measures (HRQoL). These HRQoL questions are valid and reliable (Andresen, Catlin, Wyrwich, & Jackson-Thompson, 2003; CDC, 2000; Ware, Kosinski, & Keller, 1996). Andresen et al. (2003) show that the HRQoL measures are moderate to excellent for retest reliability. Moreover, Andresen, Vahle, and Lollar (2001) investigate proxy reliability by using the HRQoL measures for individuals with disabilities. They caution against the use of proxies for HRQoL based on the findings that proxies overestimated impairments of people with disabilities and underestimated HRQoL for the individuals with disabilities. This finding is consistent with other studies that proxy respondents overreport disability (Andresen, Fitch, McLendon, & Meyers, 2000) and functional limitations (Magaziner, Simonsick, Kashner, & Hebel, 1988; Weinberger, Samsa, Schmader, Greenberg, Carr, & Wildman, 1992). As indicated previously, the BRFSS does not employ proxy respondents.

Furthermore, Nelson, Powell-Griner, Town and Kovar (2003) show that the BRFSS provides national estimates generally comparable to those of NHIS, and, as a result, they conclude that the BRFSS could be readily available for informing national policy makers. Finally, Kinne and Topolski (2005) demonstrate that people with disabilities are not underrepresented in population telephone surveys including the BRFSS. These various studies illustrate that the BRFSS is an appropriate data set to investigate health disparities between older people with and without disabilities.

#### *Analysis of Complex Survey Data*

As indicated in the previous section, the BRFSS has a disproportionate stratified sampling design. For the appropriate analysis, understanding of design features of

complex surveys is essential. Therefore, design features of the BRFSS and their associated issues in the analysis are addressed in this section. This also is necessary for effective discussion about data analysis and its procedure in the following sections.

In the BRFSS, residential telephone numbers are divided into two strata: high-density and medium-density. The telephone numbers in the two strata are sampled disproportionately, and the numbers in the high-density stratum are oversampled (CDC, 2006a). This complex survey design in the BRFSS warrants special attention to the analysis of the data set. Because most general statistical software packages assume simple random sampling and, as a result, do not take into account complex survey sampling design, analysis of complex survey data necessitates specialized statistical software (Brogan, 2005; Graubard & Korn, 1996; LaVange, Stearns, Lafata, Koch, & Shah, 1996; Lee & Forthofer, 2006).

Simple random sampling assumed in most statistics textbooks and standard statistical software packages does not appropriately deal with complex survey data primarily due to the following reasons: 1) unequal probabilities of selection, 2) clustering of observations, 3) stratification, and 4) nonresponse and other adjustments (Brogan, 2005). That is, design features of complex survey and weighting adjustment need to be taken into consideration in the analysis of complex survey data (Graubard & Korn, 1996; Lee & Forthofer, 2006). This indicates that most standard statistical software packages do not appropriately take into account in the analysis process the complex sampling design and weighting, including poststratification, used in the BRFSS.

Despite its sophisticated sampling design, complex surveys still have several sources of survey error, such as nonresponse error, noncoverage error, sampling error, or

measurement error. Of the survey errors, noncoverage error and nonresponse error are focused on in this section due to the significance of their implications to data analysis. Weights are assigned to the responding units in order to compensate for the following factors: unequal selection probabilities, unit nonresponse, or noncoverage (Brogan, 2004; Sturgis, 2004). In the BRFSS, weighting is used to reduce or eliminate bias in the sample. Specifically, weighting is employed in order to increase generalizability of the findings to the population by accounting for nonresponse and noncoverage errors, and adjusting for such demographic variables as age, race, and sex between the BRFSS sample and the population (CDC, 2006a). In the BRFSS, data are directly weighted for these factors: the probability of selection of a telephone number, the number of adults in a household, and the number of residential telephones in a household (CDC, 2006a). In addition, nonresponse and noncoverage of households without telephones are accounted for through poststratification adjustment (CDC, n.d.a).

Biemer and Lyberg (2003) indicate that weighting needs to be used to adjust for unequal selection of observations, but that weighting is also used to adjust for nonresponse and frame noncoverage. Calculating weighting in the complex survey is complex and demanding when various factors are taken into consideration to obtain the final weight. In the BRFSS, a final weight for a state's data is gained by multiplying weights for all relevant factors, and the computational formula for the final weight is as follows:  $FINALWT = GEOWT * DENWT * (1/NPH) * NAD * CSA * POSTSTR$  (CDC, n.d.b).

In the formula, FINALWT indicates the final weight assigned to each respondent, and when a factor does not apply, one is set to its value. Whilst GEOWT adjusts for

different probability of selection among geographic regions of a state, DENWT adjusts for different probability of selection between a high density stratum and a medium density stratum. Also, NPH denotes the number of residential telephone numbers in the respondent's house, and NAD indicates the number of adults in the respondent's household. CSA is "the ratio of the expected cluster size to the actual cluster size" (CDC, n.d.b). Lastly, POSTSTR denotes poststratification, which is used to adjust for age, sex, and race distribution and noncoverage and nonresponse. The formula for the final weight shows that for enhancing generalizability of the findings to the entire population, the BRFSS employs weighting to adjust for variation in selection and sampling probability, as well as such demographic factors as age, race, and sex.

Weighted analyses are necessary in order to gain unbiased or nearly unbiased estimates of population parameters with complex survey data (e.g., Brogan, 2004; Korn & Graubard, 1995; Lee & Forthofer, 2006). Brogan (2004, 2005) demonstrates that general standard statistical software packages provide biased point estimates of population parameters in an unweighted analysis, or underestimation of standard errors for point estimates in a weighted analysis. It should be noted that using most standard statistical packages with weighted variables in the analysis yields correct point estimates, but the packages still do not provide correct estimated standard error because sampling design features of complex survey, such as stratification, or clustering, are not typically taken into account in the variance estimation procedure (Brogan, 2005; Lee & Forthofer, 2006).

In sum, unweighted analysis in most standard statistical software packages yields biased point estimates of parameters, whereas weighted analysis in the packages provides

underestimation of standard errors for point estimates due to complex survey design, such as unequal probabilities of selection of elements, clustering, stratification, or unit nonresponse. This indicates that for gaining unbiased point estimates of population parameters and correct standard error for point estimates, analyses of complex survey data must be conducted with specialized statistical software, taking complex sampling design into account (Brogan, 2004, 2005; Graubard & Korn, 1996; Lee & Forthofer, 2006).

Brogan (2004) indicates that variance estimation is important for precision of estimators, as well as for correct confidence intervals for and hypotheses testing about population parameters. Although there are various approaches to approximating the estimated variance, Taylor series linearization and replication techniques are most frequently used (Brogan, 2004; Lee & Forthofer, 2006). Taylor series linearization is designed to gain an approximation to a nonlinear estimator, which is linearized using a Taylor series expansion (Brick, Morganstein, & Valliant, 2000; Lee & Forthofer, 2006). Standard sample survey variance estimation methods are then used to estimate the variance of this linear approximation (Brick et al., 2000; Rust, 1985). There are various replication methods, such as Balanced Repeated Replication, Jackknife Repeated Replication, or Bootstrap. But these methods have a common basic idea: to take multiple pseudo subsamples from an entire sample and estimate the variability across the replicate subsamples (Brick et al., 2000; Lee & Forthofer, 2006). Brick et al. (2000) show an array of advantages of the replication methods, which include but are not limited to: intuitively easy understanding of the method, a sound theoretical basis, inclusion of survey design information in replicate weights, and reflecting adjustment and estimation

methods. Ignoring complex sampling design and estimation methods in complex survey analysis will lead to incorrect confidence intervals and statistical tests (Brick et al., 2000).

To appropriately take into account the complex sampling design of the BRFSS, this study employed SAS 9.1.3, SUDAAN 9.0.3, and IVEware. First, SAS 9.1.3 (SAS Institute, Inc, Cary, NC) was used due to its prevalence in the data management and its PROCs for complex survey data analysis. SAS 9.1.3 was used in the exploratory analysis, and Taylor series linearization is used in SAS 9.1.3 for variance estimation. Second, SAS-callable SUDAAN 9.0.3 (Research Triangle Institute, Triangle Park, NC) was used to properly analyze five multiply imputed data sets, as well as to analyze subpopulations of focus in a convenient and appropriate way. Taylor series linearization and replication methods such as BRR and Jackknife are available for variance estimation in SUDAAN. For this study, Taylor series linearization was employed.

Third, IVEware developed by the Survey Methodology Program at the Institute of Social Research of the University of Michigan is a SAS callable software application built on the SAS Macro Language (Raghunathan, Solenberger, & Van Hoewyk, 2002). IVEware has a multiple imputation feature for dealing with missing data. IVEware uses a multivariate sequential regression approach for imputing values of missing items, and the software can deal with various types of variables—continuous, binary, multi-categorical, count, and mixed—in complex survey (Raghunathan, 2004; Raghunathan, Lepkowski, Van Hoewyk, & Solenberger, 2001; Raghunathan et al., 2002). Although a variety of ways is available to deal with missing data, two approaches are considered appropriate: maximum likelihood (ML) and multiple imputation (MI) (Collins, Schafer,



& Kam, 2001; Fichman & Cummings, 2003; Little & Rubin, 1989; Schafer & Graham, 2002). The two approaches present comparable results, but MI has several benefits. MI is more robust to the violation of model assumptions (Allison, 2000; King, Honaker, Joseph, & Scheve, 2001; Schafer, 1997). Also, additional variables that are not included in the analysis can be used in the imputation process of MI (Schafer & Graham, 2002). In contrast, ML requires analysts to have an explicit and correct model for analyses, and use the same variables in the imputation and analysis process (Fichman & Cummings, 2003; Schafer & Graham, 2002). Furthermore, IVEware was used to deal with missing data in national public-use data sets, such as the NHIS or the National Health and Nutrition Examination Survey (NHANES) (Parker & Schenker, 2007; NCHS, 2001; Schenker, Raghunathan, Chiu, Makuc, Zhang, & Cohen, 2006). Given the various functions of IVEware and the benefits of MI, this study employed IVEware to multiply impute missing data.

### *Procedures*

Although discussion in this section focuses on processes up to multiple imputation of missing data, it should be noted that these procedures are not mutually exclusive. They are divided merely for the convenience of discussion. The analyses employed are addressed in a data analysis section.

### *Exploratory Data Analysis*

As a first step of data analysis, an exploratory data analysis was conducted. This exploratory data analysis was necessary to make sure if the data set was appropriate for data analyses planned (Lee & Forthofer, 2006). The basic distribution and summary statistics of key variables were explored to check for unusual values or missing cases.

In addition, it was examined whether sample sizes were large enough for analyses planned and some categories of key values needed collapsing. It was also examined whether the sufficient number of observations was available in various subgroups.

Further, demographic distributions in the analytic data set were checked for reasonableness, compared to official census estimates. According to the Census Bureau (2008), the number of older people age 65 and older was estimated at 37.3 million on July 1, 2006. In contrast, the BRFSS for 2006 has an estimate of 38 million for older people. This indicates that the BRFSS's estimates for the older people are reasonable.

While the BRFSS for 2006 has 355,710 cases, the data set has 92,808 cases for older people age 65 and older. The number of older people was further decreased to 91,005 after only 50 states and the District of Columbia were targeted in this study. As a result, a total of 91,005 cases were focused on for all data analyses. However, it is important to note that the entire data set was employed in all statistical analyses after giving weight of zero to data outside the analytic domain of interest.

### *Re-coding*

Re-coding was carried out prior to data analyses to enhance the quality and ease of the data analyses. All questions of interest in the BRFSS include these two answers: 'Don't know/Not Sure' and 'Refused'. In this study, these answers were treated as missing data to avoid distorted results in statistical analyses (NCHS, 2008). In addition, given the exploratory data analyses, some variables in the data set were re-coded or re-categorized for the convenience of analyses, which is further described in the criterion and predictor variables section.

### *Missing Data*

Weighting and imputation are two primary methods to adjust for nonresponse (Biemer & Lyberg, 2003). Weighting is used to adjust for unequal selection of observations and compensate for nonresponse and noncoverage. In this study, weighting was taken into consideration by incorporating the design feature of the BRFSS in the data analyses.

Regarding imputation, many imputation methods are available to compensate for the bias of item nonresponse (Kalton, 1983). It is not rare that empirical social science researchers encounter missing data or incomplete data in their research. In fact, missing data or incomplete data are a pervasive problem in most empirical social science research. There is a variety of imputation methods, which includes but is not limited to: hot deck imputation, nearest-neighbor imputation, direct modeling, missing-indicator method, mean or median imputation, single imputation of unconditional and conditional mean, and multiple imputation (Biemer & Lyberg, 2003; Van der Heijden, Donders, & Moons, 2006; Zhou, Eckert, & Tierney, 2001). These methods use auxiliary information obtained from other items to fill in values for missing data (Kalton, 1983). For item nonresponse, a MI technique was employed through IVEware to take care of missing data in this study.

Allison (2002) indicates that MI can be used with almost any kind of data and model to deal with missing data. When the data are missing at random, appropriate use of MI yields estimates consistent and asymptotically efficient and normal (Allison, 2002). MI has been shown to be effective for handling missing data in real studies, real study-based simulations, or simulations (e.g., Barnard & Meng, 1999; Clogg, Rubin, Schenker, Schultz, & Weidman, 1991; Harper, Lynch, Hsu, Everson, Hillemeier, Raghunathan,

Salonen, & Kaplan, 2002; Rubin, Stern, & Vehovar, 1995; Taylor, Cooper, Wei, Sarma, Raghunathan, & Heeringa, 2002; van Buuren, Boshuizen, & Knook, 1999; van der Heijden et al., 2006; Yang, Lynch, Raghunathan, Kauhanen, Salonen, & Kaplan, 2007; Zhou et al., 2001). Further, MI has been used in national public-use data sets, such as the NHIS or the NHANES, in which IVEware was used for MI for missing data (Parker & Schenker, 2007; NCHS, 2001; Schenker et al., 2006).

Rubin (1996) indicates that when complex patterns of nonresponse exist in survey data, which is oftentimes true in complex surveys, MI is more flexible in the analysis, compared to replication and reweighting. In MI, missing data are filled in using nonmissing observed data. The values of the missing data are drawn from a distribution that is obtained from conditional relation of the imputed variable to other non-missing variables, that is, conditioned on all observed variables (Raghunathan et al., 2001; Taylor et al., 2002). To create multiple complete data sets, the process of drawing the values is iteratively repeated multiple times. After imputation, each complete data set that was created through the repeated imputed process is analyzed separately (Raghunathan, 2004). Based on the results combined, statistical inferences about quantities of interest—measures of association or summary statistics—are made (Taylor et al., 2002).

National Center for Health Statistics (2008) suggests that, as a general rule, 10 percent or less for missing data in a variable from an analytic data set could be acceptable to continue an analysis without further adjustment or evaluation. Among variables of interest in this study, an annual household income had the greatest percentage of missing cases of 22.5 percent. All other variables of interest showed less than five weighted percent for missing data except for a social and emotional support variable with 7.5

percent for missing data. However, it is challenging to decide what percent of missing data is acceptable since a small percent of missing cases in each variable can add up to a considerable amount in regression analyses. Therefore, all missing data in variables of interest were imputed in this study.

According to Little and Raghunathan (1997), MI theory require that all available variables related to missing data should be included in imputations. In this study, as many auxiliary variables as possible relative to missing data focusing more on annual household income were employed in the imputation process for better imputation results. Specifically, 44 variables including criterion and predictor variables were employed in the imputation for missing cases. In addition, some design-based variables were included in the imputation process in order to lessen the risk of mis-specifying an imputation model and better account for the complex sampling design of the BRFSS (Reiter, Raghunathan, & Kinney, 2006). Further, in the imputation process, the entire data set was used rather than a subset of older people to increase any likelihood of obtaining better imputation results. Five multiply imputed data sets were obtained through ten iterations for each data set by IVEware. The literature shows that five sets of imputed data sets and ten iterations are appropriate for most imputation unless the amount of missing data is extreme (Pedlow, Luke, & Blumberg, 2007; Raghunathan et al., 2002; Schafer, 1999).

Table 3.1 presents the distribution of respondents' health care access and its determinant variables for both the imputed data used in analysis and the un-imputed data, as well as frequencies of missing data in the un-imputed data. For the distribution of the imputed data sets, a separate analysis of each imputed data set was combined for five data

sets through SUDAAN. In Table 3.1, it is illustrated that the imputation process did not have a significant impact on the distribution of the data set. The distribution of the imputed data sets is considerably identical to the un-imputed data set except for annual household income. The income variable showed differences from 1.6 percent to 7.3 percent in its distribution before and after imputation. These differences could be attributed to a significant portion of missing data, 22.5 percent, in the variable before imputation. The examination of the distribution of the variable in multiply imputed data sets indicates that many poor or affluent interviewees did not respond to the income question. In particular, through the imputation process, weighted percentage increased by 4.6 and 7.3 for a '\$15,000 to less than \$25,000' and a '\$50,000 or more' category, respectively.

Table 3.1. Distribution of Access to Health Care and its Determinants by Imputed and Un-imputed Data in 91,005 Older People Age 65 and Older from the BRFSS for 2006

	Imputed Data		Un-imputed Data		No. Missing	%
	No.	%	No.	%		
Sex					0	0
Male	32,243	41.9	32,243	41.9		
Female	58,762	58.1	58,762	58.1		
Age					0	0
65 to 74	48,885	51.7	48,885	51.7		
75 to 99	42,120	48.3	42,120	48.3		
Race					1,332	1.5
Non-Hispanic White	78,837	81.3	77,990	81.6		
Non-Hispanic African American	5,373	7.7	5,287	7.7		
Hispanic	2,864	6.2	2,755	6.2		
Other race or multiracial	3,931	4.8	3,641	4.5		
Marital					268	0.3
Married	41,245	56.8	41,144	56.9		

Table 3.1 (cont'd).						
Divorced/widowed/separated	45,790	39.3	45,671	39.3		
Never married or a member of an unmarried couple	3,970	3.8	3,922	3.8		
Education Level					367	0.4
Less than high school	14,946	16.4	14,941	16.5		
High school or GED	32,995	34.9	32,883	34.9		
Some college or technical school	21,061	22.5	20,924	22.5		
More than college	22,003	26.2	21,890	26.1		
Annual Household Income					20,453	22.5
Less than \$15,000	13,428	12.6	13,168	15.8		
\$15,000 to less than \$25,000	20,660	21.5	19,443	26.1		
\$25,000 to less than \$35,000	14,591	15.5	12,467	17.1		
\$35,000 or more	16,546	18.5	11,048	16.4		
\$50,000 or more	25,779	31.9	14,426	24.6		
Social and Emotional Support					6,840	7.5
Usually or always	71,739	79.0	65,949	78.5		
Sometimes	8,636	9.2	8,085	9.4		
Rarely or never	10,630	11.8	10,131	12.2		
Health Care Coverage					235	0.3
Yes	89,230	98.0	89,023	98.1		
No	1,775	2.0	1,747	1.9		
General Health Status					633	0.7
Good and better	65,298	71.4	64,688	71.2		
Fair and poor	25,707	28.7	25,684	28.8		
Physical Health					3,787	4.2
0 day	55,879	60.3	54,556	61.3		
1 day to 14 days	19,671	22.9	17,570	21.7		
15 days to 30 days	15,454	16.8	15,092	17.0		
Mental Health					2,512	2.8
0 day	74,211	81.2	72,206	81.2		
1 day to 14 days	11,200	12.7	10,788	12.6		
15 days to 30 days	5,594	6.1	5,499	6.2		
Diabetes					116	0.1
Yes	16,087	18.7	16,071	18.7		
No	74,918	81.3	74,818	81.3		
Asthma					311	0.3
Yes	10,089	10.9	10,056	10.9		
No	80,916	89.1	80,638	89.1		
Heart Attack					794	0.9
Yes	12,169	14.0	12,062	14.0		
No	78,836	86.0	78,149	86.0		
Coronary Heart Disease					1,739	1.9
Yes	12,589	14.6	12,178	14.5		
No	78,416	85.4	77,088	85.5		
Stroke					387	0.4

Table 3.1 (cont'd).						
Yes	7,704	8.4	7,694	8.4		
No	83,301	91.6	82,924	91.6		
A Cost Barrier to Health Care					288	0.3
Yes	3,882	4.3	3,858	4.3		
No	87,123	95.7	86,858	95.7		
A Personal Health Care Provider					289	0.3
Yes, only one	75,401	83.0	75,161	83.0		
More than one	10,112	11.3	10,082	11.4		
No	5,492	5.6	5,473	5.6		
A Routine Physical Checkup					1,559	1.7
Within past 2 year	83,218	92.3	81,882	92.4		
2 years to less than 5 years ago	3,358	3.5	3,248	3.4		
More than 5 years or never	4,429	4.2	4,316	4.1		

### *Criterion and Predictor Variables*

In this study, health disparities between older people with and without disabilities were investigated in access to health care. Older people with disabilities were defined through the following processes. First, any individual who was 65 years old or over was considered an older person in this study. Second, the BRFSS employs the following two questions to find whether a respondent has a disability or not: 1) “Are you limited in any way in any activities because of physical, mental, or emotional problems?”; and 2) “Do you now have any health problem that requires you to use special equipment, such as a cane, a wheelchair, a special bed, or a special telephone? Include occasional use or use in certain circumstances” (CDC, 2006b, p. 10). A person who answers yes to either question is defined as an individual with a disability in the BRFSS. In sum, older people with disabilities were defined in this study as follows: people age 65 and older who answered yes to either question of the two disability questions. In this study, dependent variables are referred to as criterion variables, and independent variables as predictor variables for clarity. Criterion and predictor variables in this study are



illustrated in Table 3.2, followed by detailed discussion on each variable.

Table 3.2. Criterion and Predictor Variables

Criterion and Predictor Variables		BRFSS Variables
Criterion Variables		Cost Barrier to Health Care Personal Health Care Provider Routine Physical Checkup
Predictor Variables	Predisposing Characteristics	Sex Age Race Marital Status Education Level
	Enabling Resources	Annual Household Income Social and Emotional Support Health Care Coverage
	Perceived Health Needs	General Health Status Physical Health Mental Health
	Evaluated Health Needs	Diabetes Asthma Heart Attack Coronary Heart Disease Stroke

### *Criterion Variables*

The BRFSS examines access to health care in the four parts: 1) health care coverage, 2) a cost barrier to health care, 3) a personal health care provider, and 4) a routine physical checkup. However, given that the target group of this study was older people age 65 and older, and that a huge majority of the population in the US is covered by Medicare, this study did not include health care coverage in the examination of access to health care. As a result, the remaining three parts were focused on as criterion variables in this study. The questions of the three parts employed in the BRFSS are as follows (CDC, 2006b):

- a. A cost barrier to health care: “Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?” (p. 6).
- b. A personal health care provider: “Do you have one person you think of as your personal doctor or health care provider?” (p. 6).
- c. A routine physical checkup: “About how long has it been since you last visited a doctor for a routine checkup? A routine checkup is a general physical exam, not an exam for a specific injury, illness, or condition.” (p. 7).

These three parts were examined to see whether there were significant differences between older people with and without disabilities. Determinants of health disparities in access to health care were investigated in the same parts. While a cost barrier to health care had a binary answer of yes or no, a personal health care provider and a routine physical checkup had multiple answers. For a personal health care provider, this study had three categories for the answers: 1) yes, only one; 2) more than one; and 3) no. For a routine physical checkup, the BRFSS uses the following answers: 1) within past year (anytime less than 12 months ago); 2) within past 2 years (1 year but less than 2 years ago); 3) within past 5 years (2 years but less than 5 years ago); 4) 5 or more years ago; and 5) never. This study grouped them into three categories: 1) within past 2 years; 2) 2 years to less than 5 years ago; and 3) more than 5 years or never.

### *Predictor Variables*

For effectively investigating contributors to health disparities between older people with disabilities and older people without disabilities, a wide range of potential determinants was investigated in this study.

### Predisposing Characteristics

The following predisposing characteristics were examined for determinants of health disparities: sex, age, race, marital status, and education level. Age is measured in years up to 99 in the BRFSS. This study targeted older people age 65 and older. In order to better examine the impacts of age on the health disparities, age was divided into two categories: one category of people age 65 to 74 years and the other category of people age 75 and older. According to a recent study by Kamimoto, Easton, Maurice, Husten, and Macera (1999), people age 75 and older had the least physical activity. Given that physical activity can be indicative of and associated with various health issues, the division of older people was made.

The BRFSS measures race with these three questions (CDC, 2006b). First, the BRFSS asks respondents if they are Hispanic or Latino: “Are you Hispanic or Latino?” (p. 11). Second, the BRFSS measures the respondents’ multiple races by allowing them to choosing all categories that apply to them: “Which one or more of the following would you say is your race?” (p. 11). Third, the BRFSS asks what race the respondents think they belong to through this question: “Which one of these groups would you say best represents your race?” (p. 12). Respondents are provided the following categories for the last two questions: White; Black or African American; Asian; Native Hawaiian or Other Pacific Islander; American Indian or Alaska Native; or other. Given the small percentage of other categories other than White, African American, and Hispanic, race was grouped in the following four categories in this study: 1) Non-Hispanic White; 2) Non-Hispanic African American; 3) Hispanic; 4) Non-Hispanic Other Race or Multiracial.

Given that this study targeted older people age 65 and older, marital status was collapsed into three categories: 1) married; 2) divorced/widowed/separated; and 3) never married or a member of an unmarried couple. While an “a member of an unmarried couple” category presented the small weighted percent of 0.56, a “never married couple” category showed 3.25 for weighted percent. As a result, the two categories were merged into one category.

Regarding education level, the BRFSS collects information from respondents the highest grade or year of school they completed. In this study, education level was re-coded into four categories: 1) less than high school (up to grade 11); 2) high school graduates (grade 12 or GED); 3) some college or technical school (some college or technical school); and 4) college graduate (college 4 years or more).

#### Enabling Resources

According to the poverty threshold 2006 of the Census Bureau (DeNavas-Walt, Proctor, & Smith, 2007), when there are no related children under 18 years old, \$9,669 was the poverty threshold for one person age 65 and older. If there is one related child under 18 years old, and the size of family unit is two, the poverty threshold was \$12,186 for householder 65 years and older. In addition, the median income of households with householders age 65 and over was estimated at \$27,798 (DeNavas-Walt et al., 2007). Given the information, the annual household income from all sources was grouped into three categories in this study: 1) less than \$15,000; 2) \$15,000 to less than \$25,000; 3) \$25,000 to less than \$35,000; 4) \$35,000 to less than \$50,000; and 5) \$50,000 or more.

For social and emotional support, the BRFSS uses this question (CDC, 2006b): “How often do you get the social and emotional support you need?” (p. 26). The

respondents are provided the following answers: Always, Usually, Sometimes, Rarely, or Never. This study regrouped the questions into three categories: Usually or always; Sometimes; and Rarely or Never.

Finally, health care coverage, this question is employed in the BRFSS (CDC, 2006b): “Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?” (p. 6). The answers to the question were dichotomized into Yes or No.

### Health Needs

#### Perceived Health Needs

In the BRFSS, health status is measured through self-rated health—excellent, very good, good, fair, or poor. Health status is also measured through the number of healthy days in terms of physical health, mental health, and limitations in usual activities such as self-care, work, or recreation in the BRFSS. Thus, the BRFSS uses healthy days methods to measure health-related quality of life (HRQoL), and the healthy days are measured during the recent 30 days (CDC, 2000). The following questions are used in the BRFSS to measure health status (CDC, 2006b):

- a. Self-rated health: “Would you say that in general your health is—“ (p. 5).
- b. Physical health: “Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?” (p. 5).
- c. Mental health: “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” (p. 6).

d. Usual activity limitation: “During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?” (p. 6).

This study employed general health status, physical health, and mental health for perceived health needs. Self-rated general health status was dichotomized into 1) Good and Better, and 2) Fair and Poor. For physical health and mental health, the number of healthy days for each health was grouped into three subsets: 1) 0 day, 2) 1 day to 14 days, and 3) 15 days to 30 days.

#### *Evaluated Health Needs*

This study used the following chronic diseases for evaluated health needs: diabetes, asthma, and cardiovascular diseases (a heart attack, coronary heart disease, and a stroke), which are the only available chronic illnesses in the BRFSS. Since prostate cancer is a gender-specific illness, it was not included in this study. Except for diabetes, respondents in the BRFSS are asked if they have ever been told by a doctor, nurse, or other health professional that they have the chronic diseases. The responses to these questions were categorized into Yes or No. For diabetes, respondents are asked if they have ever been told by a doctor that they have diabetes, and they are given the following answers: 1) Yes, 2) Yes, but female told only during pregnancy, 3) No, and 4) No, pre-diabetes or borderline diabetes. In this study, responses to the second to fourth answer were all re-categorized into No. That is, females who had diabetes only during pregnancy as well as people with pre-diabetes or borderline diabetes were not considered diabetics. As a result, this study used two categories for diabetes: Yes or No.

#### *Data Analyses*

This study was to investigate the existence and determinants of health disparities in access to health care among older people with disabilities. To better understand the health disparities, older population with and without disabilities was divided into two categories: a group age 65 to 74 and the other group age 75 and older. It is important to note that, in this study, the BRFSS data set for 2006 was not analyzed after dividing the whole data set into two discrete data sets depending on the status of disability and age—older people with disabilities and their counterparts without disabilities—in order to sustain the design effect of the survey. Instead, the entire data set was employed in all analyses and weights of zero were assigned for observations outside the analytic domain of interest. In this way, the design feature of the entire data set is maintained, which leads to correct estimation of variance (Lee & Forthofer, 2006).

To get a general picture of the health disparities in the U.S., this study employed the core component sections of the BRFSS questionnaire. Questions in the core component alone are required of all U.S. states and territories in the BRFSS. For analysis, data from only all 50 states and the District of Columbia were used because two U.S. territories—Puerto Rico and the U.S. Virgin Islands—can be considered to have their own unique culture and lifestyle, which may impact one's health conditions and health risk behaviors, including preventative health practices and access to health care. Guam did not collect any data in BRFSS for 2006.

While the BRFSS for 2006 has 355,710 cases, the data set has 92,808 cases for older people age 65 and older. The number of older people was further decreased to 91,005 after only 50 states and the District of Columbia were targeted in this study. As a result, a total of 91,005 cases were focused on for all data analyses. However, as

mentioned previously, the entire data set was employed in all statistical analyses after giving a weight of zero to data outside the analytic domain of interest.

Lastly, analyses of the data set were performed with a primary focus on a design-based approach in this study. Conversely, a model-based approach was minimally employed in the analyses because it was greatly challenging to find all variables relevant to a topic of this study and include them in the model (Lee & Forthofer, 2006).

Therefore, design features of the BRFSS and weighting were taken into consideration in all the analyses.

### *Statistical Analysis*

This study employed descriptive statistics, chi-square test, and logistic regression. Descriptive statistics (proportions for dichotomous or polychotomous variables) of the older population by disability status were done for predictor variables in predisposing characteristics, enabling resources, and health needs. Chi-square test was employed to examine whether differences between older people with and without disabilities were statistically significant. P-values of chi-square statistics are based on Wald chi-square in SUDAAN (RTI, 2004). Furthermore, logistic regression was employed to assess associations between criterion variables and predictor variables. A series of multivariate analyses using logistic regression were performed to investigate the extent of the impact of predictor variables on access to health care. For all analyses, the significance level of .05 and 95% confidence interval (CI) were employed.

For logistic regression, separate models were run in hierarchical stages in order to more effectively find the effects of the predictor variables on health care access. First, predisposing characteristics were entered in model 1. Second, enabling resources



variables were added to model 2. Regarding health care needs, the needs variables were divided into two subsets—perceived needs and evaluated needs—to more effectively investigate the impact of health needs on access to health care. As a result, perceived health needs variables were first entered in model 3, and evaluated health needs variables were then added to model 4.

### Logistic Regression

Logistic regression is similar to multiple regression in that logistic regression investigates association between one criterion variable and multiple predictor variables. In logistic regression, however, the relationship between one categorical criterion variable and a set of predictor variables is examined. The categorical criterion variable can be dichotomous, polychotomous, or ordinal. Two types of logistic regression were employed in this study. Binary logistic regression was used for one dichotomous categorical criterion variable whereas multinomial logistic regression for two multiple categorical criterion variables.

Binary logistic regression analysis is appropriate when criterion variables are dichotomous and predictor variables are continuous or categorical (Agresti & Finlay, 1997; Menard, 2002; Tabachnick & Fidell, 2001). Multinomial logistic regression is an extension of binary logistic regression in that a criterion variable in multinomial logistic regression has multiple categories instead of dichotomous categories. This study employed binary logistic regression in examining contributors to a cost barrier to health care whereas multiple logistic regression was used for a personal health care provider and a routine physical checkup.

The logic behind conducting and interpreting logistic regression analysis is

similar to that of multiple regression, which is used when the criterion variable is measured on an interval or ratio scale of measurement (Brace, Kemp, & Snelgar, 2000). While multiple regression uses Ordinary Least Squares (OLS) to estimate parameters from the sample data, logistic regression employs maximum likelihood estimation (Agresti & Finlay, 1997; Tabachnick & Fidell, 2001). In logistic regression analyses of complex survey data sets, however, maximum likelihood estimation should be modified due to a sample weight of each observation, and, therefore, an adjusted Wald test statistic was used instead of the likelihood ratio test (Hosmer & Lemeshow, 2000; Lee & Forthofer, 2006).

## CHAPTER 4

### RESULTS

This study had a two-fold purpose of investigating the following: 1) whether there are health disparities in access to health care between older people with disabilities and their counterparts without disabilities, and 2) to what extent predisposing characteristics, enabling resources, and perceived and evaluated health needs account for such disparities if the disparities exist. To address these purposes, this study employed chi-square test and logistic regression. Chi-square test was used to address the first purpose and logistic regression to address the second.

This chapter begins with descriptive statistics of characteristics of the two populations, followed by the findings of chi-square tests of the existence of the health disparities. Because significant differences between older people with and without disabilities were found, potential determinants of the disparities were explored. More specifically, logistic regression analyses were hierarchically performed to examine to what extent such disparities were accounted for by predisposing characteristics, enabling resources, and perceived and evaluated health needs. Results of the logistic regression analyses are described for the following criterion variables: cost barrier to health care, personal health care provider, and routine physical checkup.

#### *Characteristics of Older People with and without Disabilities in the Study*

Table 4.1 illustrates the distribution of predisposing characteristics, enabling resources, and perceived and evaluated health needs for these three groups: the entire sample, older people with disabilities, and older people without disabilities. Of the

entire sample for this study, who are 65 years old and over in 50 states and the District of Columbia, older people with disabilities accounted for 37.78 percent (SE = .33; 95% CI = 37.15 to 38.43). Given that the BRFSS is a national survey with a complex sampling design, percentages in this study hereinafter indicate weighted percent. The differences between older people with and without disabilities were considered statistically significant when confidence intervals between the two groups did not overlap, as well as when p-values were significant at the significance level of .05. For the confidence interval, this study took a conservative approach. As a result, when a confidence interval started from 1.0 or ended at 1.0, it was considered insignificant. In Table 4.1, significant differences between the two groups by disability status are presented in bold.

Table 4.1. Characteristics of Older People with and without Disabilities by Predictor Variables from the BRFSS for 2006

Predictor Variables	Entire Sample N=91,005 %* (SE) 95% CI	Disability N=35,133 %* (SE) 95% CI	No Disability N=55,872 %* (SE) 95% CI	p-value
<i>Predisposing Characteristics</i>				
Sex				< .001
<b>Male</b>	41.88 (0.33) 41.22, 42.54	<b>39.26</b> (0.54) 38.21, 40.32	<b>43.47</b> (0.43) 42.64, 44.30	
<b>Female</b>	58.12 (0.33) 57.46, 58.78	<b>60.74</b> (0.54) 59.68, 61.79	<b>56.53</b> (0.43) 55.70, 57.36	
Age				< .001
<b>65 to 74</b>	51.72 (0.34) 51.06, 52.38	<b>45.38</b> (0.54) 44.32, 46.45	<b>55.57</b> (0.43) 54.74, 56.40	
<b>75 to 99</b>	48.28 (0.34) 47.62, 48.94	<b>54.62</b> (0.54) 53.55, 55.68	<b>44.43</b> (0.43) 43.60, 45.26	
Race				< .007
Non-Hispanic White	81.28 (0.35) 80.59, 81.96	82.16 (0.55) 81.06, 83.21	80.75 (0.45) 79.85, 81.62	
Non-Hispanic African American	7.69 (0.20) 7.30, 8.10	8.03 (0.35) 7.37, 8.75	7.48 (0.25) 7.01, 7.99	

Table 4.1 (cont'd).

<b>Hispanic</b>	6.24 (0.28) 5.72, 6.81	<b>5.10</b> (0.41) 4.36, 5.96	<b>6.94</b> (0.37) 6.25, 7.70	
Other race or multiracial	4.78 (0.19) 4.42, 5.17	4.71 (0.28) 4.18, 5.29	4.83 (0.25) 4.35, 5.35	
Marital				< .001
<b>Married</b>	56.83 (0.33) 56.19, 57.47	<b>50.39</b> (0.55) 49.32, 51.47	<b>60.74</b> (0.41) 59.94, 61.53	
<b>Divorced / Widowed / Separated</b>	39.33 (0.32) 38.70, 39.95	<b>45.92</b> (0.54) 44.87, 46.99	<b>35.32</b> (0.39) 34.55, 36.09	
Never married or a member of an unmarried couple	3.84 (0.13) 3.59, 4.12	3.68 (0.20) 3.32, 4.08	3.94 (0.18) 3.60, 4.31	
Education Level				< .001
<b>Less than high school</b>	16.43 (0.27) 15.90, 16.97	<b>19.11</b> (0.48) 18.18, 20.08	<b>14.80</b> (0.33) 14.16, 15.45	
High school or GED	34.88 (0.31) 34.28, 35.48	33.86 (0.50) 32.88, 34.85	35.50 (0.39) 34.75, 36.27	
Some college or technical school	22.48 (0.28) 21.95, 23.03	22.98 (0.45) 22.12, 23.87	22.18 (0.35) 21.50, 22.88	
<b>College or more</b>	26.21 (0.31) 25.61, 26.82	<b>24.05</b> (0.46) 23.15, 24.97	<b>27.52</b> (0.41) 26.73, 28.32	
<i>Enabling Resources</i>				
Annual Household Income				< .001
<b>Less than \$15,000</b>	12.58 (0.22) 12.16, 13.03	<b>16.57</b> (0.40) 15.80, 17.37	<b>10.16</b> (0.26) 9.67, 10.69	
<b>\$15,000 to less than \$25,000</b>	21.51 (0.28) 20.97, 22.07	<b>23.68</b> (0.49) 22.73, 24.65	<b>20.20</b> (0.34) 19.54, 20.87	
<b>\$25,000 to less than \$35,000</b>	15.50 (0.23) 15.05, 15.97	15.50 (0.40) 14.72, 16.30	15.51 (0.29) 14.94, 16.09	
<b>\$35,000 to less than \$50,000</b>	18.53 (0.32) 17.89, 19.19	<b>16.72</b> (0.42) 15.90, 17.57	<b>19.63</b> (0.40) 18.84, 20.45	
<b>\$50,000 or more</b>	31.86 (0.39) 31.08, 32.66	<b>27.54</b> (0.51) 26.56, 28.54	<b>34.49</b> (0.49) 33.51, 35.49	
Social and Emotional Support				< .001
<b>Usually or always</b>	79.02 (0.28) 78.46, 79.56	<b>76.58</b> (0.47) 75.66, 77.48	<b>80.50</b> (0.35) 79.81, 81.18	
<b>Sometimes</b>	9.23 (0.19) 8.86, 9.62	<b>11.51</b> (0.35) 10.85, 12.21	<b>7.85</b> (0.23) 7.41, 8.31	
Rarely or never	11.75 (0.23) 11.31, 12.20	11.91 (0.36) 11.22, 12.63	11.65 (0.29) 11.09, 12.24	
Health Care Coverage				< .057
<b>Yes</b>	98.04 (0.10) 97.85, 98.22	98.27 (0.13) 97.99, 98.51	97.91 (0.13) 97.63, 98.15	
<b>No</b>	1.96 (0.10) 1.78, 2.15	1.73 (0.13) 1.49, 2.01	2.09 (0.13) 1.85, 2.37	

Table 4.1 (cont'd).  
*Perceived Health Needs*  
 General Health Status

				< .001
<b>Good and better</b>	71.35 (0.32) 70.71, 71.97	<b>51.05</b> (0.55) 49.97, 52.12	<b>83.67</b> (0.36) 82.95, 84.37	
<b>Fair and poor</b>	28.65 (0.32) 28.03, 29.29	<b>48.95</b> (0.55) 47.88, 50.03	<b>16.33</b> (0.36) 15.63, 17.05	
Physical Health				< .001
<b>0 day</b>	60.30 (0.34) 59.64, 60.96	<b>38.76</b> (0.53) 37.72, 39.81	<b>73.39</b> (0.40) 72.59, 74.17	
<b>1 day to 14 days</b>	22.94 (0.31) 22.35, 23.55	<b>27.45</b> (0.52) 26.44, 28.49	<b>20.21</b> (0.38) 19.48, 20.96	
<b>15 days to 30 days</b>	16.75 (0.25) 16.26, 17.26	<b>33.79</b> (0.53) 32.77, 34.83	<b>6.41</b> (0.21) 6.00, 6.83	
Mental Health				< .001
<b>0 day</b>	81.20 (0.28) 80.65, 81.73	<b>72.76</b> (0.52) 71.73, 73.77	<b>86.32</b> (0.31) 85.71, 86.19	
<b>1 day to 14 days</b>	12.71 (0.23) 12.27, 13.17	<b>16.54</b> (0.43) 15.73, 17.39	<b>10.39</b> (0.26) 9.88, 10.91	
<b>15 days to 30 days</b>	6.09 (0.18) 5.74, 6.46	<b>10.69</b> (0.39) 9.96, 11.48	<b>3.29</b> (0.17) 2.97, 3.65	
<i>Evaluated Health Needs</i>				
Diabetes				< .001
<b>Diabetes</b>	18.71 (0.27) 18.18, 19.26	<b>23.96</b> (0.48) 23.03, 24.92	<b>15.53</b> (0.33) 14.89, 16.19	
<b>No Diabetes</b>	81.29 (0.27) 80.74, 81.82	<b>76.04</b> (0.48) 75.08, 76.97	<b>84.47</b> (0.33) 83.81, 85.11	
Asthma				< .001
<b>Asthma</b>	10.86 (0.21) 10.45, 11.28	<b>15.83</b> (0.42) 15.03, 16.67	<b>7.84</b> (0.22) 7.41, 8.28	
<b>No Asthma</b>	89.14 (0.21) 88.72, 89.55	<b>84.17</b> (0.42) 83.33, 84.97	<b>92.16</b> (0.22) 91.72, 92.59	
Heart Attack				< .001
<b>Heart Attack</b>	14.01 (0.24) 13.55, 14.48	<b>19.97</b> (0.44) 19.11, 20.85	<b>10.39</b> (0.26) 9.88, 10.92	
<b>No Heart Attack</b>	85.99 (0.24) 85.52, 86.45	<b>80.03</b> (0.44) 79.15, 80.89	<b>89.61</b> (0.26) 89.08, 90.12	
Coronary Heart Disease				< .001
<b>Heart Disease</b>	14.62 (0.24) 14.16, 15.09	<b>21.33</b> (0.45) 20.46, 22.22	<b>10.55</b> (0.26) 10.05, 11.06	
<b>No Heart Disease</b>	85.38 (0.24) 84.91, 85.84	<b>78.67</b> (0.45) 77.78, 79.54	<b>89.45</b> (0.26) 88.94, 89.95	
Stroke				< .001
<b>Stroke</b>	8.42 (0.18) 8.08, 8.77	<b>13.58</b> (0.37) 12.88, 14.32	<b>5.29</b> (0.17) 4.97, 5.62	

Table 4.1 (cont'd).

<b>No Stroke</b>	91.58 (0.18)	<b>86.42</b> (0.37)	<b>94.71</b> (0.17)
	91.23, 91.92	85.68, 87.12	94.38, 95.03

\* Percentages were weighted.

### *Predisposing Characteristics*

As compared to their counterparts without disabilities, older people with disabilities were more likely to be female and older. In addition, older individuals with disabilities were less likely to be married. Further, a higher percentage of older individuals with disabilities were divorced, widowed, or separated. Regarding race, older individuals with disabilities were not statistically different from their counterparts with one exception, Hispanics. Older Hispanics were less likely to have disabilities. Regarding education level, older persons with disabilities had lower levels of education as compared to their counterparts. A higher proportion of older people with disabilities reported “less than high school” education, whereas older persons without disabilities were more likely to receive higher education, “College or more.”

### *Enabling Resources*

Older individuals without disabilities were more likely to have higher annual household income and to receive more timely social and emotional support. More specifically, as compared to their counterparts, a larger proportion of older persons with disabilities reported lower income, less than \$25,000. In contrast, older individuals without disabilities were more likely to receive higher income, \$35,000 or more. Regarding social and emotional support, a higher percentage of older people without disabilities were more likely to “usually or always” receive support when they needed it. In contrast, a higher proportion of older individuals with disabilities received social and emotional support “sometimes.” Regarding health care coverage, the two groups did

not show significant differences as anticipated. This result may be due in part to the virtually universal coverage of Medicare for older persons.

### *Health Needs*

Older people with disabilities showed significant differences in all categories of health needs compared to their counterparts without disabilities. Older individuals with disabilities showed poorer health conditions in perceived health needs. In particular, those with disabilities were considerably more likely to report their general health status as “fair or poor.” In addition, regarding physical health and mental health older individuals with disabilities reported significantly more unhealthy days. More considerable discrepancies were found between the two older populations in physical health than mental health. Older people without disabilities were almost twice as likely to report no unhealthy day for physical health within the past 30 days. In relation to evaluated health needs, older people with disabilities were more likely to have diabetes, asthma, heart attack, coronary heart disease, or stroke.

### *Existence of Disparities in Access to Health Care*

Chi-square tests were conducted to investigate the existence of disparities in access to health care between older people with and without disabilities. Such disparities were examined in each of these criterion variables: cost barrier to health care, personal health care provider, and routine physical checkup. To better investigate whether disabilities were associated with the health disparities, chi-square tests were conducted twice in each criterion variable. Differences in health disparities between the two groups were first investigated using disability status. Given high prevalence of disabilities among older people, the existence of the disparities was then examined



controlling for age.

The results of chi-Square tests are presented for the criterion variables by each test. As in the previous section of characteristics of older people with and without disabilities, differences between the two older groups were considered significant when p-values were significant at  $\alpha = .05$  and confidence intervals between the two groups did not overlap. When a confidence interval started from 1.0 or ended at 1.0, it was determined to be insignificant. Significant differences are shown in bold in the following tables.

#### *Cost Barrier to Health Care*

Table 4.2 illustrates that when compared to older individuals without disabilities, the counterparts with disabilities were more likely to experience cost barrier to health care. Thus, older people with disabilities were more likely to face a situation in which they could not see a doctor due to cost.

Table 4.2. Cost Barrier to Health Care between Older People with and without Disabilities

	No N = 87,123 %* (SE) CI	Yes N = 3,882 %* (SE) CI	$\chi^2$	df	p-value
Disability Status			103.43	1	< .001
Disability	<b>93.60</b> (0.30) 92.97, 94.17	<b>6.40</b> (0.30) 5.83, 7.03			
No Disability	<b>97.02</b> (0.14) 96.74, 97.28	<b>2.98</b> (0.14) 2.72, 3.26			

\* Percentages were weighted.

Table 4.3 shows that these differences between the two groups were still

significant after controlling for age. Therefore, older persons with and without disabilities were significantly different on cost barrier to health care even after taking age into account.

Table 4.3. Chi-Square Test for Disability Status and Cost Barrier to Health Care by Age

Age	$\chi^2$	df	p-value
<b>Total</b>	103.43	1	< .001
<b>65 to 74</b>	94.00	1	< .001
<b>&gt;= 75</b>	32.34	1	< .001

#### *Personal Health Care Provider*

As shown in Table 4.4, older people with disabilities were more likely than their counterparts to have more than one personal health care provider. On the other hand, a larger proportion of older individuals without disabilities had only one or no personal health care provider.

Table 4.4. Personal Health Care Provider between Older People with and without Disabilities

	No N=5,492 %* (SE) CI	Yes, only one N=75,401 %* (SE) CI	More than one N=10,112 %* (SE) CI	$\chi^2$	df	p-value
Disability Status				93.84	2	< .001
Disability	<b>4.07</b> (0.21) 3.67, 4.51	<b>81.22</b> (0.43) 80.37, 82.05	<b>14.70</b> (0.39) 13.96, 15.48			
No Disability	<b>6.58</b> (0.21) 6.18, 7.00	<b>84.13</b> (0.32) 83.50, 84.74	<b>9.29</b> (0.26) 8.80, 9.81			

\* Percentages are weighted.

In Table 4.5, another chi-square test controlling for age reveals that the differences between older people with and without disabilities are still significant. That is, the significant differences could not be accounted for by age.

Table 4.5. Chi-Square Test for Disability Status and Personal Health Care Provider by Age

Age	$\chi^2$	df	p-value
<b>Total</b>	93.84	2	< .001
<b>65 to 74</b>	42.39	2	< .001
<b>&gt;= 75</b>	46.57	2	< .001

#### *Routine Physical Checkup*

Significant differences in routine physical checkup between older individuals with disabilities and without disabilities are presented in Table 4.6. More specifically, older people who had disabilities were more likely to have routine physical checkup within less than 2 years. In contrast, a higher proportion of older persons without disabilities had their physical checkup more than 5 years ago or never had a checkup.

Table 4.6. Routine Physical Checkup between Older People with and without Disabilities

	>=5yrs or never N = 4,429 %* (SE) CI	2yrs to 5yrs ago N = 3,358 %* (SE) CI	< 2 yrs ago N = 83,218 %* (SE) CI	$\chi^2$	df	p-value
Disability Status				6.62	2	.001
Disability	<b>3.65</b> (0.20) 3.28, 4.06	3.26 (0.19) 2.90, 3.66	<b>93.09</b> (0.27) 92.54, 93.60			
No Disability	<b>4.52</b> (0.17) 4.19, 4.87	3.60 (0.15) 3.31, 3.92	<b>91.88</b> (0.23) 91.42, 92.31			

\* Percentages are weighted.

Table 4.7 illustrates the results of another chi-Square test which adjusted for age in order to further investigate the differences in routine physical checkup. After taking age into account, the differences between older people with and without disabilities age 75 and over were still significant. In contrast, controlling for age made the differences among older people age 65 to 74 insignificant. In sum, older individuals with and without disabilities had significant differences in routine physical checkup only for people age 75 and older.

Table 4.7. Chi-Square Test for Disability Status and Routine Physical Checkup by Age

Age	$\chi^2$	df	p-value
<b>Total</b>	6.62	2	.001
65 to 74	1.02	2	.361
<b>&gt;= 75</b>	4.99	2	.007

*Relationships of Predictor Variables with Health Disparities in Access to Health Care*

This study employed binary and multinomial logistic regression to examine whether predisposing characteristics, enabling resources, and perceived and evaluated health needs were associated with health disparities in cost barrier to health care, personal health care provider, and routine physical checkup. While binary logistic regression was used for cost barrier to health care, multinomial logistic regression was employed for personal health care provider and routine physical checkup. The significance decision was made using the same criteria as those for chi-square tests: significant p-values at  $\alpha = .05$  and confidence intervals without including 1.

For the logistic regression analyses, multivariate analyses were hierarchically run to better examine the impacts of the aforementioned predictor variables on each of the

criterion variables. For cost barrier to health care, model 1 started with predisposing characteristics variables. In subsequent models, other predictor variables were sequentially entered, and model 2 included enabling resources variables. Health care needs were investigated separately after being divided into perceived needs and evaluated needs. As a result, perceived health needs variables and evaluated health needs variables were respectively entered into model 3 and model 4. Thus, the final model included all the aforementioned predictor variables. This process was repeated for personal health care provider and routine physical checkup. It should be noted that odds ratios in all the models were adjusted for disability status.

In the following tables, odds ratios are presented for the three criterion variables by disability status and predictor variables. In tables for odds ratios by disability status, changes in odds ratios in each model are presented. Through these tables, to what extent predisposing characteristics, enabling resources, and perceived and evaluated health needs impacted criterion variables can be straightforwardly examined. In addition, other tables for odds ratios by all predictor variables are presented so that the impact of each predictor variable on each criterion variable could be examined. Since this study employed hierarchical multivariate analyses for logistic regression, this study presents adjusted odds ratios (AOR); in each model the extent of the effects of predictor variables on criterion variables was investigated controlling for potential contributions from other variables.

#### *Cost Barrier to Health Care*

Table 4.8 shows odds ratios by disability status in each model. This data presents the extent predisposing characteristics (model 1), enabling resources (model 2), perceived

health needs (model 3), and evaluated health needs (model 4) impacted cost barrier to health care. Table 4.9 illustrates whether each predictor variable was associated with the cost barrier and that, if so, to what extent it had an impact on the criterion variable. Moreover, the extent of the impacts of the predictor variables in each model and their changes across the four models was examined. Therefore, as per Table 4.9, each predictor variable's association with and its impact on the cost barrier was investigated.

Table 4.8. Odds ratios (95% CI) for Cost Barrier to Health Care by Disability Status from the BRFSS for 2006

	OR <sup>a</sup> (95% CI)	Model 1 AOR <sup>b</sup> (95% CI)	Model 2 AOR <sup>b</sup> (95% CI)	Model 3 AOR <sup>b</sup> (95% CI)	Model 4 AOR <sup>b</sup> (95% CI)
Disability					
Older PWD <sup>c</sup>	2.23* (1.95, 2.56)	2.21* (1.92, 2.54)	2.10* (1.81, 2.43)	1.52* (1.30, 1.77)	1.47* (1.25, 1.72)
Older PW/OD <sup>d</sup>	Reference	Reference	Reference	Reference	Reference

<sup>a</sup>Unadjusted odds ratio

<sup>b</sup>Adjusted odds ratio

<sup>c</sup>Older People with Disabilities

<sup>d</sup>Older People without Disabilities

\*  $p < .05$

Table 4.9. Adjusted Odds Ratios (95% CI) for Cost Barrier to Health Care by Predictor Variables from the BRFSS for 2006

Predictor Variable	Model 1 AOR (95% CI)	Model 2 AOR (95% CI)	Model 3 AOR (95% CI)	Model 4 AOR (95% CI)
<i>Predisposing Characteristics</i>				
Sex				
Male (referent)	1.0	1.0	1.0	1.0

Table 4.9 (cont'd).

Female	1.01 (0.88, 1.17)	1.09 (0.94, 1.26)	1.03 (0.89, 1.20)	1.05 (0.91, 1.22)
Age				
65 to 74 (referent)	1.0	1.0	1.0	1.0
75 to 99	0.66* (0.58, 0.77)	0.67* (0.57, 0.77)	0.69* (0.59, 0.80)	0.68* (0.59, 0.79)
Race				
Non-Hispanic White (referent)	1.0	1.0	1.0	1.0
Non-Hispanic African American	1.83* (1.51, 2.23)	1.53* (1.26, 1.87)	1.52* (1.24, 1.85)	1.56* (1.28, 1.90)
Hispanic	2.49* (1.82, 3.39)	2.09* (1.49, 2.94)	1.90* (1.36, 2.66)	1.97* (1.41, 2.76)
Other race or multiracial	1.71* (1.30, 2.25)	1.42* (1.07, 1.89)	1.40* (1.05, 1.86)	1.41* (1.06, 1.87)
Marital Status				
Married (referent)	1.0	1.0	1.0	1.0
Divorced/ Widowed/Separated	1.33* (1.15, 1.54)	1.02 (0.87, 1.20)	1.01 (0.86, 1.19)	1.01 (0.86, 1.19)
Never married or a member of an unmarried couple	1.07 (0.79, 1.43)	0.78 (0.58, 1.06)	0.72 (0.50, 1.02)	0.74 (0.52, 1.03)
Education Level				
College or more (referent)	1.0	1.0	1.0	1.0
Some college or technical school	1.64* (1.29, 2.07)	1.36* (1.07, 1.73)	1.32* (1.04, 1.68)	1.31* (1.03, 1.66)
High school or GED	1.74* (1.39, 2.17)	1.26* (1.01, 1.59)	1.19 (0.95, 1.49)	1.19 (0.95, 1.49)
Less than high school	3.07* (2.45, 3.85)	1.89* (1.47, 2.41)	1.66* (1.29, 2.12)	1.65* (1.29, 2.12)
<i>Enabling Resources</i>				
Annual Household Income				
\$50,000 or more (referent)		1.0	1.0	1.0
\$35,000 to less than \$50,000		1.07 (0.82, 1.40)	1.06 (0.80, 1.39)	1.06 (0.80, 1.40)
\$25,000 to less than \$35,000		1.23 (0.98, 1.54)	1.21 (0.96, 1.53)	1.21 (0.96, 1.53)
\$15,000 to less than \$25,000		2.03* (1.62, 2.55)	1.94* (1.55, 2.45)	1.94* (1.54, 2.44)
Less than \$15,000				

Table 4.9 (cont'd).

	2.72*	2.56*	2.52*
	(2.17, 3.41)	(2.04, 3.21)	(2.01, 3.16)
<b>Social and Emotional Support</b>			
Usually or always (referent)	1.0	1.0	1.0
Sometimes	1.98*	1.68*	1.68*
	(1.64, 2.38)	(1.38, 2.05)	(1.38, 2.05)
Rarely or never	1.91*	1.73*	1.73*
	(1.57, 2.31)	(1.42, 2.11)	(1.42, 2.10)
<b>Health Care Coverage</b>			
Yes (referent)	1.0	1.0	1.0
No	3.46*	3.47*	3.45*
	(2.64, 4.53)	(2.61, 4.62)	(2.60, 4.57)
<i>Perceived Health Needs</i>			
<b>General Health Status</b>			
Good or better (referent)		1.0	1.0
Fair or poor		1.27*	1.23*
		(1.09, 1.48)	(1.05, 1.46)
<b>Physical Health</b>			
0 day (referent)		1.0	1.0
1 day to 14 days		1.52*	1.51*
		(1.28, 1.81)	(1.27, 1.79)
15 days to 30 days		1.53*	1.50*
		(1.25, 1.88)	(1.22, 1.85)
<b>Mental Health</b>			
0 day (referent)		1.0	1.0
1 day to 14 days		1.43*	1.43*
		(1.19, 1.71)	(1.19, 1.71)
15 days to 30 days		2.03*	2.02*
		(1.57, 2.61)	(1.56, 2.61)
<i>Evaluated Health Needs</i>			
<b>Diabetes</b>			
No (referent)			1.0
Yes			0.89
			(0.74, 1.07)
<b>Asthma</b>			
No (referent)			1.0



Table 4.9 (cont'd)	
Yes	1.15 (0.95, 1.38)
Heart Attack	
No	1.0
(referent)	
Yes	1.14 (0.94, 1.38)
Coronary Heart	
Disease	
No	1.0
(referent)	
Yes	1.07 (0.88, 1.30)
Stroke	
No	1.0
(referent)	
Yes	1.29* (1.06, 1.56)

\*  $p < .05$

Table 4.8 shows that, as compared to their counterparts, older people with disabilities were more likely to face difficulty accessing health care due to cost by 2.23 with no predictor variable included (OR=2.23, 95% CI=1.95 to 2.56). However, as shown in model 1 (Table 4.8), predisposing characteristics variables had little impact on cost barrier to health care (AOR=2.21, 95% CI=1.92 to 2.54). In the model, age, race, and education level independently influenced one's cost barrier to health care.

On the other hand, Table 4.8 shows that enabling resources variables in model 2 attenuated the risk of the cost barrier to a minor extent (AOR=2.10, 95% CI=1.81 to 2.43) with predisposing characteristics controlled for. As illustrated in Table 4.9, predisposing characteristics significant in model 1 still remained significant in model 2. In addition, low annual household income, specifically less than \$25,000, social and emotional support, and no health care coverage are respectively strong predictors of cost

barrier to health care.

In contrast to predisposing characteristics and enabling resources, perceived health needs (model 3, Table 4.8) decreased the risk for the cost barrier by almost 60% with predisposing characteristics and enabling resources variables adjusted for (AOR=1.52, 95% CI=1.30 to 1.77). All perceived health needs variables—general health status, physical health, and mental health—were independently related to cost barrier to health care, and mental health showed a graded association. Thus, the more unhealthy mental health days one had, the more likely he or she was to encounter the cost barrier (AOR=1.43, 95% CI=1.19 to 1.71 for 1 day to 14 days; AOR=2.03, 95% CI=1.57 to 2.61 for 15 days to 30 days). In contrast, the extent of the association of physical health with the cost barrier was almost the same in each category compared to 0 day (AOR=1.52, 95% CI=1.28 to 1.81 for 1 day to 14 days; AOR=1.53, 95% CI=1.25 to 1.88 for 15 days to 30 days).

Lastly, Table 4.8 illustrates that evaluated health care needs variables in model 4 had little impact on the cost barrier when all other independent variables were controlled for (AOR=1.47, 95% CI=1.25 to 1.72). Table 4.9 demonstrates that of the five chronic illnesses, only a stroke was significantly associated with the cost barrier (AOR=1.29, 95% CI=1.06 to 1.56). Also, physical health and mental health were still significant in model 4, but only mental health still showed a graded association (AOR=1.43, 95% CI=1.19 to 1.71 for 1 day to 14 days; AOR=2.02, 95% CI=1.56 to 2.61 for 15 days to 30 days). The extent of the associations was almost identical across models 3 and 4.

#### *Personal Health Care Provider*

For personal health care provider, multinomial logistic regression was employed.

Therefore, while investigating the impact of predictor variables on the criterion variable, “no personal health care provider” and “only one personal health care provider” were respectively compared to “more than one personal health care provider,” which was a referent. In Tables 4.10 and 4.11, changes in odds ratios for predisposing characteristics, enabling resources, perceived health needs and evaluated health needs were examined. Table 4.12 illustrates the effect of each predictor variable on the criterion variable and its changes across models.

Table 4.10. Odds Ratios (95% CI) for Personal Health Care Provider by Disability Status for ‘No Personal Health Care Provider’ versus ‘More than One Health Care Provider’ from the BRFSS for 2006

	OR <sup>a</sup> (95% CI)	Model 1 AOR <sup>b</sup> (95% CI)	Model 2 AOR <sup>b</sup> (95% CI)	Model 3 AOR <sup>b</sup> (95% CI)	Model 4 AOR <sup>b</sup> (95% CI)
Disability					
Older PWD <sup>c</sup>	0.39* (0.34, 0.45)	0.39* (0.33, 0.45)	0.38* (0.32, 0.44)	0.57* (0.48, 0.67)	0.62* (0.53, 0.74)
Older PW/OD <sup>d</sup>	Reference	Reference	Reference	Reference	Reference

<sup>a</sup>Unadjusted odds ratio

<sup>b</sup>Adjusted odds ratio

<sup>c</sup>Older People with Disabilities

<sup>d</sup>Older People without Disabilities

\*  $p < .05$

Table 4.10 shows that as compared to “more than one health care provider,” predisposing characteristics variables in model 1 did not have an impact on “no personal health care provider” (AOR=0.39, 95% CI=0.33 to 0.45), and enabling resources variables also made almost no impact to the criterion variable (AOR=0.38, 95% CI=0.32 to 0.44) with predisposing characteristics adjusted for. In contrast, perceived health needs made

modest impact to the criterion variable by almost 20% (AOR=0.57, 95% CI=0.48 to 0.67), after controlling for predisposing characteristics and enabling resources. Finally, model 4 indicates that evaluated health needs had a small impact (AOR=0.62, 95% CI=0.53 to 0.74) after taking all the predictor variables into account.

Table 4.11. Odds Ratios (95% CI) for Personal Health Care Provider by Disability Status for ‘Only One Personal Health Care Provider’ versus ‘More than One Health Care Provider’ from the BRFSS for 2006

Predictor Variable	OR <sup>a</sup> (95% CI)	Model 1 AOR <sup>b</sup> (95% CI)	Model 2 AOR <sup>b</sup> (95% CI)	Model 3 AOR <sup>b</sup> (95% CI)	Model 4 AOR <sup>b</sup> (95% CI)
Disability					
Older PWD <sup>c</sup>	0.61* (0.56, 0.66)	0.61* (0.56, 0.67)	0.61* (0.56, 0.67)	0.77* (0.70, 0.84)	0.79* (0.71, 0.87)
Older PW/OD <sup>d</sup>	Reference	Reference	Reference	Reference	Reference

<sup>a</sup>Unadjusted odds ratio

<sup>b</sup>Adjusted odds ratio

<sup>c</sup>Older People with Disabilities

<sup>d</sup>Older People without Disabilities

\*  $p < .05$

Table 4.11 illustrates that compared to “no personal health care provider” (Table 4.10), “only one personal health care provider” showed almost identical findings in terms of changes in odds ratios across models. That is to say, predisposing characteristics in model 1 and enabling resources in model 2 did not impact personal health care provider. However, perceived health care needs in model 3 had some impact to the criterion variable although the extent of influence was modest at 16% (AOR=0.77, 95% CI=0.70 to 0.84). Lastly, evaluated health needs in model 4 had little impact (AOR=0.62, 95% CI=0.53 to 0.74).

Table 12. Adjusted Odds Ratios (95% CI) for Personal Health Care Provider by Predictor Variables from the BRFSS for 2006

<i>Predisposing Characteristics</i>	Model 1		Model 2		Model 3		Model 4	
	No <sup>a</sup> AOR (95% CI)	One <sup>b</sup> AOR (95% CI)	No <sup>a</sup> AOR (95% CI)	One <sup>b</sup> AOR (95% CI)	No <sup>a</sup> AOR (95% CI)	One <sup>b</sup> AOR (95% CI)	No <sup>a</sup> AOR (95% CI)	One <sup>b</sup> AOR (95% CI)
<b>Sex</b>								
Male (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Female	0.68* (0.59, 0.79)	1.24* (1.14, 1.36)	0.72* (0.62, 0.84)	1.24* (1.13, 1.36)	0.74* (0.64, 0.87)	1.25* (1.14, 1.37)	0.67* (0.58, 0.79)	1.19* (1.08, 1.30)
<b>Age</b>								
65 to 74 (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
75 to 99	0.70* (0.60, 0.80)	0.94 (0.86, 1.03)	0.69* (0.59, 0.79)	0.94 (0.86, 1.03)	0.68* (0.59, 0.79)	0.94 (0.86, 1.03)	0.69* (0.59, 0.80)	0.95 (0.87, 1.04)
<b>Race</b>								
Non-Hispanic White (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Non-Hispanic African American	1.32* (1.01, 1.72)	1.12 (0.95, 1.34)	1.16 (0.88, 1.53)	1.12 (0.94, 1.34)	1.23 (0.93, 1.63)	1.16 (0.97, 1.38)	1.24 (0.94, 1.64)	1.13 (0.94, 1.35)
Hispanic	1.80* (1.26, 2.57)	0.88 (0.65, 1.19)	1.53* (1.07, 2.19)	0.89 (0.66, 1.20)	1.78* (1.24, 2.56)	0.97 (0.71, 1.32)	1.76* (1.22, 2.53)	0.95 (0.70, 1.29)
Other race or multiracial	1.67* (1.10, 2.54)	0.96 (0.75, 1.22)	1.46 (0.96, 2.23)	0.97 (0.76, 1.23)	1.52 (1.00, 2.30)	0.99 (0.78, 1.25)	1.57* (1.03, 2.39)	0.99 (0.78, 1.26)
<b>Marital Status</b>								
Married (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Table 12 (cont'd).

Divorced/Widowed/ Separated	1.68* (1.44, 1.96)	0.98 (0.89, 1.07)	1.47* (1.24, 1.74)	0.97 (0.88, 1.07)	1.46* (1.24, 1.73)	0.97 (0.88, 1.07)	1.46* (1.23, 1.73)	0.97 (0.88, 1.06)
Never married or a member of an unmarried couple	1.59* (1.11, 2.29)	0.98 (0.74, 1.28)	1.25 (0.81, 1.92)	0.97 (0.74, 1.27)	1.31 (0.88, 1.94)	0.99 (0.76, 1.29)	1.26 (0.86, 1.86)	0.96 (0.74, 1.25)
Education Level								
College or more (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Some college or technical school	1.15 (0.94, 1.42)	0.90 (0.79, 1.01)	1.04 (0.85, 1.28)	0.87* (0.77, 0.99)	1.09 (0.88, 1.34)	0.89 (0.79, 1.01)	1.09 (0.89, 1.35)	0.90 (0.79, 1.02)
High school or GED	1.33* (1.11, 1.60)	1.01 (0.91, 1.13)	1.10 (0.91, 1.34)	0.98 (0.87, 1.09)	1.20 (0.99, 1.45)	1.03 (0.91, 1.15)	1.19 (0.99, 1.44)	1.03 (0.91, 1.15)
Less than high school	1.48* (1.19, 1.86)	0.82* (0.71, 0.95)	1.09 (0.86, 1.39)	0.80* (0.69, 0.93)	1.34* (1.05, 1.71)	0.90 (0.77, 1.05)	1.35* (1.06, 1.73)	0.91 (0.78, 1.06)
<i>Enabling Resources</i>								
Annual Household Income								
\$50,000 or more (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
\$35,000 to less than \$50,000	1.14 (0.89, 1.47)	1.10 (0.94, 1.29)	1.17 (0.90, 1.51)	1.12 (0.94, 1.32)	1.18 (0.91, 1.52)	1.12 (0.94, 1.32)	1.18 (0.91, 1.52)	1.12 (0.95, 1.33)
\$25,000 to less than \$35,000	1.21 (0.97, 1.51)	1.24* (1.06, 1.46)	1.25 (1.00, 1.56)	1.27* (1.08, 1.49)	1.26* (1.01, 1.57)	1.27* (1.08, 1.49)	1.26* (1.01, 1.57)	1.27* (1.08, 1.50)
\$15,000 to less than \$25,000	1.41* (1.13, 1.76)	1.13 (0.99, 1.29)	1.52* (1.21, 1.89)	1.19* (1.04, 1.36)	1.57* (1.25, 1.97)	1.19* (1.04, 1.36)	1.57* (1.25, 1.97)	1.21* (1.06, 1.38)
Less than \$15,000	1.71* (1.32, 2.22)	1.07 (0.90, 1.27)	1.95* (1.49, 2.55)	1.16 (0.97, 1.38)	2.03* (1.55, 2.67)	1.16 (0.97, 1.38)	2.03* (1.55, 2.67)	1.18 (0.99, 1.41)
Social and Emotional Support								

Table 12 (cont'd).

Usually or always (referent)	1.0	1.0	1.0	1.0	1.0	1.0
Sometimes	1.17 (0.94, 1.46)	1.02 (0.88, 1.17)	1.31* (1.05, 1.63)	1.09 (0.94, 1.26)	1.28* (1.02, 1.60)	1.08 (0.93, 1.25)
Rarely or never	1.54* (1.24, 1.93)	0.90 (0.78, 1.04)	1.68* (1.35, 2.08)	0.95 (0.82, 1.09)	1.70* (1.37, 2.11)	0.95 (0.82, 1.09)
Health Care Coverage						
Yes	1.0	1.0	1.0	1.0	1.0	1.0
(referent)						
No	5.28* (3.11, 8.97)	0.91 (0.57, 1.48)	5.39* (3.26, 8.90)	0.93 (0.58, 1.48)	5.45* (3.29, 9.03)	0.94 (0.59, 1.51)
<i>Perceived Health Needs</i>						
General Health Status						
Good or better (referent)			1.0	1.0	1.0	1.0
Fair or poor			0.49* (0.41, 0.59)	0.68* (0.61, 0.76)	0.60* (0.50, 0.73)	0.73* (0.65, 0.81)
Physical Health						
0 day (referent)			1.0	1.0	1.0	1.0
1 day to 14 days			0.60* (0.49, 0.72)	0.86* (0.77, 0.97)	0.62* (0.51, 0.75)	0.87* (0.77, 0.98)
15 days to 30 days			0.62* (0.50, 0.77)	0.76* (0.68, 0.87)	0.65* (0.52, 0.81)	0.78* (0.69, 0.88)
Mental Health						
0 day (referent)			1.0	1.0	1.0	1.0

Table 12 (cont'd).

1 day to 14 days	0.86 (0.69, 1.08)	0.95 (0.83, 1.09)	0.87 (0.69, 1.09)	0.95 (0.83, 1.10)
15 days to 30 days	0.79 (0.55, 1.13)	0.82 (0.68, 1.00)	0.82 (0.57, 1.17)	0.82 (0.67, 1.00)
<i>Evaluated Health Needs</i>				
Diabetes				
No			1.0	1.0
(referent)				
Yes			0.57*	1.00
			(0.46, 0.72)	(0.90, 1.12)
Asthma				
No			1.0	1.0
(referent)				
Yes			0.71*	0.95
			(0.55, 0.91)	(0.83, 1.08)
Heart Attack				
No			1.0	1.0
(referent)				
Yes			0.74*	0.75*
			(0.58, 0.94)	(0.66, 0.85)
Coronary Heart Disease				
No			1.0	1.0
(referent)				
Yes			0.51*	0.82*
			(0.40, 0.65)	(0.73, 0.92)
Stroke				
No			1.0	1.0



Table 12 (cont'd).		
(referent)		
Yes	0.82 (0.61, 1.10)	1.04 (0.90, 1.21)

<sup>a</sup>No personal health care provider' versus 'more than one personal health care provider'

<sup>b</sup>Only one personal health care provider' versus 'more than one personal health care provider'

\*  $p < .05$

In Table 4.12, two comparisons were made for each model: “no personal health care provider” versus “more than one personal health care provider” and “only one personal health care provider” versus “more than one personal health care provider.” In both models, “more than one personal health care provider” was a referent. As illustrated in Table 4.12, older people with disabilities were less likely to have no or only one personal health care provider across all models.

Models 1 and 2, females were significantly related to no or one personal health care provider. All other predisposing variables—age, race, and marriage—were individually strongly associated with no personal health care provider alone in model 1. Minorities and people who were not in marriage were more likely to have no personal health care provider. However, Tables 4.10 and 4.11 show that the inclusion of predisposing characteristics in model 1 did not have any impact on the risk of having no or only one personal health care provider, compared to unadjusted odd ratio (AOR=0.39, 95% CI=0.34 to 0.45 for no health care provider; AOR=0.61, 95% CI=0.56 to 0.66 for only one health care provider).

In model 2 including enabling resources with predisposing characteristics controlled for, females and older people age 75 and over were continuously less likely to have no personal health care provider. In addition, people who had low annual household income, particularly less than \$25,000, received social and emotional support “rarely or never,” and had no health care coverage were individually strong predictors of having no personal health care provider. Thus, older people with these enabling resources were more likely to have no personal health care provider. In contrast, for only one personal health care provider, only “\$25,000 to less than \$35,000” for an annual

household income was a significant predictor among enabling resources variables. As illustrated in Tables 4.10 and 4.11, however, enabling resources in model 2 did not have any effect on the outcomes (AOR=0.38, 95% CI=0.32 to 0.44 for no health care provider; AOR=0.61, 95% CI=0.56 to 0.67 for only one health care provider).

Table 4.12 demonstrates that general health status and physical health in model 3 slightly attenuated the risks of having no or only one health care provider by 19% and 16% with predisposing characteristics and enabling resources adjusted for (AOR=0.57, 95% CI=0.48 to 0.67 for no health care provider in Table 10; AOR=0.77, 95% CI=0.70 to 0.84 for only one health care provider in Table 11). However, Table 4.12 further shows that mental health was not significantly associated with the criterion variables when predisposing characteristics, enabling resources, and other perceived health needs variables were controlled for.

In the final model, evaluated health needs had a very slight impact on the criterion variables (AOR=0.62, 95% CI=0.53 to 0.74 for no health care provider in Table 4.10; AOR=0.79, 95% CI=0.71 to 0.87 for only one health care provider in Table 4.11). Table 4.12 illustrates that compared to more than one health care provider, people with diabetes, asthma, heart attack and coronary heart disease were less likely to have no personal health care provider, whereas individuals with heart attack and coronary heart disease were less likely to have only one health care provider.

Across all four models for a personal health care provider, females were individually a strong predictor of having no or only one health care provider. Thus, compared to more than one personal health care provider, females were less likely to have no personal health care provider, or they were more likely to have only one health



care provider. In addition, individuals aged 75 and older, Hispanics, and people who were divorced, widowed, or separated were significantly associated with no personal health care provider. Specifically, Hispanics or people who were divorced, widowed or separated were more likely to have no personal health care provider. In contrast, the risk of having no personal health care provider was lower for people age 75 and over across all the four models, as compared to older people age 65 to 74.

#### *Routine Physical Checkup*

For routine physical checkup, multinomial logistic regression was employed. As a result, two comparisons were made: “routine physical checkup more than 5 years ago or no routine physical checkup” versus “routine physical checkup less than 2 years ago”; and “routine physical checkup 2 years ago to 5 years ago” versus “routine physical checkup less than 2 years ago.”

In contrast to cost barrier to health care and personal health care provider, however, routine physical checkup did not show significant results for all models. As demonstrated in Tables 13, only models 1 and 2 presented significant results when “More than 5 Years ago or Never” was compared to “Less than 2 Years ago.” Thus, health needs variables (Models 3 and 4) had no significant effect on routine physical checkup. However, it should be noted that predisposing characteristics in model 1 and enabling resources in model 2 with predisposing characteristics adjusted for had almost no impact on routine checkup (AOR=0.79, 95% CI=0.69 to 0.91 in model 1; AOR=0.78, 95% CI=0.68 to 0.89 in model 2).

Table 4.13. Odds Ratios (95% CI) for Routine Physical Checkup by Disability Status for ‘More than 5 Years ago or Never’ versus ‘Less than 2 Years ago’ from the BRFSS for 2006

	OR <sup>a</sup> (95% CI)	Model 1 AOR <sup>b</sup> (95% CI)	Model 2 AOR <sup>b</sup> (95% CI)	Model 3 AOR <sup>b</sup> (95% CI)	Model 4 AOR <sup>b</sup> (95% CI)
Disability					
Older PWD <sup>c</sup>	0.80* (0.70, 0.91)	0.79* (0.69, 0.91)	0.78* (0.68, 0.89)	0.88 (0.77, 1.01)	0.93 (0.81, 1.07)
Older PW/OD <sup>d</sup>	Reference	Reference	Reference	Reference	Reference

<sup>a</sup>Unadjusted odds ratio

<sup>b</sup>Adjusted odds ratio

<sup>c</sup>Older People with Disabilities

<sup>d</sup>Older People without Disabilities

\*  $p < .05$

In relation to a comparison between “2 years to 5 years ago” versus “Less than 2 years ago,” Table 4.14 illustrates that no model had any significant impact on routine physical checkup. In addition, as previously discussed, significant differences in routine physical checkup for older groups with and without disabilities were found only for older people age 75 and over. Therefore, the following discussion on routine checkup is centered on a comparison between “More than 5 Years ago or Never” and “Less than 2 Years ago” only for older persons age 75 and older. Further, the focus is placed on model 1 and model 2 in the discussion because perceived and evaluated health needs had no significant effect on the criterion variable.

Table 4.14. Odds Ratios (95% CI) for Routine Physical Checkup by Disability Status for  
 '2 Years to 5 Years ago' versus 'Less than 2 Years ago' from the BRFSS for 2006 <sup>a</sup>

	OR <sup>a</sup> (95% CI)	Model 1 AOR <sup>b</sup> (95% CI)	Model 2 AOR <sup>b</sup> (95% CI)	Model 3 AOR <sup>b</sup> (95% CI)	Model 4 AOR <sup>b</sup> (95% CI)
Disability					
Older PWD <sup>c</sup>	0.89 (0.77, 1.04)	0.91 (0.78, 1.05)	0.89 (0.76, 1.04)	1.03 (0.87, 1.23)	1.08 (0.91, 1.28)
Older PW/OD <sup>d</sup>	Reference	Reference	Reference	Reference	Reference

<sup>a</sup>Unadjusted odds ratio

<sup>b</sup>Adjusted odds ratio

<sup>c</sup>Older People with Disabilities

<sup>d</sup>Older People without Disabilities

\*  $p < .05$

Table 15. Adjusted Odds Ratios (95% CI) for Routine Physical Checkup by Predictor Variables from the BRFSS for 2006

<i>Predisposing Characteristics</i>	Model 1		Model 2		Model 3		Model 4	
	>=5yrs <sup>a</sup> AOR (95% CI)	2 to 5 yrs <sup>b</sup> AOR (95% CI)	>=5yrs <sup>a</sup> AOR (95% CI)	2 to 5 yrs <sup>b</sup> AOR (95% CI)	>=5yrs <sup>a</sup> AOR (95% CI)	2 to 5 yrs <sup>b</sup> AOR (95% CI)	>=5yrs <sup>a</sup> AOR (95% CI)	2 to 5 yrs <sup>b</sup> AOR (95% CI)
<i>Sex</i>								
Male (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Female	0.70* (0.61, 0.80)	0.79* (0.67, 0.92)	0.72* (0.62, 0.83)	0.80* (0.68, 0.93)	0.72* (0.63, 0.83)	0.80* (0.69, 0.94)	0.68* (0.59, 0.78)	0.76* (0.65, 0.90)
<i>Age</i>								
65 to 74 (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
75 to 99	0.82* (0.71, 0.95)	0.74* (0.63, 0.86)	0.82* (0.71, 0.95)	0.74* (0.63, 0.86)	0.83* (0.71, 0.95)	0.74* (0.63, 0.86)	0.82* (0.71, 0.94)	0.73* (0.63, 0.85)
<i>Race</i>								
Non-Hispanic White (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Non-Hispanic African American	0.39* (0.27, 0.57)	0.59* (0.40, 0.86)	0.35* (0.24, 0.52)	0.55* (0.38, 0.81)	0.36* (0.25, 0.54)	0.57* (0.38, 0.83)	0.38 (0.26, 0.57)	0.60* (0.41, 0.88)
Hispanic	1.13 (0.75, 1.72)	1.27 (0.86, 1.88)	1.01 (0.66, 1.54)	1.20 (0.80, 1.78)	1.09 (0.71, 1.66)	1.27 (0.85, 1.89)	1.13 (0.74, 1.72)	1.31 (0.88, 1.94)
Other race or multiracial	0.84 (0.63, 1.12)	0.88 (0.63, 1.23)	0.76 (0.57, 1.01)	0.83 (0.59, 1.17)	0.76 (0.58, 1.01)	0.84 (0.60, 1.18)	0.80 (0.60, 1.06)	0.88 (0.62, 1.23)
<i>Marital Status</i>								
Married (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0



Table 15 (cont'd).

Divorced/Widowed/ Separated	1.40* (1.21, 1.64)	1.22* (1.03, 1.44)	1.28* (1.08, 1.50)	1.16 (0.96, 1.39)	1.26* (1.07, 1.48)	1.15 (0.96, 1.39)	1.26* (1.07, 1.48)	1.15 (0.96, 1.39)
Never married or a member of an unmarried couple	2.18* (1.65, 2.87)	1.32 (0.99, 1.75)	1.85* (1.39, 2.47)	1.21 (0.91, 1.62)	1.87* (1.41, 2.49)	1.23 (0.92, 1.64)	1.87* (1.41, 2.49)	1.23 (0.92, 1.64)
Education Level								
College or more (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Some college or technical school	1.07 (0.89, 1.29)	1.23* (1.01, 1.50)	0.99 (0.81, 1.20)	1.19 (0.97, 1.46)	1.00 (0.82, 1.22)	1.21 (0.99, 1.48)	1.01 (0.83, 1.23)	1.23 (1.00, 1.51)
High school or GED	1.19* (1.01, 1.42)	1.36* (1.13, 1.63)	1.04 (0.86, 1.26)	1.29* (1.05, 1.57)	1.07 (0.89, 1.30)	1.33* (1.08, 1.62)	1.08 (0.89, 1.30)	1.35* (1.10, 1.65)
Less than high school	1.51* (1.21, 1.88)	1.49* (1.18, 1.88)	1.21 (0.97, 1.52)	1.35* (1.04, 1.74)	1.30* (1.03, 1.65)	1.46* (1.13, 1.90)	1.34* (1.06, 1.69)	1.52* (1.17, 1.97)
<i>Enabling Resources</i>								
Annual Household Income								
\$50,000 or more (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
\$35,000 to less than \$50,000	1.20 (0.99, 1.47)	1.15 (0.91, 1.44)	1.21 (0.99, 1.48)	1.15 (0.92, 1.45)	1.22 (1.00, 1.49)	1.16 (0.92, 1.45)	1.22 (1.00, 1.49)	1.16 (0.92, 1.45)
\$25,000 to less than \$35,000	1.36* (1.11, 1.67)	1.08 (0.87, 1.35)	1.37* (1.12, 1.68)	1.08 (0.87, 1.35)	1.39* (1.14, 1.70)	1.11 (0.89, 1.39)	1.39* (1.14, 1.70)	1.11 (0.89, 1.39)
\$15,000 to less than \$25,000	1.21 (1.00, 1.47)	1.00 (0.78, 1.29)	1.24* (1.02, 1.50)	1.00 (0.78, 1.29)	1.27* (1.05, 1.54)	1.06 (0.82, 1.36)	1.27* (1.05, 1.54)	1.06 (0.82, 1.36)
Less than \$15,000	1.58* (1.23, 2.01)	1.29 (0.97, 1.71)	1.65* (1.29, 2.12)	1.29 (0.97, 1.71)	1.70* (1.33, 2.18)	1.39* (1.04, 1.86)	1.70* (1.33, 2.18)	1.39* (1.04, 1.86)
Social and Emotional Support								

Table 15 (cont'd).

Usually or always (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sometimes	1.37* (1.11, 1.69)	1.36* (1.07, 1.71)	1.41* (1.14, 1.73)	1.41* (1.11, 1.78)	1.39* (1.13, 1.71)	1.40* (1.11, 1.78)	
Rarely or never	1.26* (1.03, 1.54)	1.23 (0.97, 1.57)	1.28* (1.05, 1.55)	1.26 (0.99, 1.61)	1.30* (1.06, 1.58)	1.29* (1.01, 1.64)	
Health Care Coverage							
Yes (referent)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
No	3.65* (2.70, 4.94)	1.80* (1.25, 2.60)	3.64* (2.71, 4.89)	1.81* (1.26, 2.60)	3.57* (2.66, 4.79)	1.78* (1.24, 2.55)	
<i>Perceived Health Needs</i>							
General Health Status							
Good or better (referent)		1.0	1.0	1.0	1.0	1.0	1.0
Fair or poor		0.67* (0.56, 0.80)	0.72* (0.58, 0.90)	0.78* (0.65, 0.94)	0.81 (0.65, 1.02)		
Physical Health							
0 day (referent)		1.0	1.0	1.0	1.0	1.0	1.0
1 day to 14 days		0.64* (0.54, 0.76)	0.89 (0.72, 1.10)	0.66* (0.56, 0.78)	0.91 (0.73, 1.12)		
15 days to 30 days		1.03 (0.84, 1.26)	0.88 (0.65, 1.18)	1.07 (0.87, 1.31)	0.90 (0.67, 1.21)		
Mental Health							
0 day (referent)		1.0	1.0	1.0	1.0	1.0	1.0

Table 15 (cont'd).

1 day to 14 days	0.95 (0.77, 1.17)	0.91 (0.73, 1.14)	0.96 (0.78, 1.18)	0.91 (0.73, 1.14)
15 days to 30 days	1.17 (0.87, 1.57)	0.97 (0.71, 1.32)	1.20 (0.89, 1.60)	0.99 (0.73, 1.34)
<i>Evaluated Health Needs</i>				
Diabetes				
No			1.0	1.0
(referent)				
Yes			0.41* (0.33, 0.51)	0.49* (0.38, 0.63)
Asthma				
No			1.0	1.0
(referent)				
Yes			0.83 (0.67, 1.04)	1.00 (0.76, 1.32)
Heart Attack				
No			1.0	1.0
(referent)				
Yes			0.91 (0.74, 1.12)	0.82 (0.64, 1.03)
Coronary Heart Disease				
No			1.0	1.0
(referent)				
Yes			0.69* (0.56, 0.85)	1.01 (0.82, 1.25)
Stroke				
No			1.0	1.0

Table 15 (cont'd).		
(referent)		
Yes	1.01 (0.79, 1.29)	0.71 (0.49, 1.03)
<sup>a</sup> A routine physical checkup more than 5 years ago or no physical checkup' versus 'a routine physical checkup less than 2 years ago'		
<sup>b</sup> A routine physical checkup 2 years to 5 years ago' versus 'a physical checkup less than 2 years ago'		
* $p < .05$		

Table 4.15 shows that predisposing characteristics in model 1 had little effect on routine physical checkup (AOR=0.79, 95% CI=0.69 to 0.91). Sex, age, and marital status were statistically significant predictors of the criterion variable. More specifically, females and older people age 75 and over were less likely to have routine physical checkup more than 5 years ago or have no physical checkup as compared to “less than 2 years ago.” It should be noted, however, that this study found significant differences between older people with and without disabilities only for those aged 75 and over. On the other hand, older people who were not in marriage or had an education level—“high school or GED” or “less than high school”—were more likely to have no physical checkup or have it more than 5 years ago.

In model 2, predisposing characteristics significant in model 1 remained to be strong predictors except an education level when enabling resources were accounted for. When enabling resources were controlled for, any education level became insignificant. In relation to enabling resources, older people who did not receive social and emotional support they needed “usually or always” or did not have health care coverage were more likely to have their routine physical checkup more than five years ago or to have no physical checkup. Furthermore, older people who reported their annual household income as “\$25,000 to less than \$35,000” and “Less than \$15,000” were more likely to have a physical checkup more than five years ago or have no checkup. However, these significant enabling resources had almost no impact on the criterion variable with predisposing characteristics controlled for (AOR=0.78, 95% CI=0.68 to 0.89).

## CHAPTER 5

### DISCUSSION

The two-fold purpose of this study was as follows: 1) to examine the existence of health disparities in access to health care between older people with and without disabilities, and 2) to what extent such disparities could be accounted for by predisposing characteristics, enabling resources, and perceived and evaluated health needs.

Employing older individuals age 65 and over in 50 states and the District of Columbia from the BRFSS for 2006, health disparities in access to health care of older people with disabilities were investigated in cost barrier to health care, personal health care provider, and routine physical checkup. After findings of this study are concisely presented, in-depth discussion of the disparities ensues. The limitations of this study and suggestions for future studies, as well as a conclusion follow after the discussion.

#### *Findings of the Study*

This study revealed that significant differences in access to health care existed between older people with and without disabilities. First, older individuals with disabilities were more likely than their counterparts without disabilities to face cost barrier to health care. In relation to the extent of the effects of the behavioral model variables—predisposing characteristics, enabling resources, and perceived and evaluated health needs—on cost barrier to health care, predisposing characteristics had little effect on the cost barrier, and enabling resources accounted for the cost barrier by a modest portion with predisposing characteristics controlled for. In contrast, perceived health needs explained the cost barrier the most after controlling for predisposing characteristics

and enabling resources, while evaluated health needs little accounted for cost barrier to health care with all other variables adjusted for.

Second, this study found that older individuals with disabilities were more likely to have more than one personal health care provider, whereas older people without disabilities were more likely to have no or only one personal health care provider. Regarding the effects of the behavioral model variables on personal health care provider, predisposing characteristics and enabling resources did not impact “no personal health care provider” and “only one personal health care provider” when they were both compared to “more than one health care provider.” However, perceived health needs had the biggest effect in the two comparisons when predisposed characteristics and enabling resources were taken into consideration. This finding is consistent with cost barrier to health care; perceived health needs had the biggest effect on the cost barrier. But evaluated health needs had extremely little effect on personal health care provider in the two comparisons while all other variables were controlled for.

Third, regarding routine physical checkup, older persons with disabilities were found to be more likely to have routine checkup within less than 2 years compared to the counterparts without disabilities. In contrast, older people without disabilities were more likely to have no routine checkup or have it more than five years ago. However, it should be noted that these differences were significant only for those aged 75 and older. In addition, routine physical checkup showed significant findings only for a comparison of “more than 5 years ago or never” versus “less than 2 years ago”; the other comparison—“2 years to 5 years ago” versus “less than 2 years ago”—was not significant. Furthermore, even in the first comparison, only model 1 (predisposing

characteristics) and model 2 (enabling resources) were statistically significant, but the two models did not make noticeable change in adjusted odds ratios. That is, routine physical checkup was little explained by predisposing characteristics and enabling resources with predisposing characteristics controlled for. In cost barrier to health care and personal health care provider, perceived health needs explained each aspect of health care access the most. However, this was not applied to routine physical checkup since only model 1 and model 2 showed significant associations with the routine checkup. As indicated above, this study found that health disparities occurred through intricate mechanisms, and that the mechanisms of such disparities had intricate patterns in each aspect of health disparities.

#### *Discussion of the Disparities in Access to Health Care*

To facilitate an in-depth discussion of the findings of this study, general discussion on the findings are first provided. Detailed discussion about the three aspects of access to health care is then followed. This study suggests that as compared to the counterparts without disabilities older people with disabilities paid more attention to and they were more concerned about their health status given the findings of personal health care provider and routine physical checkup. Based on a substantial review of studies on the impact of health insurance on health-related outcomes for adults age 18 through 64, Institute of Medicine (2002) indicates that adults with chronic conditions and those in late middle age benefit most from health insurance coverage due to their greater need for health care. This could be applied to the findings of this study: older persons with disabilities were more likely to have more than one personal health care provider and have routine physical checkup within less than 2 years, compared to their counterparts



without disabilities. Thus, the relatively greater need for health care for older individuals with disabilities and their more attention to and concern about health status due to their existing health issues could make them take full advantage of public health care coverage such as Medicare or Medicaid.

Given the employment-related issues, economic distress and their impacts on medical insurance for people with disabilities, favorable results of personal health care provider and routine physical checkup may be much ascribed to public health care coverage. Nonetheless, it is important to note that the effect of public health insurance on health care access for older people with disabilities could not be investigated in this study because the types and sources of health care coverage were not dealt with in the BRFSS. Despite the potential favorable effect of public health care coverage on access to health care for older individuals with disabilities, this study revealed that older persons with disabilities were more likely to face cost barrier to health care. In other words, they were more likely to have difficulty seeing a doctor in a timely manner because of cost. This illustrates that in spite of the near-universal coverage of Medicare for older people age 65 and over and supplemental coverage of Medicaid for those with low incomes older individuals with disabilities still face challenge in accessing timely health care.

This unfavorable finding can be inversely interpreted that public health care coverage is still necessary to enhance access to health care for older people with disabilities. Individual account and privatization has been highlighted among the recent political debates on Social Security and universal health care coverage (Herd & Kingson, 2005; Moon, 2005). Concerns about financial crisis, as well as the sheer rapid increase

of older population due to the aging of the baby boomer generation have made debates over reforms of old age policies on the top of political agenda. People for privatization claim that a market solution will solve the financial crisis that Social Security faces. However, a variety of valid arguments exist against the market solution and they emphasize the significance of existence of Social Security and public health care coverage run by the government. In relation to individuals with disabilities, it is highly likely that older people with chronic illnesses or disabilities are precluded or denied by private insurers, or that, if those with illnesses or disabilities are enrolled in private health insurance, they have challenge in paying high premiums and co-pays due to their health issues (Mills, 1993; Moon, 2005; Williams, Dulio, Claypool, Perry, & Cooper, 2004).

With regard to Medicare, increasing pressure for individual account and raising the age of eligibility should be taken into consideration for older people with disabilities. According to Moon (2005), raising the age of eligibility for Medicare can go favorably for older individuals with disabilities as long as a new standard is created for increasing assistance for older persons with great needs for health care due to chronic illnesses or disabilities. Moon (2005) suggests that a new standard be created for qualifying for disabilities and two-year waiting period for eligibility be eliminated in order to buffer the effects of increasing the eligibility age.

#### *Cost Barrier to Health Care*

This study found that older people with disabilities were more likely to face cost barrier to health care than their counterparts without disabilities. Thus, older individuals with disabilities had more difficulty seeing a doctor due to cost within the previous 12 months. This result was anticipated given that, despite the ADA, people with

disabilities are still one of the most disadvantaged groups in society from various aspects, such as education, income, employment, or living condition. At the same time, however, cost barrier to health care due to the disadvantaged situation could be anticipated to ameliorate among older people given the near-universal coverage of Medicare. This study revealed that although health disparities in access to health care are enhanced among older people due to Medicare compared to young counterparts (USDHHS, 2006), older individuals with disabilities were more likely to face difficulty in accessing health care due to cost than their counterparts without disabilities.

It has been very well documented that people with disabilities suffer from unemployment, underemployment and, as a result, economic distress (e.g., Kaye, 1998; Lustig et al., 2003; Stapleton & Burkhauser, 2003). The economic distress for people with disabilities can prevent them from purchasing supplemental health care coverage, which impacts their access to and quality of health care. Aside from the economic distress, people with disabilities can be further burdened with the following issues (Millman, 1993; Williams et al., 2004): exclusion waivers for preexisting health conditions, too high premiums and co-pays, and denials. This suggests that despite the near-universal Medicare older people with disabilities can still face enormous challenge in accessing quality health care.

Other studies illustrate that lack of supplemental health coverage is related to challenge of accessing health care. When compared to individuals with supplemental health insurance, people who rely on Medicare alone were more likely to delay care due to cost and have difficulty obtaining care within the previous year, and those also were less likely to have usual source of care (Gluck & Hanson, 2001). More specifically, the

study shows that 21% of people with Medicare alone experienced delaying care due to cost in comparison to 5% of individuals with private supplemental insurance. In addition, 8% of individuals with Medicare alone had difficulties obtaining care compared to 3% of people with private coverage.

Employing data of the population aged less than 65 from the 1994 RWJF National Access to Care Survey, Berk and Schur (1998) showed that people in Medicaid were twice as likely to have difficulties accessing services compared to individuals with private insurance. Although this study restricted its attention to people aged less than 65 to effectively examine the impact of health insurance on access to health care, the study revealed that as compared to those with private health coverage, individuals in Medicaid were twice as likely to report difficulties in these areas: having a usual source of care, obtaining needed care, and number of physician visits.

These studies indicate that people with Medicare or Medicaid alone have a great risk of accessing quality and timely health care. Given the prevalent unemployment and underemployment among people with disabilities as well as their poor quality of employment, individuals with disabilities can be less likely to have other supplemental health insurance, such as employer-sponsored retiree insurance or Medigap. In fact, as of 2002, 12 percent of Medicare beneficiaries do not have any supplemental health coverage (Cubanski, Voris, Kitchman, Neuman, & Potetz, 2005). In particular, in an era of continuously advancing science and technology and enhanced medicine, older people with chronic/fatal illnesses or disabilities are highly likely to sustain their life longer, requiring more spending on their health care. Nonetheless, Medicare covers only 45 percent of health care expenses (total medical and long-term care expenses) for both

institutionalized and non-institutionalized beneficiaries in 2002 (Cubanski et al., 2005).

But older persons with disabilities who have extremely low incomes can have fill-in benefits from Medicaid as well as Medicare; these people are “full-benefit dual eligibles” (Cubanski et al., 2005). Cubanski et al. show that 56 percent of Medicare beneficiaries with the lowest income, “\$10,000 or less” are provided supplemental health coverage through Medicaid. The benefits for older individuals with extremely low incomes are generally generous and comprehensive (Clark et al., 2004; Moon, 2006). However, these benefits can be offset by much greater need for health care among older individuals with disabilities in great poverty. As compared to those with higher income, Medicare beneficiaries with low incomes residing in the community self-reported that they were in poor or fair health (Cubanski et al., 2005). Moreover, those beneficiaries are highly likely to be uninsured before receiving Medicare or Medicaid, and, as a result, their health condition are more likely to be worse (Hadley, 2002; IOM, 2002). Given a marginalized status in society for people with disabilities, many of older individuals with disabilities can have considerable and dire need for health care and be in poor health condition. Hence, public health coverage may not be sufficient to cover their health issues for older persons with disabilities. In this context, the finding that older people with disabilities were more likely to be exposed to cost barrier to health care in spite of public health coverage can be taken without great surprise.

In relation to the behavioral model variables, this study revealed that older aging people age 75 and over were less likely to face cost barrier to health care. This finding can seem perplexing since, given the positive association of age with chronic disease or disability among older people, older aging people should have faced more cost barrier to

health care. The finding might be related to the fact that this study focused only on community-dwelling individuals and excluded older people residing in institutions such as nursing homes or other long-term care settings, who were more likely to have severe and chronic diseases or disabilities. The percentage of older people who live in nursing homes increases substantially with age (Administration on Aging, 2006). As a result, older individuals aged 75 and over could be relatively healthy in this study. Or older people in the age range were more apt to take it granted that they have some health issues, and, as a result, they might be less likely to seek for assistance from medical professionals compared to those aged 65 to 74. But perceived and evaluated health needs in this study could not explain the difference between older people in the two age ranges. Further studies are warranted for a better understanding of the finding.

In addition, this study shows that health care coverage had a considerable effect on a timely access to health care for older persons with disabilities. Although older people age 65 and over are eligible for Medicare, this study found that 1.73% of those with disabilities and 2.09% of those without disabilities did not have any health care coverage. Thus, this study demonstrates that Medicare is not a universal health care coverage for all older people age 65 and over. Medicare provides basic acute care services for over 97 percent of older individuals aged 65 and older (Clark et al., 2004). Some older persons may not have Medicare since they are recent immigrants who are not eligible for Medicare (DeLia, 2006), or they are in the process of eligibility (Williams et al., 2004).

Furthermore, this study examined five chronic diseases for evaluated health needs: diabetes, asthma, heart attack, coronary heart disease, and stroke. Of the five

chronic diseases, however, only stroke showed a significant association with the cost barrier. When older individuals with disabilities had a stroke, they were more likely to face the cost barrier. The reason why the other chronic diseases showed insignificant results warrants further studies, but this might be related to Medicare coverage. Medicare recently showed some improvements in preventative services, hospital treatment, or outpatient health care for chronic conditions (Leatherman & McCarthy, 2005). As a result, hospital treatment of heart attack and outpatient care for chronic health conditions such as diabetes have been possible through Medicare. In essential, Medicare coverage has a primary focus on acute and post-acute health care services (Clark et al., 2004; Moon, 2006). Stroke may require long-term care and rehabilitation for older persons with disabilities, resulting in the exposure to the cost barrier.

#### *Personal Health Care Provider*

This study showed favorable findings on personal health care provider for older people with disabilities; older individuals with disabilities were more likely to have more than one personal health care provider, whereas older persons without disabilities were more likely to have no or only one personal health care provider. The near-universal coverage of Medicare for older people age 65 and over, as well as Medicaid for those with low incomes should play a role in the results. Leatherman and McCarthy (2005) show through a comprehensive review of recent studies that Medicare played a significant part in reducing preexisting disparities in screening, preventive care, and seeking care among older people who did not have health insurance before 65.

Regarding health care coverage, this study revealed that those without health care coverage were more than five times as likely to have no personal health care coverage,

while it was not found whether health care coverage played a significant role in having one personal health care provider compared to more than one health care provider. This finding can be interpreted that health care coverage can help stop older persons with disabilities from having no personal health care provider, but the effect of health insurance was not enough to encourage older individuals with disabilities to have more than one health care provider. This may result from the lack of supplemental health insurance with comprehensive coverage for older people with disabilities.

In spite of Medicare, older people are still burdened with considerable out-of-pocket costs (Gonyea, 2005). In fact, Medicare does not provide universal benefit coverage for older individuals although the eligibility of Medicare is almost universal (Gonyea, 2005). Long-term care, preventive care, Part B premiums, deductibles, co-payments, dentures and dental care, eyeglasses, and hearing aids are among gaps in Medicare coverage (Moon, 2006; Social Security Administration, 2006). For older individuals, cost sharing and premiums can be huge and they are also increasing, which makes it necessary for older people to purchase additional private health insurance (Meyer, 2005; Moon, 2006). In addition, health insurance coverage can increase likelihood that people can have appropriate health care through a primary care provider or a regular source of health care (IOM, 2002). Given the aforementioned findings of the studies, it is possible that the lack of supplemental health insurance prevented older persons with disabilities from having more than one personal health care provider. It is important to note, however, that the BRFSS does not collect information on the types and sources of health insurance from interviewees, so this study could not investigate the relationship between types and sources of health care coverage and personal health care



provider in further detail.

Gender was significantly related to personal health care provider; older females with disabilities were less likely to have no personal health care provider compared to males. Given this finding, older females with disabilities seemed to pay more attention to their health. The finding might stem from the fact that older females with disabilities were likely to have greater needs for health care. It should be noted that the gender difference was not explained by perceived and evaluated health needs. Gender-specific preventive care services might account for the gender difference in personal health care provider. That is, women interviewees might think of professionals for preventative care services as health care provider. But this study did not examine the effect of gender-specific preventive care services on health care provider, such as a mammography, a clinical breast exam, a pap test, prostate cancer screening, or colorectal cancer screening.

In the prior comparison between “no personal health care provider” versus “more than one personal health care provider,” older females with disabilities were less likely to have no personal health care provider. However, the finding of a comparison between “one personal health care provider” versus “more than one health care provider” showed that older females with disabilities were more likely to have only one health care provider. This study revealed that older females with disabilities were less likely to have no personal health care provider, but they were more likely to have only one health care provider. These findings make it difficult to reach a conclusion that older females with disabilities paid more attention to their health. As previously discussed, these findings may also be associated with supplemental health care coverage. Nonetheless, this was

not examined due to the limitation of the BRFSS.

Song, Chang, Manheim, and Dunlop (2006) found that women had more physician contact after controlling for variables in sociodemographics, health needs, and economic access. However, physician contact could not be examined in this study given the limitation of the BRFSS. In addition, different research methodologies should be noted. While Song et al. (2006) investigated physician contact through binary logistic regression, this study examined personal health care provider employing multinomial logistic regression. These differences merit caution in the comparison of the findings of the two studies.

Age had an independently significant effect on personal health care provider in a comparison between “no personal health care provider” versus “more than one personal health care provider.” Older persons with disabilities aged 75 and older were less likely to have no personal health care provider compared to those aged 65 to 74. Aging shows a positive association with greater prevalence of chronic diseases and conditions (NCHS, 2006). Thus, the older aging individuals become, the more likely they are to have various physical or mental illnesses and disabilities. Higher age can make older individuals with disabilities more apt to perceive their health status as poor, or sustain various health issues. This should make the older aging people less likely to have no personal health care provider compared to the younger aging people aged 65 to 74.

In relation to race, all non-Whites were significantly related to personal health care provider in model 1 with predisposing characteristics. That is, all minority groups were more likely to have no personal health care provider compared to non-Hispanic Whites. However, non-Hispanic African Americans were more likely to have no

personal health care provider in only model 1 with predisposing characteristics, but they did not present a significant association in all other models. This indicates that the significant association in model 1 was explained by enabling resources, and perceived and evaluated health needs.

This finding of African Americans is different from the result of a study by Dunlop, Manheim, Song, and Chang (2002). Dunlop et al. (2002) found that compared to non-Hispanic Whites, minority men, especially African Americans were less likely to have any physician contact, which was not accounted for by variables in health need and economic access. However, this study revealed that the significant association for African Americans in model 1 was accounted for by enabling resources and perceived and evaluated health needs. Several differences between the two studies should be noted. First, Dunlop et al.'s (2002) study included the interaction between gender and race, whereas this study did not examine the interaction. In addition, Dunlop and colleagues employed data from the 1993-1995 study on the Asset of Health Dynamics Among the Oldest Old (AHEAD). Further, although Dunlop et al. examined many aspects of health care utilization, the number of a personal health care provider was not investigated. Therefore, these differences make difficult a direct comparison of the findings of the two studies.

With regard to social and emotional support, this study found that the less likely timely social and emotional support older individuals with disabilities received, the more likely they were to have no personal health care provider. Social connectedness and social support present several benefits to health in the following aspects: a) finding resources when one is exposed to problems and threats, b) offsetting the effects of stress,

and c) being more likely to access health-related information (Thomson et al., 2006).

Older persons can learn greater knowledge of health from others through social support, which includes information on health promotion and skills of a doctor (Adler, 2006).

Given these benefits of social support, the finding of this study makes sense.

### *Routine Physical Checkup*

This study revealed that while older people with disabilities were more likely to have routine physical checkup within less than 2 years compared to the counterparts without disabilities, those without disabilities were more likely to have no routine checkup or have it more than five years ago. However, these differences were significant only for those aged 75 and older. Therefore, the following discussions are centered only on older people aged 75 and over.

Older females with disabilities were less likely to have routine physical checkup more than five years ago or have no physical checkup in both model 1 (predisposing characteristics) and model 2 (enabling resources). In the discussion about personal health care provider, older females with disabilities were less likely to have no health care provider. This can suggest that older females with disabilities paid more attention to their health and that they had greater needs for health care. This suggestion can be applied to routine physical checkup as well.

With regard to race, only non-Hispanic African Americans showed significant results, and they were less likely to have routine physical checkup more than five years ago or have no physical checkup, compared to non-Hispanic Whites. That is, this study revealed that, compared to Whites, African Americans were more likely to have routine physical checkup. It should be noted that only older people age 75 and over showed

significant results in routine checkup. Hence, it may be possible that African Americans in this age range were in poorer health status, which made them pay more attention to their health. Cubanski et al. (2005) show that as compared to Medicare beneficiaries with higher incomes living in the community those with lower incomes have poorer health, and that African American (41%) and Hispanic (37%) beneficiaries are much more likely to be in fair or poor health compared to non-Hispanic Whites (25%). However, this study's finding on African Americans was not accounted for by perceived and evaluated health needs.

Regarding marital status, older individuals with disabilities who were not in marriage were more likely to have their routine physical checkup more than five years ago or have no checkup in both model 1 and model 2. This unfavorable effect of being out of marriage on routine physical checkup may be associated with social network. More direct and reciprocal interrelations may be more likely to happen in marriage especially for older people with disabilities. Given the double challenge of disability and old age, it can be particularly demanding for older persons with disabilities who are not in marriage to find continuous and meaningful relationships. In contrast, those with disabilities in marriage could have more direct and continual encouragement for the routine physical checkup from their spouse.

In relation to social and emotional support, this study found that older people with disabilities in "sometimes" and "rarely or never" categories were more likely to have no routine physical checkup or have it more than five years ago. This can illustrate the importance of social support among older people as previously described. At the same time, however, it should be noted that although the BRFSS examines social and

emotional support, the concept of the support is crude and general since the BRFSS simply asks the interviewees to include support received from any source. This can serve as a limitation to effectively investigate the impact of social support on access to health care in this study.

Finally, older people with disabilities who did not have any health care coverage were more than three and a half times as likely to have the checkup more than five years ago or have no checkup. According to Institute of Medicine (2002), health insurance helps insured individuals to have enduring relationship with a professional health care provider, and uninsured status will make individuals with chronic diseases less likely to have regular checkup. In this regard, public health insurance coverage such as Medicare and Medicaid can help older persons with disabilities have a regular relationship with health care providers, which could in turn assist them with routine physical checkup.

#### *Limitations of this Study*

For investigating health disparities in access to health care between older people with and without disabilities, this study employed a secondary data analysis, using the BRFSS for 2006. Although the BRFSS employs complex sampling design and this study appropriately used statistical analyses to examine such disparities, this study had some drawbacks resulting from the national survey data set and resultant secondary data analyses. The following are potential limitations of this study.

First, the BRFSS collects health condition and health risk behaviors of adults in the U.S. households, but did not include people in institutions, such as nursing homes or other long-term care settings. As a result, this data set may not reflect the full reality of the older population in terms of chronic disease or disability. In particular, given that

some older people, especially a significant portion of oldest-old population spend their later life in nursing homes, the BRFSS may not truly capture health disparities among the oldest-old people. The Administration on Aging (2006) illustrates that the percentage of older people living in nursing homes in 2000 increases considerably with age: 1.1% for people age 65 to 74, 4.7% for people age 75 to 84, and 18.2% for people age 85 and older. This substantial portion of 18.2% for the oldest-old population may serve as a barrier to investigating health care access in this group.

Second, general limitations related to the participation of people with disabilities in national population surveys should be carefully considered. Kinne and Topolski (2005) compared the 2001 BRFSS with the Census 2001 supplementary survey, the 2001 and 2003 BRFSS disability supplements, and the Washington state population survey. All the surveys were telephone surveys except for the census survey, all focusing on the state of Washington. Kinne and Topolski (2005) demonstrated that people with disabilities were not underrepresented in all the population telephone surveys. In addition, adults with disabilities in the 2001 BRFSS did not show less severe limitations in sensory, mental, self-care, and multiple limitations, compared to adults in the Census survey. These findings could not be accounted for by differences in survey methodologies.

Despite this finding, however, the design and conduction of the BRFSS still warrant great consideration. Given that the BRFSS is a telephone survey, the nature of the survey may serve as an obstacle for the participation of people with disabilities, especially people with deafness or hearing problems. Moreover, individuals with severe cognitive or intellectual disabilities can have difficulty understanding survey questions,

more likely resulting in cessation, avoidance, or denial of participation in the survey. These limitations can further increase among older population given their high prevalence of chronic or severe illnesses and disabilities. As a result, the BRFSS may not accurately reflect access to health care among the population with disabilities.

Third, the BRFSS employs a crude and broad concept of disability, which may serve as a significant barrier for applying the findings of this study to people with disabilities in general. The BRFSS measures interviewees' disability, chronic diseases, and health status through the telephone interview. The BRFSS uses only two questions to define disability, which focus on any activity limitation and use of special equipment due to any health problem. In this concept of disability, individuals with temporary injuries using special equipment such as a wheelchair can be considered people with disabilities. This concept is considerably different from the concept of disability accepted by society or laws. Disability is a significantly complex concept and there exist a variety of definitions. If we refer to the ADA as a conservative approach, a person is considered having a disability when he or she meets one of the following criteria: (a) having a physical or mental impairment significantly limiting one's major life activity(ies), (b) having a record of the impairment, or (c) being regarded as having such an impairment. This definition of the ADA illustrates that the BRFSS employs a crude concept of disability stressing activity limitation, which can make people with disability in the BRFSS considerably different from those considered in society and the law.

In addition, the measures of disability in the BRFSS have not been validated (Okoro, Balluz, Campbell, Holt, & Mokdad, 2005). However, the clear concept of disability is essential to elucidate intricate mechanisms of health disparities for



individuals with disabilities. Further, functional limitations due to disability or chronic diseases are not measured in the core component section of the BRFSS. As a result, the severity of disability and chronic diseases cannot be examined in the BRFSS. These limitations prevented further investigations into determinants of health disparities among older people with disabilities.

Fourth, this study employed a cross-sectional data set for secondary data analysis. Cross-sectional analysis can have limitations in unraveling mechanisms of health disparities. Many health issues among older people are associated with various factors in their youth, such as lifestyle, socioeconomic status, food consumption, or nutrition. Hence, studies without considering these factors associated with younger days of older population should have some limitation to finding causality of health disparities. The drawback pertaining to causality limits generalizing the findings of this study to a broader population.

Fifth, this study examined health disparities in access to health care through cost barrier to health care, personal health care provider, and routine physical checkup. Due to a lack of information in the BRFSS, more direct aspects of health care access could not be investigated. For instance, this study examined the number of personal health care providers, and it was found that older individuals with disabilities were more likely to have more than one personal health care provider. However, the actual use and volume of health care, such as the number of physician visits or hospital admission, could not be appropriately investigated through the number of health care providers.

Finally, this study investigated health disparities of older people with disabilities on a national level. This approach could present a national picture of the health

disparities. On the other hand, it may have drawbacks in terms of a given state because such disparities can be different from state to state, but the variability cannot be adequately captured in the aggregate approach. As a result, the applicability of the findings in this study to the state level is limited.

### *Suggestions for Future Research*

Given the findings and limitations of this study, the following suggestions are presented for future studies that investigate the determinants of health disparities for older people with disabilities and mechanisms of such disparities. First, it is clear that access to and utilization of health care are intricately intertwined with a great variety of factors. With regard to the behavioral model, access to health care itself is conceived to influence predisposing characteristics, enabling resources, and health needs. Thus, access to health care is dynamic and recursive in the model. However, this study restricted its attention to the linear effects of the behavioral model variables—predisposing characteristics, enabling resources, and perceived and evaluated health needs—on access to health care. Health disparities in access to health care for older persons with disabilities could not be effectively accounted for by only those behavioral model variables considered in this study. This finding suggests that future studies need to account for dynamic and recursive aspects of access to health care to better understand the intricate mechanisms of health disparities.

Second, this study placed attention on the examination of the existence of health disparities among older individuals with disabilities due to a great lack of emphasis in the literature on this issue. This study found the existence of the health disparities. This finding warrants further studies to elucidate and unravel intricate mechanisms of such

disparities. Future studies should focus attention on the following points:

- Interaction between gender and race/ethnicity
- Subdivision of health care coverage including private health insurance
- The effect of functional limitations on access to health care
- The impact of aging on people with disabilities, and, if possible, the further differentiation of the impact of aging on individuals with disabilities who acquired their disabilities at older age and those who had disabilities in their youth
- A lifelong approach of the impact of disabilities on health status and access to health care for older people with disabilities
- The actual use and volume of health care for older people with disabilities

Given the widely heterogeneous compositions of a group of people with disabilities and the challenge of defining and measuring disability, the operationalization of individuals with disabilities need to be clearly stated and discussed in future studies.

Third, a rigorous and comprehensive approach needs to be taken in future studies on health disparities of people with disabilities. Future studies should go beyond simply exploring health disparities issues to rigorously investigate determinants and mechanisms of the health disparities. In doing so, research on health disparities should be comprehensively carried out on the wide spectrum of disabilities. At the same time, given challenge of the participation of people with disabilities in surveys, qualitative studies also should be employed in tandem with quantitative studies to gain deeper understanding of access to and utilization of health care among individuals with disabilities.

### *Conclusions*

The two purposes of this study were to examine whether health disparities in access to health care existed between older individuals with and without disabilities, and, if such disparities existed, to what extent such disparities could be accounted for by the behavioral model variables. This investigation demonstrated that significant disparities in access to health care—cost barrier to health care, health care provider, and routine physical checkup—existed between the two older populations. In addition, this study illustrated that such disparities were accounted for by the behavioral model variables in each aspect of health care access, and that each mechanism had intricate patterns. Thus, this study demonstrated that health disparities in access to health care for older people with disabilities occurred through intricate mechanisms.

This study indicated that as compared to their counterparts without disabilities older individuals with disabilities paid more attention to their health, as evidenced by the finding of personal health care provider and routine physical checkup. This study also demonstrated that in spite of the near-universal coverage of Medicare for older people age 65 and over and supplemental coverage of Medicaid for those with low incomes older individuals with disabilities were more likely than their counterparts without disabilities to face challenge in accessing timely health care.

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