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**THE EFFECTS OF SOCIAL NETWORKS AND SOCIAL SUPPORT ON THE
RELATIONSHIP BETWEEN RACE/ ETHNICITY AND DISABILITY IN
OLDER ADULTS**

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RELATIONSHIP BETWEEN RACE/ ETHNICITY AND DISABILITY IN
OLDER ADULTS**

by

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Dedication

This work is dedicated to my mother, Delores Hirth, for the encouragement you gave me,
and for helping me to realize that I could do anything that I set my mind to.

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Objectives: Researchers have begun to focus on social resources, including social support and social networks, as being important to health. Especially in the case of race and ethnic differences in disability among older adults, social resources are important to consider because they may be able to help explain some of the gap in disability that exists between groups. This study describes the effects of social support and social networks on disability in older whites, blacks and Mexican Americans. **Methods:** In this study, two sets of longitudinal data were used to conduct the analyses, including the Hispanic EPESE (1993-2007) which represents older Mexican Americans 65 years and older (N=3,050), and the Duke EPESE (1986-1992), that consists of older blacks and whites 65 years and older (N=4,316). Generalized linear mixed models were used to analyze the change in disability across time, and discrete-time hazard analysis estimated with logistic regression was used to analyze the risk of developing disability and recovery between

intervals of data collection. **Results:** Social support was associated with decreased disability among blacks and whites; however, contrary to hypotheses, social support was associated with increased disability across time among Mexican Americans (with the inclusion of depressive symptoms in the models). In addition, social support partially mediated the association between race and disability. Focusing on social networks, the results showed that social network size is associated with decreased disability across time in all groups and with greater recovery among blacks and whites. A higher proportion of friends was associated with less disability across time among Mexican Americans and a decreased risk of developing disability among blacks and whites. **Conclusions:** This study illustrates the complex nature of social support and social networks and how each affects disability in diverse populations. Depression plays an important role in the association between social support and disability among Mexican Americans, and health is also important in the association between social support, social networks, and disability in all three groups. In the future, researchers should consider the sociocultural context of social support and social networks in investigating health disparities in disability.

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Introduction

The aging of the population of the United States is occurring at a rapid pace (Goulding, Rogers et al., 2003). Aging is associated with many health conditions that negatively impact the older adult's well-being and ability to live independently (Goulding et al., 2003). One important health condition that can impact the freedom of older adults to live independently is disability.

Disability is of concern in the United States because it disproportionately affects minorities who have less resources to deal with illness and disability (Mendes de Leon, Barnes et al., 2005). Much study has been done that examines proximate risk factors to disability, but there is much work yet to be done on how social resources affect disability.

There is a gap in the literature that deals with how different social resources affect disability among different racial and ethnic groups. A few studies exist that examine the effect of social networks on disability in different cultures, but they do not compare results across sociocultural groups (Giles, Metcalf et al., 2004; Mendes de Leon, Glass et al., 1999; Mendes de Leon, Gold et al., 2001; Walter-Ginzburg, Blumstein et al., 2004). New research has indicated that there are, indeed, differences in when social resources are sought and received and how they affect health depending on the sociocultural context in which the population is situated (Kaniasty & Norris, 2000; Litwin, 2010). In addition, more research is needed to address how social support and social networks affect the disparity in disability that exists between older blacks and whites in the United States.

This study was proposed because of the lack of research in the literature that addresses how social support and social networks affect disability among different racial and ethnic groups. This study explores the effects of social support and social networks on disability among two samples of older adults. The first sample of older adults comes from the Duke established population for the epidemiologic study of the elderly (EPESE), administered between the years 1986 and 1992. This sample of older blacks and whites comes from five counties in North Carolina, and will be used by this study to examine the effects of social support and social networks on the difference in disability by race.

The second sample comes from the Hispanic EPESE, a longitudinal sample of Mexican Americans from five states in the Southwestern United States that was administered between 1993 and 2007. Although this sample cannot be pooled with the Duke EPESE sample for direct comparisons due to the difference in the time periods that they were collected, general comparisons of the effects of social support and social networks on disability can be made between Mexican Americans and older blacks and whites. This study is intended to indicate if there are any differences in how social support and social networks affect disability between different groups, and whether social support and social networks affect the differences in disability that can be observed by race.

This study examines disability in three different ways. The first two aims examine disability among all respondents from the Duke EPESE and the Hispanic EPESE whether they were disabled or not. The analyses for these two aims examine the change in the level of disability among the respondents across time. The last two aims examine the

other two types of disability. The second way of examining disability includes only non-disabled respondents at baseline, and examines the risk of developing a disability between any interval in the study. Individuals who recovered fully within any interval were subsequently considered “at risk” during the next interval. The third way that disability was examined was by including respondents at baseline who had reported a disability at baseline, and then the “risk” of full recovery from disability in any subsequent interval in the study was measured. In this case, if recovery occurred, and then in a subsequent interval of data disability was reported again, the respondent re-entered the analyses, and was “at-risk” for recovery again.

This study indicates that there are some differences in how social support and social networks affect disability among older blacks and whites compared to Mexican Americans. Greater social support is associated with less disability among older blacks and whites across time, while greater social support is associated with increased disability among Mexican Americans across time. Health appears to play an important role in the association between social support and disability among blacks and whites, with health factors attenuating the association between social support and disability. However, among Mexican Americans, the association between social support and disability is suppressed by depressive symptoms. In addition, social support reduces the association between race and disability.

Social network size seems to be important among both the respondents of the Duke EPESE and the Hispanic EPESE, with larger social networks associated with less disability across time, and a lower risk of developing disability. However, the proportion

of friends in the social network is associated with less disability across time among Mexican Americans, but the association is not as strong among blacks and whites.

This study shows that there are some differences in how social support and social networks directly affect disability, and adds to the literature in this area. This study also provides reason for caution to other researchers that results from analyses that assess social support and social networks should be viewed in the sociocultural context for the population studied.

Chapter 1: Study Goals

Differences in health outcomes among different racial/ethnic groups continue to persist despite efforts by several national programs to eliminate these disparities. Disparities for many major and debilitating diseases exist by racial/ethnic groups and include: cardiovascular disease, cancer, diabetes, HIV/AIDS, cognitive function, stroke, and disability (Adkins, Wang et al., 2009; Allison, Cushman et al., 2009; Kagawa-Singer, Dadia et al., 2010; LaVeist, Thorpe et al., 2009; Oramasionwu, Brown et al., 2009; Pandey & Gorelick, 2005; Sloan & Wang, 2005; White & Keenan, 2009; Zsembik, Peek et al., 2000). These conditions place a large burden on families and financial resources, and are of special concern among populations that may not have good access to medical care, and suffer disproportionately due to the economic hardships that disease and disability may impose on finances that are already strained. Disability in old age in particular reduces the ability of older adults to function independently and often accompanies other debilitating chronic diseases that need special care.

Disability in older adults is an important public health concern. Chronic disability in older age is associated with lower quality of life and with increased risk of mortality among older adults (Jang, Chiriboga et al., 2009; Marengoni, von Strauss et al., 2009). Although disability rates in older adults appears to be decreasing, disparities persist by racial and ethnic groups (Erickson & Lee, 2008; Manton, 2008a; Mendes de Leon et al., 2005; Wolf, Mendes de Leon et al., 2007; Zsembik et al., 2000). Studies of disability and socioeconomic status have failed to fully explain why the gap in disability rates exist (Litwin, 2003; Mendes de Leon et al., 2005).

Although many explanations have been explored, more focus has been placed on the social resources of older adults. Some social resources, such as social networks and social support, have been emphasized by researchers as being particularly important to the health of older adults. “Social network” refers to the web of relationships that each individual person maintains, including relationships with friends, family, and formal relationships with other individuals and groups (Seeman, 1996). “Social support” is interaction with others that leads the receiver of the interactions to believe that they are cared for and loved as well as held in esteem and part of a network of obligations that are shared by all members of that network (Cobb, 1976). Social networks, including network type and size, have been associated with reduced risk of disability among older adults, while social support has been shown to be associated with various health conditions such as hypertension and diabetes that strongly affect disability (Al Snih, Fisher et al., 2005; Bell, Thorpe et al., 2010; Litwin, 2003; Mendes de Leon et al., 2001; Strogatz & James, 1986).

Social networks and social support may explain some of the differences that remain in disability by race/ ethnicity after sociodemographic status has been accounted for. This study will examine the effect of social support and social networks on disability across time. Disability is examined three ways in this study. First, disability is examined as the change in general disability levels across time, and includes all respondents in the analyses, whether disabled or not. Second, disability is examined in non-disabled older adults as a development of one or more disabilities from a non-disabled state. Third, disability is examined as a change from being disabled to full recovery. This study uses the data from two data sources. These two sets of data include older Mexican Americans

(n=3,050) from the Hispanic established populations for the epidemiologic study of the elderly (EPESE) study, and examine differences in disability by race from data collected in the Duke EPESE study (n=4,136). This study will also explore how social support and social networks affect the association between race and recovery from disability. In this study, non-Hispanic whites will be referred to as whites, and non-Hispanic blacks will be referred to as black.

The data that will be used to explore the aims of this study come from the Duke EPESE (data collected 1986-1992) and the Hispanic EPESE (data collected 1993-2007). Direct comparisons between the two sets of data are not possible because the data were collected in time-frames that did not overlap and because of geographic differences of the populations studied. Therefore, the data could not be pooled into one set where older Mexican Americans could be directly compared with blacks and whites from the Duke EPESE. Therefore, direct race comparisons could only be made using the Duke EPESE and direct ethnic comparisons with blacks and whites from the Duke EPESE could not be made using the data from the Hispanic EPESE. The following are specific aims describing the goals of this study:

SPECIFIC AIMS

Specific Aim 1

Examine the effect of social support on disability levels over time among older blacks, whites, and Mexican Americans.

Description of Specific Aim 1

Differences in disability rates by race and ethnicity are well documented, with older blacks having a high rate of ADL disability, similar to rates experienced by older Spanish-speaking Hispanics, and higher than whites or English-speaking Hispanics (Dunlop, Song et al., 2007). Older black adults have higher levels of disability and experience earlier onset of disability than older white adults (Mendes de Leon, 2005; Mendes de Leon, Beckett et al., 1997). Since socioeconomic status cannot fully explain why differences in disability rates persist, researchers have considered how social interaction among older adults affects disability. For example, social support is associated with lower disability among older adults and evidence suggests that access to social resources, such as social support, may vary by race (Barnes, Mendes de Leon et al., 2004; Finch & Vega, 2003; Mendes de Leon et al., 2001). This study will explore how social support affects the change in disability levels among older Mexican Americans in the Hispanic EPESE study between the years 1993-2007 and older blacks and whites from the Duke EPESE study between the years 1986-1992. This study will also explore whether social support affects the association between race and disability between older blacks and whites from the Duke EPESE study.

Representative Hypotheses:

- 1a. Greater social support will be associated with lower levels of disability in whites, blacks, and Mexican Americans.

1b. Blacks will have higher rates of disability than whites and social support will mediate the association between race and disability among respondents from the Duke EPESSE.

Specific Aim 2

Examine the effect of social network size and characteristics on disability levels among older blacks, whites, and Mexican Americans over time.

Description of Specific Aim 2

Social networks include a variety of individuals who may provide different types of support. Social networks are usually composed of several types of contacts that are measured in studies using terminology that reflects the relationship that each person has with the subject. These network members usually include: friends who are not related to the subject, relatives other than children, children, or confidants. It has been shown that friends, relatives, and children have an important effect on disability in older adults (Giles et al., 2004; Mendes de Leon et al., 1999; Seeman, Bruce et al., 1996). However, results from these studies are not always consistent and do not agree on what types of relationships provide more benefit to older adults in terms of developing disability. These studies have concluded that the composition of social networks, including those that consist of a higher proportion of friends, and in some studies social networks with a higher proportion of relatives, is associated with lower risk of disability in older adults among various geographic and cultural groups (Giles et al., 2004; Mendes de Leon et al., 2001; Walter-Ginzburg et al., 2004). In order to examine how social networks affect

differences in disability by race/ ethnicity, this study will investigate the association between social networks and disability and the possible mediating role of social networks in the pathway between race and disability. Data for this aim will be taken from the Duke EPESE (1986-1992) and the Hispanic EPESE (2004-2007). The social network data was available in the last two waves of data collection for the Hispanic EPESE, so those are the data that are used for the social network aims. The last two waves of the Hispanic EPESE include older adults that were 75 years and older at the time of the interview.

Representative Hypotheses:

2a. Larger social networks will be associated with less disability in whites, blacks, and Mexican Americans.

2b. A higher proportion of non-kin in the network of older adults will be associated with less disability in whites, blacks, and Mexican Americans.

2c. Blacks will have higher rates of disability than whites and the association of race with disability will be partially mediated by social network size and composition (proportion of non-kin in network) among respondents from the Duke EPESE.

Specific Aim 3

Explore the effect of social support on the risk of developing disability and recovery from disability in older black, white, and Mexican American adults.

Description of Specific Aim 3

Social support is associated with an increased likelihood of recovery from disability and functional status among older adults (Kempen, Scaf-Klomp et al., 2001; Weinberger, Hiner et al., 1986). Recovery is an important part of the disability process. Disability does not work one way, where a person becomes disabled and either remains disabled or becomes worse. Recovery is also an important facet of disability, and will be examined in this study. This study will also examine racial/ ethnic differences that may exist in both recovery and disability. While there is not much evidence that there is a difference by race/ ethnicity in the recovery process, some evidence exists that there are differences in the onset of disability among racial/ ethnic groups. The differences in disability rates that vary by race/ ethnicity cannot always entirely be explained by socioeconomic or health status (Mendes de Leon et al., 2005; Mendes de Leon et al., 1997). Therefore, it is important to study other factors, such as social support, that may play a role in the differences in disability rates that have been observed to exist among racial/ ethnic groups. In order to fully understand differences that exist, it is important to consider both disability and recovery from disability, as the duration of disability plays a role in determining the rates of disability in any population. This study explores whether social support explains some of the racial/ ethnic differences in disability and recovery. Racial differences will be compared using data from the Duke EPESE study (1986-1992) and will be compared to results that are found among Mexican Americans using data from the Hispanic EPESE (1993-2007) study.

Representative Hypotheses:

3a. Greater social support will be associated with a decreased risk of developing disability and increased risk of recovery from disability in whites, blacks, and Mexican Americans.

3b. Blacks will have a higher risk of developing disability and a decreased risk of recovering from disability compared to whites. Social support will mediate the association of race with developing disability and with recovery from disability among respondents from the Duke EPESE.

Specific Aim 4

Examine the effect of social networks in among older blacks, whites, and Mexican Americans on the risk of developing disability and recovery from disability.

Description of Specific Aim 4

Social network size as well as the composition of social networks have been shown to affect the transition into disability, as well as the level of disability, in several studies across geographic and culturally diverse populations (Giles et al., 2004; Mendes de Leon et al., 1999; Walter-Ginzburg et al., 2004). Different types of social ties, such as relatives, spouse, and friends, within the social network have not only been shown to affect disability, but have also been shown to be associated with disease outcomes and mortality (Berkman & Syme, 1979; Giles et al., 2004; Mendes de Leon et al., 1999). Social network size is also associated with disability, with larger networks associated with less disability (Mendes de Leon et al., 1999). It is also possible that social network

size and composition may influence recovery from disability; larger networks, as well as networks with more friends or relatives are associated with less disability in older adults (Mendes de Leon et al., 2001). However, there is less evidence to show that social network size and composition is associated with recovery among older adults of different racial/ ethnic groups. This study will examine how social network size and composition affect the association between race and development of disability, as well as recovery from disability. Racial differences will be examined using the Duke EPESE study (1986-1992) and results for Mexican Americans will be examined using the last two available waves of the Hispanic EPESE (2004-2007) study.

Representative Hypotheses:

- 4a. A larger social network size will be associated with a decreased risk of developing disability and an increased risk of recovery from disability in whites, blacks, and Mexican Americans.
- 4b. A higher proportion of non-kin in the social network will be associated with a decreased risk of developing disability and increased risk of recovery from disability in whites, blacks, and Mexican Americans.
- 4c. Blacks will have a higher risk of developing disability and a decreased risk of recovering from disability compared to whites. The association of race with developing disability and recovery from disability will be partially mediated by social network size and composition (proportion of non-kin in network) among respondents from the Duke EPESE.

Chapter 2: The Role of Social Networks and Social Support in Disability and Health Disparities

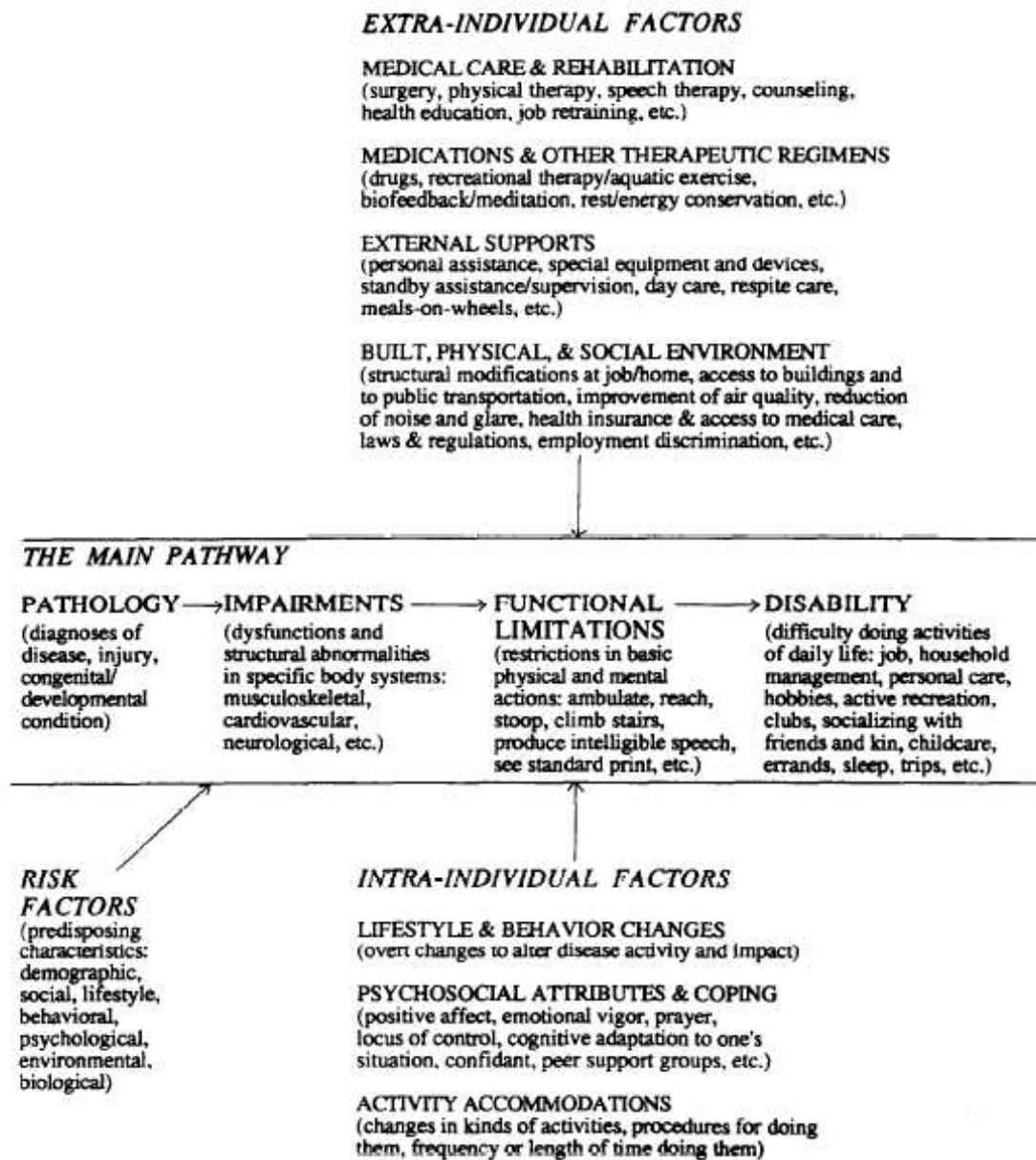
DISABILITY: A PROCESS

Disability is discussed as a process because this term reflects the trajectory of functional outcomes over time and the factors that affect the direction, pace, and patterns of change (Verbrugge & Jette, 1994). Disability is not just a single-dimensional measure of a person's ability to perform a task. It is an ongoing process that can be very different for each person who experiences a particular type of disability. Verbrugge and Jette (1994) have proposed a model that helps to understand the disablement process and the factors that precede and affect the transition into disability and recovery from disability. The model proposed by Verbrugge and Jette (1994) is illustrated in figure 2.1.

“Disablement” is a general term that describes the impact that chronic and acute conditions have on a person's ability to act in necessary, usual, expected and personally desired ways in their society and can refer to any consequences of pathology for functioning (Verbrugge & Jette, 1994). The disablement process model includes factors that affect the main pathway between pathology and disablement, as shown in figure 2.1, that include factors that may speed up or slow down the progression of the disablement process (Verbrugge & Jette, 1994).

Pathology is the interruption of normal physiological processes that may occur due to disease, injury, or a congenital condition (Verbrugge & Jette, 1994). The interruption of the physiological processes caused by chronic pathology can lead to impairments that affect specific body systems and results in significant abnormalities that

Figure 2.1: The Disablement Process Models from Verbrugge and Jette (1994)



Reprinted from Social Science & Medicine, 38(1), Verbrugge, L. M., & Jette, The Disablement Process, 1-14, Copyright (1994), with permission from Elsevier.

may have consequences for physical, mental, or social functioning (Verbrugge & Jette, 1994).

The next step that may occur in the disablement process is the progression to functional limitations. Functional limitations are restrictions in performing physical or mental processes that may be essential to daily life, such as speaking intelligibly or climbing stairs. Functional limitations affect physical and mental capabilities that are meant to act as the basic interface between an individual and their physical and social environment in which they perform daily activities (Verbrugge & Jette, 1994). Disability itself is a consequence of functional limitations and is described as experiencing any difficulty performing activities that are performed in a day-to-day routine because of health or any physical problem (Verbrugge & Jette, 1994).

Disability can affect many domains of a person's life, and can inhibit their ability to perform basic functions such as bathing or dressing as well as impairing more distal functions such as their ability to perform hobbies or interact socially. Disability in older adults may be a gradual process that can slowly affect their ability to function in a manner with which they are accustomed (Verbrugge & Jette, 1994). It can also occur suddenly, due to an acute event such as stroke. However, it must be noted that disability is not a one way process and recovery in older adults may occur, although full recovery from disability does not always happen. It is important to study disability, because disability leads to a lower quality of life in older adults, as well as inhibiting their ability to act independently, and is also associated with a diminished survival (Gruenewald, Karlamangla et al., 2007; Jang et al., 2009; Keeler, Guralnik et al., 2010; Marengoni et

al., 2009). This study focuses on how social support and social networks affect disability- both the level of disability across time in blacks, whites, and Mexican Americans, as well as how social support and social networks affect the development of disability and the recovery from disability as well.

RACIAL/ETHNIC DISPARITIES IN DISABILITY

Disability that occurs in older adults places a large burden on the aging adult and their family. Chronic disability places financial strain on the aging adult, as well as loss of well-being, loss of independence, reduced quality-of-life, and loss of feeling of use to others (Gruenewald et al., 2007; Jang et al., 2009; Marengoni et al., 2009). Disparities in disability place an unequal level of burden on minorities who may struggle disproportionately due to lower ability to afford rising healthcare costs and inability to reduce hours spent working to help an older family member to cope with increasing disability levels. Research has persistently found that disparities exist in disability in minorities in the United States despite a trend that shows a decrease in disability overall (Manton, 2008a, 2008b).

Differences in the rates of disability among different racial/ ethnic groups persist, and are reflected in national level data. Blacks are more likely than other minority groups to report mobility limitations and needing help in ADLs and IADLs among Medicare beneficiaries (Ciol, Shumway-Cook et al., 2008). Older Hispanics, according to the year 2000 Census data, report higher disability rates than whites, but lower disability rates than blacks (Markides, Eschbach et al., 2007). Mexican Americans reported lower rates of disability than Puerto Ricans, and less disability than blacks (Markides et al., 2007). Approximately 50% of older Mexican American men and 54% of older Mexican

American women reported having any disability (Markides et al., 2007). This is compared to 42% white males and 42% white females and 53% black males and 57% black females who reported experiencing any disability and were aged 65 years and older in the 2000 Census data (Markides et al., 2007).

A national study detailed the racial/ethnic differences in the prevalence and development of disability in older adults in the United States (Dunlop et al., 2007). This study showed that the prevalence of ADL disability among older blacks was substantially higher than in whites. In addition, the study illustrated that although Hispanics have similar rates of ADL disability compared with whites, those who interviewed in Spanish had a much higher prevalence of ADL disability than older whites when compared to older Hispanic adults who interviewed in English (Dunlop et al., 2007). The same national study also showed that over a 6-year period among older adults initially free of disability, close to one-third of older blacks (30.41%) and Hispanics interviewed in Spanish (32.67%) developed disability compared with the lower rates among Hispanics interviewed in English (19.98%) and older whites (20.13%) (Dunlop et al., 2007).

The “Hispanic” group has been shown to be rather heterogeneous, and there are differences in rates of disability and health among groups of Hispanics depending on their origination (Hajat, Lucas et al., 2000). Therefore, Hispanics are often separated into groups that represent their origin. For example, foreign-born Puerto Ricans have been reported to have higher prevalence of hypertension than Mexican Americans, and Hispanics of Cuban origin have lower prevalence of hypertension than Mexican Americans, and the prevalence of diabetes among Cuban-, Dominican-, and Central/South American-origin groups are lower than among Mexican Americans (Pabon-Nau, Cohen et al., 2010). For this study, Mexican Americans are the group of origin that was sampled and will be studied. Mexican Americans have slightly higher rates of disability

and report worse health than whites, but these rates remain somewhat lower than those reported by blacks, despite having similar socioeconomic circumstances (Hajat et al., 2000).

This pattern remains true, even among older adults who already have acquired disease factors that predispose them to disability. Among a nationally representative sample of older adults in the United States who reported being diagnosed with arthritis, there were still substantial differences in ADL disability reported by race/ethnicity. Among these arthritic older adults, the incident rates of ADL disability among blacks were 28.0%, similar to the rate reported by Hispanics interviewed in Spanish (28.5%) (Song, Chang et al., 2007). The rate of incident ADL disability among older arthritic whites (16.7%) was significantly lower, as was that of Hispanics who completed the interview in English (19.1%) (Song et al., 2007). This illustrates that even in groups of older adults with predisposing disease that has been shown to make disability more likely, minority groups still report higher rates of disability among a group where disease should make the risk of developing disability more similar among different groups.

It has been suggested that minority groups tend to be more concentrated among those of lower education and income groups. Because of the high concentration of minorities with lower socioeconomic status, most of the racial/ethnic gap in disability can often be explained by socioeconomic circumstances. However, often socioeconomic status does not explain all of the differences that are found in disability by race. In addition, the problem with disparities in disability is expected to persist and perhaps even grow more pronounced. These differences have continued to persist although there has been a reduction in overall disability among older adults (Manton, 2008a, 2008b). The general downward trend in disability occurs among all education, income, and racial/ethnic groups, but these declines appear to be greatest among the most educated

and those with the highest income (Schoeni, Martin et al., 2005). Because of the differences in the declining rates of disability, these trends have indicated a widening gap in disability between more and less advantaged groups, including educational and income groups (Schoeni et al., 2005). National data have confirmed the gaps in disability that exist among older blacks, whites, and Hispanics. Medicare beneficiary data has shown longitudinal disparities in levels of ADL and IADL disability among blacks, Hispanics and whites have persisted despite the overall decline in disability in the U. S. population during the past decade (Ciol et al., 2008). Even though socioeconomic status has been found to explain much of the variation in the differences in disability rates, it does not account for all of the variation in disparities that occur among chronically disabled older adults. Other factors, such as acculturation, social stress, or access to healthcare have been suggested as potential factors that may be associated with disparities in disability among older adults (Tirodkar, Song et al., 2008). These factors may be important in explaining some of the variation seen in disability rates among racial/ ethnic groups, but they are also tied to socioeconomic status and may not provide a complete picture of the variables that are affecting the association between race/ ethnicity and disability.

Disparities in disability are expected to persist and perhaps even grow more pronounced. The increase in the aging of the United States' population and the increase in rates of obesity are expected to have a large impact on disability rates (Ogden, Carroll et al., 2006; Sturm, Ringel et al., 2004). It has been predicted by some researchers that the current downward trend in disability will slow, and possibly even reverse itself as increased rates of chronic disease related to obesity and aging begin to have an impact on disability rates in the United States (Ogden et al., 2006; Sturm et al., 2004). Recent evidence has indicated that adults who are just entering the senior population (60-69 years old) face a significant increase in the prevalence of ADL, IADL, and mobility

disability, especially among non-whites and obese individuals (Seeman, Merkin et al., 2010). Obesity, as a significant risk-factor for disability, continues to show differences in prevalence by racial/ethnic groups, especially among women, children, and adolescents, potentially providing another source of disparities in disability among aging adults, especially in minority groups where the prevalence of obesity and obesity-related diseases are higher (Ogden et al., 2006). Hispanics are expected to particularly be at risk for an increase in physical disability levels due to a higher prevalence of obesity-related disease in older age, such as diabetes, and due to a tendency to report higher levels of depressive symptoms relative to non-Hispanic whites. (Beard, Gerst et al., 2009; Brown & Turner, 2010; Kim, Chiriboga et al., 2009) Current evidence suggests that there are increases in the rates of Mexican Americans and blacks reporting disability as they enter retirement age (Seeman et al., 2010).

Before these risk-factors for chronic disability in old age begin to make themselves more apparent, it is important to consider as many factors involved in the association of race/ethnicity with disability so that the disablement process can be better understood, as more apparent causes of chronic disability, such as health or predisposing disease are not the only causes of disability. Social determinants of disability have been gaining in importance in research that focuses on disparities in disability among older adults. Social networks, for example, have been shown to be associated with disability in various populations (Giles et al., 2004; Mendes de Leon et al., 1999; Mendes de Leon et al., 2001; Walter-Ginzburg et al., 2004).

SOCIAL NETWORKS AND HEALTH

Various pathways between social networks and health have been proposed. Part of the association between social network size and disability is likely due to the increased

risk of poor physiological health in older adults with smaller social networks. Smaller social networks are associated with higher mortality, increased risk of cardio-vascular disease, reduced cognitive function, and increased risk of stroke (Crooks, Lubben et al., 2008; Seeman, 1996). Having a smaller social network is believed to increase isolation from the social environment (Crooks et al., 2008). This isolation may decrease an older adult's ability to interact with others and cope with their social surroundings due to disuse of their social skills, and therefore contribute to the loss of cognitive ability (Crooks et al., 2008). This has occasionally been referred to as "use it or lose it" in the literature, where using social skills is necessary to maintaining different health functions in older age and provides mental stimulation and variety that helps to preserve function (Coyle, 2003). It is also believed that smaller social networks may be associated with reduced ability to cope with stress, which in turn may lead to more severe health conditions such as cardiovascular disease and stroke . It has also been suggested that different types of members from the social network influence health decisions, both negatively and positively (Uchino, 2004). These decisions, such as eating choices or smoking, can accumulate and affect health, leading to disability. The size of the social network appears to be important in the association with disability, but also of seemingly equal relevance is the composition of social networks (Fiori, Smith et al., 2007; Litwin, 2003).

SOCIAL NETWORKS AND DISABILITY

Social Network Composition and Disability

Social network composition is an important predictor of developing and recovering from disability among older adults in groups from various geographic regions and cultural backgrounds (Giles et al., 2004; Mendes de Leon et al., 1999; Mendes de

Leon et al., 2001; Walter-Ginzburg et al., 2004). This is illustrated in several studies that have been conducted in Australia, Israel, and in different populations in the United States. In older adults who live in Australia, there were persistent associations with social network composition on disability (Giles et al., 2004). These protective effects varied in the study by the composition of the social network (Giles et al., 2004). Older Australians who reported that they had social networks that were composed mainly of relatives had less onset of mobility disability and reported more recovery than older adults with social networks that were composed of mainly confidants, friends, or children (Giles et al., 2004).

Mendes de Leon et al. (1999) found that more extensive social networks that were composed of a variety of different types of social ties were associated with decreased transition into ADL disability and increased recovery from ADL disability in a sample of older adults from a community in the United States. In addition to the beneficial effects of greater numbers of social ties, older adults were less likely to report developing disability over an eight year time period if social networks were composed primarily of relatives (Mendes de Leon et al., 1999). Also, recovery from disability was greater in older adults who reported social networks that were composed of more relatives or friends, compared to those who reported social networks that included higher numbers of children or confidants (Mendes de Leon et al., 1999). Social networks that were composed mainly of social ties with children or confidants was not associated with disability or recovery from disability across the eight years of the study (Mendes de Leon et al., 1999).

Another study that examined the association between social network composition and disability had slightly different findings. This study examined older black and white adults and found that social networks with a greater level of contact with friends, but not

relatives, had a protective effect against developing disability (Mendes de Leon et al., 2001). It was also found that increased contact with children was associated with increased development of disability (Mendes de Leon et al., 2001). In agreement with these study results, older adults that lived in an Israeli Kibbutz responded across time that social networks with a greater number of living children actually had an increased risk of ADL disability (Walter-Ginzburg et al., 2004). The study that examined older adults who live in an Israeli Kibbutz found that larger social networks, with the exclusion of networks that included mostly children, were associated with lowered risk of disability (Walter-Ginzburg et al., 2004).

All of these findings, from multiple studies, are all important to note, as they show many similarities in groups of older adults across sociocultural and geographical boundaries. However, there were some differences in the study results that created ambiguity when considering the results across all of the studies. For example, not all of the studies showed a negative effect of children on disability in older adults, and simply showed that social networks that were composed largely of children contacts did not affect disability at all (Giles et al., 2004; Mendes de Leon et al., 1999). In addition, the study by Mendes de Leon et al. (2001) reported that there were no differences in the transition into disability for older adults with more relatives in their social network, which was different than the results found in other studies. So there were some differences in the results across studies, leaving it unclear whether social networks that are composed of greater numbers of friends or relatives have a stronger effect on disability. It is possible that these differences indicate sociocultural influences that at work in the association between social network composition and disability.

Social network composition may act differently in different cultures depending on the different values placed on various types of relationships. Evidence shows that the

importance of different types of social network composition may affect older adults depending on the importance that their culture places on different types of social ties. For example, it has been proposed that Mexican Americans may place a higher level of importance on family ties than non-Hispanic whites (Almeida, Molnar et al., 2009). It was discovered that this importance placed in the ties held with family waned as Mexican Americans become more acculturated, or had a higher socioeconomic status in the United States (Almeida et al., 2009). Foreign-born Mexican Americans reported less friend support and more familial support than those born in the United States (Almeida et al., 2009). These findings may indicate that there are variations in how friend and family ties within the social network are perceived and may affect how differences in composition of social networks work to improve health among populations from different sociocultural backgrounds.

A potential variance in sociocultural norms may lead to differences in the association of social network composition and disability among different racial or ethnic groups, depending on expectations and the level of importance placed on a particular tie within each group. This could affect how social networks influence disability risk in a particular population, depending on the cultural contexts of different types of social ties. In addition to the sociocultural influence on social network composition, a small amount of evidence exists that shows that network composition also varies by different racial groups, although there is much more room for work in this area (Ajrouch, Antonucci et al., 2001; Barnes et al., 2004)

Social Network Size and Disability

Social network size is an important factor in the disability process. The size of the social network provides the framework from which older adults may draw support.

Differences in the sizes of networks of both older blacks and whites have been reported (Ajrouch et al., 2001; Barnes et al., 2004). Older blacks report smaller networks across time, although the network size remains more stable as they age compared to the social network size of whites (Barnes et al., 2004). This difference in network size could influence disparities in disability between blacks and whites, because if blacks have smaller social networks, then they have less of a framework for support during critical or stressful times in their lives, which may increase their risk for developing disability and decrease the risk for recovering from disability after disablement has occurred.

As for older Mexican Americans, there are no studies that directly compare network size with other groups of whites or blacks. However, there are studies that demonstrate decreased mortality when older Mexican Americans live in communities with a higher density of Mexican Americans (Eschbach, Ostir et al., 2004). Results that come from these types of studies may indicate that the Mexican Americans have numerous ties within their communities, and therefore are protected from negative health events. However, this does not answer the question about network size and composition among Mexican Americans, and there is a lot of work that could be done when considering social networks and the health of Mexican Americans. It is important to explore social networks and how they influence the disability process among different racial and ethnic groups so that disparities in disability can be better understood.

SOCIAL SUPPORT

Social support refers to the support that an individual receives or gives to members of their social network. Cobb (1976) refers to social support as the belief that a person is a member of a group that cares for, loves, and feels esteem for each other, takes part in mutual obligations within their group. Social support is a complicated concept that

has different domains that can be measured, such as emotional, informational, tangible, or belonging (Uchino, 2004). Emotional support is the perception that one is cared for and will be provided comfort in times of need, while informational is the giving of advice and guidance (Uchino, 2004). Tangible, often referred to as instrumental social support, is when a person gives another aid in a material form, and belonging support is when a person feels that they take part in social activities and have a general sense of belonging (Uchino, 2004).

Two types of support that are used often are measures that reflect both instrumental and emotional support. Perceived emotional support, in particular, seems to affect positive health outcomes, while received support does not have as strong of an association with distress (Uchino, 2004). So, in the context of this study, social support refers to perceived emotional social support, or the emotional support that a respondent perceives as being available to them. Even more specifically, social support is the perception by an individual that he/ she has family or friends that they can count on in times of trouble and/ or talk to.

SOCIAL SUPPORT AND HEALTH

Social support plays an important role in the well-being of older adults with chronic conditions, such as arthritis, depression, mental health, and disability, as well as all-cause mortality (Allen, Ciambrone et al., 2000; Evers, Kraaimaat et al., 2003; Fitzpatrick, Newman et al., 1991; Fitzpatrick, Newman et al., 1988; Kawachi & Berkman, 2001; Taylor & Lynch, 2004; Uchino, 2004). There are two models of social support that have been supported in the literature. The first model of social support is

believed to have a main or direct effect on health. The second model of social support is believed to moderate stress or have a buffering effect on stress. The next two sections describe both the direct effect model of social support as well as the stress-buffering model of social support.

Social Support and the Direct Effect Model

The direct effect model emphasizes an individual's embeddedness in their social network and allows them to engage in meaningful roles that increase their sense of purpose and esteem (Uchino, 2004). The sense of purpose or esteem both improves social identity and control, leading to improved physical health directly (Uchino, 2004). Social support has long been shown to have an effect on mortality (House, Umberson et al., 1988). The effect of social support on mortality has been found to be general, and not related to cause-specific mortality (House et al., 1988). However, there are different explanations for why social support might directly affect physical health, other than increasing an individual's feeling of belonging and the engagement in meaningful roles. Lower levels of social support have been linked to increased depression and negative morale, which are in turn related with negative health outcomes (Schaefer, Coyne et al., 1981).

Another pathway that exists in the direct effect model includes an explanation called the social control hypothesis. This pathway is thought to lead to improved physical health through support received from social networks encouraging improved health behaviors (Uchino, 2004). Improved health behaviors, such as smoking cessation and increased physical activity, can not only prevent poor health outcomes, but can also

decrease the effects of disease that have already occurred (Uchino, 2004). In addition, this pathway may also work through improving recovery once an individual has experienced an adverse health event. Social support may help to increase medication and rehabilitation adherence, improve the diet, and increase physical activity once it has been recommended by a doctor to do so due to poor health (Ahmad & Crandall, 2010; Carranza & LeBaron, 2004; Molloy, Perkins-Porras, Bhattacharyya et al., 2008; Wen, Shepherd et al., 2004).

Social Support and the Stress-Buffering Model

Social support has been described as being a moderator of life stress-a buffer that can limit the negative effects, such as depression, of acute events or stressful life events, as well as increase an individual's willingness to participate in healthful activities, and adhere to medication regimens (Cobb, 1976; Lin, Woelfel et al., 1985). It is believed that social support impacts individuals when a stressful event occurs-the stressful event appears less threatening, and reduces the impact of the event on health through the reduction of stress (House, 1987).

The buffering model of social support is a model that has received much attention and has been widely researched (Cobb, 1976). In the stress-buffering model, social support affects the association between a potential stressor and the appraisal of the stressor by the affected individual (Uchino, 2004). Thus, social support affects the individual's ability to cope with a stressful situation, such as the death of a spouse, and in turn, lessens the effect of that stressful situation on the individual's health (Uchino, 2004).

There is an abundance of literature that ties the occurrence of stressful life events to mental and physical health (Turner, Wheaton et al., 1995). It is thought that individuals living in lower socioeconomic circumstances tend to experience a greater number of stressful events, and therefore have a larger burden of physiological processes that are related to that stress (Turner et al., 1995). This greater exposure to stressful events can increase the risk for poor health among these populations (Turner et al., 1995).

The social support stress-buffering model proposes that social support reduces the negative impact of stressful situations on health. Social support is a multidimensional measure that can provide the support that will help an individual respond to a stressful event with the optimal coping response (Cutrona & Russel, 1990). However, understanding different types of stressors and how the negative effects that they elicit on health are complicated and it is still not well understood what type of social support will maximize the best coping response for a particular situation (Cutrona & Russel, 1990; Uchino, 2004).

Social Support and the Effect of Chronic Disease on Minorities

Social support may help to reduce the racial disparities that are found for different chronic conditions, regardless of socioeconomic status. In order to better understand the gap in disability among racial and ethnic minorities, it is important to consider other factors that may play a role in the disability process. Chronic disease plays an important role in the disability process, as it is associated with greater disability, and affects minorities disproportionately (Adler & Rehkopf, 2008; Bhattacharya, Choudry et al., 2008). Understanding how social support affects chronic diseases may help to explain the

effect of social support on disability. Research focusing on the relationship between social support and general health is limited, with much of the research focusing on small clinical studies. More of the larger studies are conducted with very specific outcomes, such as hypertension, diabetes, and coronary artery disease. Because of this, these are the conditions that will be considered in the following review.

Reducing the effects of chronic disease among vulnerable populations may help to overcome the gap that currently exists between whites and minorities in disability (Kubzansky, Berkman et al., 2000). Social support reduces the effects of various diseases that are associated with disability, such as hypertension and diabetes (Strogatz & James, 1986). Understanding those processes can not only help to prevent disease, but to lessen the health consequences, such as disability, among those who have the disease already. There is some evidence that racial and ethnic minorities may not only have reduced access to social resources, such as social support, but may view sources of social support differently from whites (Almeida et al., 2009; Ashida & Heaney, 2008; Barnes et al., 2004).

Social support has been shown to reduce the effects of chronic disease that are associated with increased disability (Bell et al., 2010; Evers et al., 2003). Hypertension and type II diabetes are just two examples of diseases that disproportionately affect racial and ethnic minorities, and affect the rates of disability among them (Cutler, Sorlie et al., 2008; Hertz, Unger et al., 2005). Although there are few studies that directly examine the role of race/ ethnicity in the relationship between social support and disability, it is possible to understand a little more about this relationship when the role of social support in the association between race/ ethnicity and chronic diseases is examined. Following is

a short discussion of hypertension and diabetes, and the role that social support plays in those two diseases among non-Hispanic blacks, whites, and Hispanics.

Hypertension is a chronic condition that shows a clear racial disparity in its prevalence and is related to increased disability in older adults, through its association with more acute diseases such as heart disease and stroke (Caskie, Sutton et al., 2010). Hypertension occurs in both older Mexican Americans as well as blacks in disproportionate numbers, and reducing the disparity in this disease could lead to a lessening in the disparities in disability by race/ ethnicity (Hertz et al., 2005). Bell et al. (2010) showed in a NHANES sample of black and white adults 40 years of age and older that the effect of emotional and financial social support reduced the effect of race on hypertension. This was similar to another study which reported that social support accounted for some of the difference in hypertension prevalence among blacks and whites (Strogatz & James, 1986). In the same study, married Mexican Americans had lower odds of hypertension than whites if they reported receiving both emotional and financial support (Bell et al., 2010). This is an important finding, because older Mexican Americans have a high risk of developing hypertension, which increases the likelihood of developing disability (Caskie et al., 2010). In a sample of Mexican Americans, the risk of ADL and IADL disability increased when the criteria for having developed hypertension was met over a period of seven years (Caskie et al., 2010). Hypertension is only one chronic condition that can erode health and lead to disabling conditions among older adults such as stroke, coronary heart disease, heart failure, vascular dementia, and chronic kidney disease (Franklin, 2006). Another chronic disease that has disproportionately affected Mexican Americans and blacks and is associated with a variety of disabling

conditions such as amputation, kidney disease, retinopathy, and vascular disease, is type II diabetes (Bash, Selvin et al., 2008; The Emerging Risk Factors Collaboration, 2010; Van Damme & Limet, 2007; Zhang, Saaddine et al., 2010). Since social support appears to play a significant role in the development of hypertension and its complications that can ultimately lead to disability, it is important to understand how the relationship between social support and hypertension works among Mexican Americans and blacks.

Older adults in Mexico who have been diagnosed with diabetes are at increased risk of experiencing a shorter total life expectancy as well as a shorter disability free life expectancy (Andrade, 2010). In order to mitigate the negative health effects of diabetes, adjustments to diet and increasing exercise are beneficial, in addition to adhering to a medication regimen (Ahmad & Crandall, 2010). Among Mexican Americans in the United States, the support of the spouse and family members, as well as doctors and friends to a lesser extent, is important in the maintenance of a healthy diet and exercise among those who have been diagnosed with type II diabetes (Carranza & LeBaron, 2004; Wen et al., 2004). Diet and exercise are important behaviors among individuals with insulin resistance, as they reduce the likelihood of developing the full form of type II diabetes and reduce the risk of morbidity and mortality resulting from the disease (Ahmad & Crandall, 2010). Social support has also been linked to adherence to medication regimens which in can both prevent future consequences of related chronic symptoms, and delay the recurrence of acute events, such as myocardial infarction, which in turn leads to increased morbidity and mortality among those with diabetes (Molloy, Perkins-Porras, Bhattacharyya et al., 2008; Molloy, Perkins-Porras, Strike et al., 2008).

In addition to the positive effects of social support on preventing and reducing the effects of disease or stressful events on the health of various populations, research indicates that social support is directly related to disability among older adults (Taylor & Lynch, 2004). Disability among different racial and ethnic groups can be attributed in part to high levels of physical limitations and medical conditions. However, social support is negatively associated with disability in groups of older blacks and whites, regardless of differences in education, income, or differences in health status (Mendes de Leon et al., 2001; Zsembik et al., 2000). Since social support is associated with disease that leads to disability, as well as with disability itself, it is possible that differences in social support play a role in the pathway to disability among older adults from different racial and ethnic groups.

SOCIAL SUPPORT AND DISABILITY

Emotional social support is associated with a reduced risk of disability in older blacks and whites, regardless of education, income, or physical health (Mendes de Leon et al., 2001). This is important because blacks report higher ADL and IADL disability than non-Hispanic whites and Hispanics, even after considering differences in sociodemographics (Carrasquillo, Lantigua et al., 2000). Although the effect of social support on disability is known, little research has been done that considers the effect of social support on the association between race and disability.

However, it is important to consider how social support affects disability before considering how social support affects the relationship between race and disability. Social support affects many facets of the disability process, such as recovery from disabling

conditions and reducing the onset of advanced disease that increases the risk of developing disability. For example, social support has been reported to affect the process of recovery from potentially disabling acute diseases, such as stroke (Mitchell, Teri et al., 2008). In addition, social support is associated with less depression, increased exercise compliance, and better medication adherence, which may also affect the onset of disability and recovery from disability, as well as increased well-being once disability has been experienced (Fitzpatrick et al., 1991; Fraser & Spink, 2002; Mitchell et al., 2008; Molloy, Perkins-Porras, Bhattacharyya et al., 2008; Taylor & Lynch, 2004). All of these processes are important to the disability process, and social support has an important role in not only preserving function, but also in reducing the disabling effects of an acute health event after it has been experienced.

Although social support may act directly to affect disability, much research focuses on the mechanisms through which it may affect disability and recovery from disability once an event has occurred. One method of delaying disability and recovering functions once disability has been developed is to lead a physically active life. For example, social support may increase an older adult's ability to cope with pain, which may help to increase their physical activity level both reducing the risk for developing disability and increasing functionality once disability has been experienced (Evers et al., 2003; Hardy & Gill, 2005). Social support not only acts through physical mechanisms, such as medication adherence and physical activity, but it also has been found to affect depression. Since depression is associated with disability and mortality, it is important to also consider the role that social support plays in depression.

Social support is associated with improved well-being in older adults with rheumatoid arthritis as well as improved quality of life in individuals who have experienced stroke (Fitzpatrick et al., 1991; Lynch, Butt et al., 2008). Improved well-being in those experiencing disabling chronic disease could help to improve their overall function, as well as decrease depression, which is associated with decreased disability-free life expectancy and decreased total life expectancy (Pérès, Jagger et al., 2007). Even though these mechanisms have been studied, it is still unclear whether social support protects older adults from developing disability, and what type of social support is more protective in the disablement process. Even more important is research that helps to examine how social support plays a role in the racial/ ethnic differences in disability.

Less research exists on the influence of social support on the association between race/ ethnicity and disability. It has been observed that blacks and foreign-born Hispanics, including Mexican Americans, more often rely on familial support than on friend support (Almeida et al., 2009). However, non-Hispanic whites and native born Mexican Americans with higher socioeconomic status tend to rely more on support from friends than their foreign-born counterparts or blacks (Almeida et al., 2009). These findings indicate that there is an ethnic difference in reliance on social support from different members of the social network. These findings show that there may be some sociocultural influences that affect social support. These sociocultural influences may in turn affect how social support protects different racial/ ethnic groups from disability. This study proposes to explore how social support affects disability among older Mexican Americans, blacks and whites in the United States.

MODEL USED IN THIS STUDY

This study will examine the effect of social support and social networks on disability using a direct effect model. Although there may be more proximal causes of disability, it has been argued that more research is needed on how social conditions, including social support and social networks, affect health without focusing on intervening factors that may detract from the essential relationship between the social condition and the health condition being studied (Link & Phelan, 1995). This study proposes to examine whether social support and social networks (size and proportion non-kin in network) affect disability directly, and if the associations differ between the three groups that are being studied. Other variables that are associated with disability or with social support are also included as controls in the models. These variables include: gender, marital status, race in the Duke EPESE analyses, education, time, age, Body-Mass Index (BMI), cognitive function, depressive symptoms and a count of seven chronic conditions including: cardiovascular disease, stroke, hypertension, cancer, diabetes, fractures after age 50, and arthritis.

Chapter 3: Methods

DATA

In this study, two longitudinal datasets will be analyzed. The datasets are from sites of the Established Populations for Epidemiologic Studies of the Elderly (EPESE). The datasets include samples representing five counties in north central North Carolina (Duke EPESE) and the Hispanic EPESE, a sample from the population of Mexican Americans in the states of Arizona, California, Colorado, New Mexico, and Texas. Detailed descriptions of the sampling methods for the Duke EPESE are available (Cornoni-Huntley, Ostfeld et al., 1993). The following sections will discuss:

1. Descriptions of the two EPESE studies.
2. Limitations and strengths of the data.
3. Measures to be included in the analysis.
4. Analysis plan.

DESCRIPTION OF THE DUKE EPESE

Baseline data collection for the Duke EPESE took place during in-home face-to-face interviews in 1986, with subsequent in-person interviews during the 3rd and 6th years. There were a total of 7 waves of data, representing years 1986 through 1992. During the years between the in-person interviews, respondents were contacted by telephone for data collection. Housing units were selected through a three-stage cluster sampling design within each of the five represented counties, and one person was selected from each

household that contained one or more people who were 65 years of age or older. Housing units were stratified by race, and blacks were oversampled to represent 55 percent of the sample. The response rate at baseline for the Duke EPESE sample was 80 percent. The baseline sample consisted of 4,162 men and women, with 2,260 self-identified as non-Hispanic blacks and 1,876 self-identified as non-Hispanic whites ($n = 4,136$). By the 7th wave of data collection, 1,281 of the respondents had died, and loss to follow-up was 4.4 percent (125 out of 2,862).

DESCRIPTION OF THE HISPANIC EPESE

The H-EPESE is a longitudinal study of Mexican Americans aged 65 years and older who live in the southwestern region of the United States and includes 6 waves of data to date. The H-EPESE was modeled after the other EPESE studies that were conducted in New Haven, East Boston, rural Iowa and North Carolina (Cornoni-Huntley et al., 1993). The subjects were chosen using area probability sampling procedures. The respondents were screened in face-to-face interviews, yielding 3,050 participants in the first wave, during the 1993-1994 interview year. There was an 83% response rate at baseline, similar to the other EPESE studies. Of the 3,050 subjects, 2,873 were interviewed without proxies, and the remaining 177 (5.8%) were interviewed by proxy. The interviews were conducted in Spanish or English, depending on the preference of the respondents. By the fifth wave of data collection in 2004-2005, 1,410 (46.2%) respondents had died and loss to follow up was 10.2 percent (309 out of the original 3,050). During the fifth wave of data collection, a new sample of 902 Mexican Americans aged 75 years and older was added to the original cohort. These 902

additional Mexican Americans will be included in the analyses that evaluate the second, third, and fourth aims because data for social network size and composition was available for the fifth and sixth waves of data collection and those analyses used all available participants.

STRENGTHS OF THE DUKE EPESE AND HISPANIC EPESE

These particular EPESE studies were chosen because they are longitudinal studies representing diverse populations of older individuals with similar study goals and methods. The two studies are consistent in their measurement of ADL disability in all of the waves. In addition, the Duke EPESE has consistent measurements of social support across the waves, and consistent measurements for social network size and composition for the first, fourth, and seventh waves. Both studies measure other variables that are important to this study consistently across waves of the study. The Hispanic EPESE includes solely older Mexican Americans as its respondent pool, and results will help to indicate the importance of conducting future research on this minority group. Also, both studies contain important similarities in variables, sampling techniques, and are consistent in measuring the control variables, such as depression, cognitive status, and chronic conditions across time that affect the association between the focal relationships.

LIMITATIONS OF THE DUKE EPESE AND THE HISPANIC EPESE

Measurement Consistency

Although the items in the questionnaires were the same in each wave in which they were included, some items that are important to the goals of this study were not

asked in each wave of the two studies. For example, in the Hispanic EPESE, detailed social network information is not available until waves 5 and 6, data that was collected between 2004 and 2007. Therefore, analyses concerning social networks as an independent variable will not be conducted using the Hispanic EPESE data until the fifth and sixth waves among Mexican Americans 75+ years of age.

The Duke EPESE also had certain variables that are available for only the first, fourth, and seventh waves of data collection when data was collected in person from respondents. These variables include IADL disability, Body-Mass Index (BMI), social support variables, social network variables, depressive symptoms, and cognitive status. Although it is expected that having less information for IADL disability may pose some difficulties in the analyses, the data that is available for the other variables should not present difficulties in the analyses.

Differences in Geographical Distribution

The two studies have major differences in the size and location of the regions represented in the sampling strata. Since the two populations that were sampled in different regions of the United States, with the Hispanic EPESE sampling older adults in five states in the Southwest and the Duke EPESE sampling older adults from a much smaller area representing five southern counties in North Carolina, there may be differences in results that stem from the population residing in areas with social and environmental variations and there could be unmeasured influences on the results. In addition, the population of the Hispanic EPESE represents a population from a much broader physical size than that of the Duke EPESE. The respondents from the Duke

EPese are more likely to be similar to each other due to proximity to other respondents compared in the sample, and due to the mostly rural setting of the counties that were sampled. This is opposed to the Hispanic EPese respondents, who represent older Mexican Americans from a very broad geographic area, and include respondents who both live in urban and rural settings.

Interview Timing

Surveys were administered during different time intervals. The H-EPese was administered during the years 1993-2006, while the Duke EPese was administered between 1986 and 1992. The results from this study must consider any cohort effects that may exist between the two studies and how that will affect any of the conclusions that are derived from comparisons between these studies.

Change in Mode of Interview

In the Duke EPese, there were waves of data that were collected using the telephone instead of face-to-face. In other studies assessing disability, respondents contacted by telephone tend to underreport disability in comparison to face-to-face interviews. Researchers report that the change in mode of interview technique could lead to inconsistencies within the data from wave to wave (Wolf et al., 2007). However, in the Duke EPese, the variables that were considered most vulnerable to this type of fluctuation in responses were only collected during the face-to-face interviews, and should not provide too much variation in the results of the analyses from this study.

MEASURES

Dependent Variables: Disability and Recovery

In order to assess functional disability in both the Duke EPESE and the Hispanic EPESE studies, the six activities of daily living (ADLs) will be used, including: bathing, dressing, eating, using the toilet, walking across a small room, and transferring from a bed to a chair. These measures assess limitations in basic physical functions that researchers consider as being more related to the underlying disease processes that are associated with age-related disability. These six items will be coded as a count variable for every respondent in each wave of data, with possible values ranging between 0-6. Respondents were asked if they needed assistance with 6 items during each interview in both the Duke EPESE and the Hispanic EPESE and ADL items are available across all waves of data for both questionnaires. The ADL questions that were asked are as follows:

Other than when you might have been in the hospital, was there any time in the past 12 months when you need help from some person or equipment or device to do any of the following things?

- Walking across a small room?
- Bathing, either a sponge bath, tub bath, or shower?
- Dressing, like putting on a shirt, buttoning and zipping, or putting on shoes?
- Eating, like holding a fork, cutting food or drinking from a glass?
- Getting from a bed to a chair?
- Using the toilet?

Disability will also be examined using the instrumental activities of daily living (IADL). IADL items represent underlying causes of disability that often leads to greater functional decline in an individual. The IADL scale includes items that involve interaction with the environment, such as: handling finances, shopping, food preparation, housekeeping, using the telephone, using transportation, and taking medication. These seven items will be coded as count variables, with possible ranges between 0-7. All seven items are included in the first, fourth, and seventh waves of the Duke EPESE and all 6 waves of the Hispanic EPESE.

In this study, disability is explored in three ways. For the first two aims of this study, disability level is averaged across all of the respondents, and is estimated as a function of change in the rate of disability across time-the outcome in this case describes how the average response across subjects changes with the covariates that are included in the model. The second way that disability is explored, and is used to analyze part of the last two aims, is by taking all of the non-disabled adults in the study at baseline and including them in a risk pool for disability. Each subsequent wave, there can be one of two outcomes: remained non-disabled or developed a disability. Respondents who developed a disability, then recovered fully, were allowed to re-enter the risk group. However, if a disability continued across more than one wave, only the first wave that represented the onset of disability was counted.

The third way that disability is assessed is through recovery from disability. Recovery is assessed for both ADL and IADLs. This study only considers recovery if complete recovery from ADL or IADL disability occurred. This is measured by including all respondents who report having difficulty with one or more disability item in the ADL

or IADL variable. After reporting at least one disability in a previous wave, if the respondent indicated in a subsequent wave that they did not have a disability, then they were considered fully recovered.

Independent Variables: Social Support

All waves of the Hispanic EPESE included measures of perceived emotional support, and can be compared to the perceived emotional support domain of the Duke EPESE study. The two items that detail social support in both of the surveys are as follows:

- In times of trouble, can you count on at least some of your family or friends most of the time, some of the time, or hardly ever?
- Can you talk about your deepest problems with at least some of your family or friends most of the time, some of the time, hardly ever?

Social support will be the combined score of the responses, with an answer of “hardly ever” assigned a value of 0, “some of the time” assigned a value of 1, and “most of the time” assigned a value of 2. The responses for the two questions will be added for a total possible range of 0-4. Social support measures are available for all six waves of the Hispanic EPESE and the first, fourth, and seventh waves of the Duke EPESE. In the Duke EPESE, social support will be included in the analyses in the first, fourth, and seventh waves. The intervening waves will have a missing value for social support. It is important to include the intervening waves because there is data that is important to the analyses included in those waves. This is especially important when ADL disability is the independent variable, as it varies across each year of the Duke EPESE study.

Social Networks

The social network variable will consist of two measures, including network size and network composition. Network size will be calculated using a count of number of relationships that the respondent reports feeling close to. These include: children, friends, and relatives other than children.

Network composition will consist of the proportion of non-kin (friends) to total network members that was reported by each respondent. To determine the proportion for the participants, the proportion of non-kin to total members that each respondent reported feeling close to will be calculated for the first, fourth, and seventh waves of the Duke EPESE and waves 5 and 6 of the Hispanic EPESE. Non-kin will be determined by the number of friends the respondent reports having. Kin will be determined by the number of living children and the number of relatives the respondent reports feeling close to. Waves from the Duke EPESE with no information included about social networks will be included in the analyses, and network information will be included in the models from only the first, fourth, and seventh waves.

Race/ Ethnicity

In the Duke EPESE, respondents were asked to identify their race. Those who identified themselves as non-Hispanic black and non-Hispanic white in the first wave will be used in these analyses. Hereafter, non-Hispanic blacks will be referred to as blacks, and non-Hispanic whites will be referred to as whites. The Hispanic EPESE consists only of older Mexican Americans.

Additional Covariates

It is important to include other established variables that are associated with disability, social networks, and social support to avoid confounding. Both sociodemographic characteristics and health-related variables will be included. Sociodemographic variables in this study are: age (coded in single years), gender, marital status (married, widowed, single), and education (years of school completed). Health-related variables will include Body-Mass Index (BMI), depressive symptoms, cognitive function, and a count of chronic conditions. Education and gender will be determined using information from the first wave of data from both studies.

BMI is available in the first, fourth, and seventh waves of the Duke EPESE and in all 6 waves of the Hispanic EPESE. Chronic conditions are available in all 7 waves of the Duke EPESE and all 6 waves of the Hispanic EPESE. Information for depressive symptoms are available in all 6 waves of the Hispanic EPESE, and were available for the first, fourth, and seventh waves of the Duke EPESE. Depressive symptoms are measured in both the Hispanic EPESE and the Duke EPESE using the Center for Epidemiological Studies Depression scale (CESD) (Radloff, 1977). There are some differences in the CESD scales between the two studies. The Hispanic EPESE used a version of the CESD depression scale with 20 items included in the scale. Responses were scored using a four point scale (0-3) with a total possible score for the entire scale ranging between 0-60. The Duke EPESE included a modified scale of the original CESD scale, where respondents were asked if they had experienced a symptom during the previous week. The CESD scale included 20 items that ranged in score from 0-20. The CESD has been found to be predictive of future clinical depression, although it does not provide a clinical depression

diagnosis (Roberts & Vernon, 1983; Schulberg, McClelland et al., 1987). The CESD is a widely used measure of depressive symptomology that has been found to be valid and reliable across many studies (Blazer, Hughes et al., 1987; Himmelfarb & Murrell, 1983).

Cognitive function is measured in the Hispanic EPESE using the Mini Mental State Examination (MMSE) in each wave, and the Short Portable Mental Status Questionnaire (SPMSQ) in the Duke EPESE for the first, fourth, and seventh waves. The MMSE is a widely used test that measured cognitive ability among older respondents. The MMSE includes 19 items that are scored between 0-30, with a higher score indicating better cognitive function. The SPMSQ is a 10 item questionnaire that determines impaired cognitive functioning based on errors in the questionnaire, but does not discriminate between good levels of cognitive function. The SPMSQ has been shown to be both valid and reliable (Fillenbaum, Leiss et al., 1998; Pfeiffer, 1975).

Chronic conditions will be measured as a count in both studies. Chronic conditions in both studies include: cardiovascular disease, stroke, hypertension, cancer, diabetes, fractures after age 50, and arthritis. If the respondent either reported that the doctor had told them that they had the chronic condition, or had told them that it was suspected to be present, then the condition was counted as a chronic condition that was present in the respondent. Possible scores range between 0-7.

STATISTICAL ANALYSIS

Overall Approach

Descriptive and bivariate analyses will be performed to show the frequencies of the model variables and correlations between variables in the models for both the Duke EPESE and the Hispanic EPESE. In order to test differences in mean disability prevalence for each wave, Analysis of Variance, or ANOVA will be used to determine whether there are significant differences between the means for blacks and whites. Next, a graph will be constructed to show the differences. Aims 1 and 2 will be modeled using generalized estimating equations (GEE) for generalized linear mixed models (GLMM) method in SAS statistical software to fit the longitudinal disability data. GEE for GLMM with a Poisson distribution and a log link specified in the model is appropriate for count data, which is expected to have a Poisson distribution, with repeated measures. This method can adjust for the correlated structure of data across repeated measures that occur within each individual case in a longitudinal data set like the Hispanic EPESE and the Duke EPESE. GEE for GLMM uses quasi-likelihood methods to estimate the unstandardized coefficient for the mean of the sample responses for disability, or beta, across time and standard errors, which will be what is estimated for any significant effects in the models that are analyzed. GEE uses a population average model which describes how the average response across subjects changes with the covariates. GEE estimates the marginal expectation, which is the average response for observations sharing the same covariates, as a function of the explanatory variables. Let Y_{ij} , $i = 1, \dots, n$, $j = 1, \dots, t$ be the j th outcome for the i th subject, where it is assumed that observations on

different subjects are independent, although associations between variables across time within each subject “cluster” is accounted for. The marginal regression model

$$\log(E[Y_{ij}]) = x_{ij}'\beta$$

where x_{ij} is a $p \times 1$ vector of covariates for the i th subject at the j th outcome. The β consists of the regression parameters of interest and the link function in this case is log, which is the appropriate link function for count data.

Aims 3 and 4 will be addressed using discrete time-hazard models estimated with the maximum likelihood method. Using SAS version 9.2, the hazard ratios will be estimated using the logistic procedure. This method allows respondents to move into and out of a “recovered” state, and can capture fluctuations from disabled to recovered, to disabled again. For the analyses that are measuring risk of disability, respondents must enter the analyses initially as non-disabled. The analyses will measure the risk of becoming disabled during subsequent waves.

For the analyses that are measuring risk of recovering from disability, respondents must begin in a disabled state during one of the intervals of available data and the event that is of interest is the “recovery” event after a respondent has reported a disability. So the analyses will produce a hazard ratio that will describe the “risk” of recovery during any of the intervals defined by the study.

Specific Aim 1 Analyses

For Hypothesis 1a, the association of social support with disability will be modeled longitudinally as a function of follow-up time since baseline using GEE for GLMM. This method estimates rates of change of the mean of the outcome variable

across time. In the case of this study, the outcome which is the unstandardized beta, measures the rate of change in the count of ADL or IADL variables across time. ADL and IADL are the dependent variables that will be assessed as continuous, Poisson-distributed count variables. ADLs and IADLs will be assessed separately, as count variables, for the focal relationship. Hypothesis 1a will use all waves of data in both the Hispanic EPESE and the Duke EPESE.

Hypothesis 1b will be tested with the Duke EPESE data using the steps for a mediation models (Baron & Kenny, 1986). Using the Baron and Kenny (1986) model for mediation is a rigorous assessment of a reduction in the association between two variables due to the influence of a third variable. Figure 3.1 shows the focal association between the independent variable, X, and the outcome variable, Y. Path c represents the total effect of X on Y.

Figure 3.1: Understanding Mediation through a Visual Representation of the Model: The Initial Model



Figure 3.2: Understanding Mediation through a Visual Representation of the Model: The Mediation Model

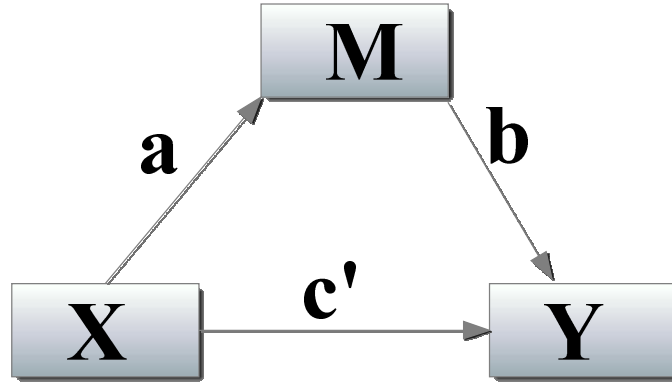


Figure 3.2 shows the mediated model. Complete mediation is when X is no longer associated with Y when M is included in the model. Partial mediation is when the effect of X on Y is reduced in size, but the difference is different than zero when the mediator is included in the model. So, the four steps come from this model. In order to mediate an association, X must be associated with M, and M must be associated with Y.

In this study, each association (a, b, and c) is established through steps. Then, the fourth step estimates c'. In this study, X represents race (black/ white in the Duke EPESE), and Y represents disability. M represents social support and is added into the model as the fourth step to determine whether there is a reduction in the association between X and Y. Once these steps are followed, the reduction in the association between X and Y can be evaluated to determine whether the value, c', is significantly different from zero. This test is called a Sobel test. It uses the formula

$$z\text{-value} = a*b/\text{SQRT}(b^2*s_a^2 + a^2*s_b^2)$$

where s_a is the standard error of the estimate, a and s_b is the standard error of the estimate, b in the mediation model.

Following is a discussion of the steps that will be used to determine the mediation effect of social support on the association between race and disability. Step 1 is to establish the association between race and disability. This association will be tested using GEE for GLMM across time. Step 2 is to show that race is associated with social support across time. Again, GEE for GLMM will be used, with a Poisson distribution and a log link, since social support is unevenly distributed. Step 3 will be tested using GEE for GLMM to measure the association of social support with disability across time. The fourth and final step is to add social support into the equation measuring the association between race and disability, and if the effect of race on disability is diminished, then social support has a mediating effect on the association between race and disability. If any reductions of the association between race and disability are noted, a Sobel test will be conducted to determine whether the reduction in the association is significantly different from zero. For the Hispanic EPESE data, since there are no comparison racial or ethnic groups, the association of social support on disability across time will be established for Mexican Americans 65+ years of age, across time for all 6 waves of data collected between 1993 and 2007.

Specific Aim 2 Analyses

Aim 2, which is to examine ethnic differences in the effect of social network characteristics on the change in disability in older adults over time, will also be analyzed using GEE for GLMM. ADL and IADL outcomes will be modeled separately. As in aim

1, aim 2 will utilize counts of ADL and IADL reports as the dependent variables. The counts will vary across time to capture change in disability levels. Hypothesis 2a, testing whether Larger social networks will be associated with less disability in whites, blacks, and Mexican Americans, will be tested by modeling the association of network size with disability across time. These models will be run across all 7 waves of the Duke EPESE. The effect of social network size on disability in Mexican Americans will be tested using waves 5 and 6 of the Hispanic EPESE, as only waves 5 and six have data available on social network size. These two waves of data were collected on 2,069 Mexican American 75 years of age and older in the 2004-2005 and 2006-2007 data collection years. This study will include 902 older Mexican Americans that were added to the study in 2004-2005, plus the 1,168 Mexican Americans surviving from the previous waves of data collection.

Hypothesis 2b, a higher proportion of non-kin in the network of older adults will be associated with less disability in whites, blacks, and Mexican Americans, will be modeled across time using GEE for GLMM. Focal associations will be examined, with change in ADL and IADL disability as the dependent variables. Network size and proportion of kin to non-kin relationships will be identified, with respondents with larger numbers of non-kin in their network expected to provide more protection against disability across time. This association will be tested in Mexican Americans using the Hispanic EPESE data in waves 5 and 6, and across all 7 waves of the Duke EPESE.

For hypothesis 2c, **blacks will have higher rates of disability than whites and the association of race with disability will be partially mediated by social network size and composition (proportion of non-kin in network) among respondents from**

the Duke EPESE, GEE for GLMM will be used to test the mediating effect of social network characteristics for the Duke EPESE data on the relationship of race/ ethnicity with disability across time, using the four steps for establishing a mediation effect (Baron & Kenny, 1986). The unadjusted model will be used to test for the mediation effect, consistent with another study that tested the mediation effects of education and physical activity on the association between ethnicity and cognitive function in late middle-aged adults (Masel, Raji et al., 2010). If any reductions in the effect of race on disability are noted when the mediator is included in the model, a Sobel test will be conducted to determine if the reduction in effect is different from zero.

Specific Aim 3 Analyses

To address hypothesis 3a, **greater social support will be associated with decreased development of disability and increased recovery from disability in whites, blacks, and Mexican Americans**, discrete time-hazard models, utilizing the logistic procedure in SAS version 9.2, will be used for the Hispanic EPESE and the Duke EPESE data sets. The association between social support and development of disability and recovery from disability will be tested across time for both sets of data. For development of disability, the “risk” group will consist of respondents at the beginning of each time period who reported no disability. If in a subsequent wave, the respondent reports developing at least one disability item within the disability scale being predicted, that will be coded as a “1,” and the individual will be considered as having developed disability. The discrete time-hazard models using logistic regression will be used to

predict development of disability between intervals. This method utilizes a maximum likelihood method of estimation.

For recovery from disability, each of the time intervals in both datasets will focus on respondents who have developed a disability at each interval. The discrete time-hazard models will then be used to predict recovery between intervals. This model will allow repeated events, where a respondent could reenter the risk group if disability and subsequent recovery occurs more than once in a respondent during the study. For the analyses that measure recovery, respondents will only enter the risk group if they reported a disability. Then, in a subsequent interval, if the respondent reported that they had “0” disabilities for the outcome being measured, then they were considered as fully recovered. For example, if respondent A reported 0 ADL disabilities for all of the intervals, then respondent A did not enter the equation, because he/she did not have a disability to recover from. If respondent B reports 2 ADL disabilities in the third interval, respondent B would then enter the analysis as disabled. In the next interval, if respondent B reported 0 ADL disabilities then respondent B would be considered recovered for that interval.

Hypothesis 3b, **social support will mediate the association of race with recovery from disability**, will be tested using the same discrete time-hazard analysis method. The estimation of the change in risk and the standard error from the maximum-likelihood estimates will be used to measure the mediation effect. In order to determine whether social support mediates the association between race and disability across six waves in the Duke EPESE, Baron and Kenny’s (1986) four steps for establishing mediation will be used. If any reductions in the effect of race on disability are noted

when the mediator is included in the model, a Sobel test will be conducted to determine if the reduction in effect is different from zero.

Specific Aim 4 Analyses

Hypothesis 4a, social network size will be associated with decreased development of disability and increased recovery from disability in whites, blacks, and Mexican Americans, will be analyzed with discrete time-hazard models by using the logistic procedure in SAS version 9.2 to examine the association between network size, disability and recovery across the seven waves of the Duke EPESE. Discrete time-hazard models will be used to examine the association between network size, disability and recovery in the 5th and 6th waves of the Hispanic EPESE.

The proportion of non-kin (friends) in social networks will be used to assess the focal relationship between race and development of disability, as well as race and recovery from disability in hypothesis 4b. Hypothesis 4b is that a higher proportion of non-kin in the social network will be associated with reduced development of disability, and recovery from disability in whites, blacks, and Mexican Americans. Discrete time-hazard models will be used to test the hypothesis and determine whether a higher proportion of friends in the social network reduces the risk of developing disability and increases the risk of recovery between any interval. This hypothesis will be tested using discrete time-hazard models with logistic regression for the 5th and 6th waves of the Hispanic EPESE, as those are the only two waves of data that the network variables are available for.

Hypothesis 4c, the association of race with risk of developing disability and risk of recovery will be partially mediated by social network size and composition (proportion of non-kin in network), will be evaluated using discrete time-hazard models, and the Maximum-Likelihood estimate and standard error will be used to determine if there is a reduction in effect between race and disability when the mediating variable is included in the model. This test will be conducted using Baron and Kenny's (1986) four step method for establishing mediation. Recovery as the outcome is used in the following example of how mediation will be established for this hypothesis. First, the association between race and recovery will be tested. For the second step, the association between race and social network size and composition (proportion of non-kin to kin) will be tested. The third step will establish the association of social network size and composition with recovery. The fourth and final step will establish whether mediation exists if the effect of race on recovery diminishes when social network characteristics is added into the models. If any reductions in the effect of race on disability are noted when the mediator is included in the model, a Sobel test will be conducted to determine if the reduction in effect is different from zero.

Chapter 4: Aim 1 Results

Chapters 4 through 7 summarize the results of the analyses that were conducted to address each of the four specific aims. Chapter 4 discusses descriptive statistics, the results that address aim 1, which includes longitudinal results assessing the relationship between disability and social support by race/ ethnicity, and the exploration of the social support variable¹. Two hypotheses were developed to explore the relationship between social support and disability among older blacks, whites, and Mexican Americans. The first hypothesis is: greater social support will be associated with lower rates of disability in whites, blacks, and Mexican Americans. The second hypothesis is: blacks will have higher rates of disability and social support will mediate the association between race and disability.

DESCRIPTIVE STATISTICS

Table 4.1 shows the baseline characteristics of the variables that are used in the analyses. Two sets of data, from the Duke EPESE dataset and the Hispanic EPESE dataset, were used in the analyses. In the Duke EPESE, there were 4,136 respondents 65 years of age or older who self-identified as either black or white from five rural counties in North Carolina. The Hispanic EPESE was the other dataset that was used, and represented older Mexican Americans 65 years or older from the Southwest. The sample size that was used in the baseline data was 3,050 respondents. However, analyses for Aims 2 and 4 will include 902 respondents that were at least 75 years old and that were added to the Hispanic EPESE in the 5th wave of data collection during 2004-2005. Social

network data was not collected for the Hispanic EPESE until the last two waves, between 2004 and 2007. Therefore, in the descriptive statistics, social network data for the Hispanic EPESE was calculated for the fifth wave (2004-2005) of data collection. After mortality and loss to follow-up, and with the addition of the 902 new respondents aged 75 years and more, the sample size in the Hispanic EPESE for Aims 2 and 4 is 2,069. The unweighted sample characteristics for the first wave of the two datasets are presented in table 4.1.

Demographic Characteristics

The average age was 73.6 at baseline in both the Duke EPESE and the Hispanic EPESE. Sixty-five percent of respondents from the Duke EPESE were women, and 57.7% of respondents from the Hispanic EPESE were women. In the Duke EPESE, 45.3% of respondents were white, and 54.7% were black. About three-fourths of the sample from the Duke EPESE had less than a high school education (77.27%), and 14.3% reported having more than 12 years of education. A large proportion of Mexican Americans also had less than a high school education (90.2%). The high proportion of older blacks and Mexican Americans that have a lower level of education is commonly seen in other studies. Education has an important role in the development of disability, and the large differences that are seen between whites, blacks, and Mexican Americans should be carefully considered when examining the results of this study (Choi & Schlichting-Ray, 2001).

Forty six percent of whites were married at baseline, and close to 50% were widowed. Thirty six percent of blacks were married at baseline, and 53.4% were

widowed. Over half of Mexican Americans (55.5%) were married at baseline, and 31.7% were widowed.

Health Variables Characteristics

Forty five percent of whites had a normal Body-Mass Index (BMI) while 44.7% had a BMI that was overweight or obese. Almost thirty percent of blacks had a normal BMI while 56.6% were overweight or obese. Twenty six percent of Mexican Americans had BMIs that were normal, while 63.2% were overweight or obese. BMI is an important predictor of disability, and the large differences that are found in BMI between whites, blacks, and Mexican Americans may affect the results greatly (Sturm et al., 2004).

At baseline, 82% of whites reported no ADL disability, while 79.8% of blacks and 86.2% of Mexican Americans reported no ADL disabilities. Ten percent of whites reported two or more ADL disability, compared to 12.6% of blacks and 10.6% of Mexican Americans. Seventy two percent of whites reported no IADL disabilities, while 62.8% of blacks and 46.8% of Mexican Americans reported no IADL disabilities at baseline. Seventeen percent of whites reported at least two IADL disabilities, compared to 23.3% of blacks and 38% of Mexican Americans.

The mean score for whites for the Short Portable Mental Status Questionnaire (SPMSQ) was 7.7 on a 0-9 scale. Blacks had a mean score of 6.8 for the same cognitive test at baseline. For the Mini-Mental State Examination (MMSE) that was administered to Mexican Americans, the average score was 24.7 with a total possible score of 30. The scores for the SPMSQ and the MMSE are not meant to be compared. These two indicators of cognitive function are not equivalent. However, each respective cognitive

test was the only one available for the study, and are used only to control for cognitive function, and not as a tool for comparison of cognitive abilities between the two studies.

The mean number of depressive symptoms reported by whites was 3, and blacks reported a mean of 3.4 depressive symptoms. Mexican Americans reported an average of 9.9 depressive symptoms. Twenty nine percent of whites reported no chronic conditions compared with 25.1% of blacks and 27.6% of Mexican Americans. Thirty percent of whites reported having at least 2 chronic conditions, compared with 32.5% of blacks and 41.5% of Mexican Americans.

Social Characteristics

Ninety-two percent of white respondents report that they can count on family/friends most of the time, while 82.8% of blacks and 74.6% of Mexican Americans made the same response. Seventy-nine percent of whites reported that they could talk to family/friends most of the time, compared to 67.9% of blacks and 72.6% of Mexican Americans. The mean score for social support was 3.6 for whites, 3.3 for blacks and 3.2 for Mexican Americans.

The mean total network size was 11.1 for whites, 11 for blacks, and 8.8 for Mexican Americans. The mean proportion of friends in the network was 0.51 for whites, 0.45 for blacks, and 0.2 for Mexican Americans. Mexican Americans had reported having a mean 4.9 number of children, while whites reported 2.7 children, and blacks reported 4.2 children. Both white and black respondents reported a mean 4.2 relatives in their networks, and Mexican Americans reported 2.1 relatives. Whites reported 6.2 friends in their networks, compared to 5.2 for blacks and 2.4 for Mexican Americans.

Table 4.1: Baseline Characteristics of the Duke EPESE (N = 4,136) and Hispanic EPESE (N = 3,050)

	Total Sample, Duke EPESE			Whites, Duke EPESE			Blacks, Duke EPESE			Mexican-Americans, Hispanic EPESE		
	Mean (St Dev)	%	n	Mean (St Dev)	%	n	Mean (St Dev)	%	n	Mean (St Dev)	%	n
Age	73.6 (6.7)	73.6 (6.8)		73.5 (6.6)	73.6 (6.8)		73.6 (6.8)	73.6 (6.8)				
Gender												
Female	2691	65.06	1218	65.0	1473	65.1	1759	57.7				
Male	1445	34.94	657	35.0	788	34.9	1291	42.3				
Total	4136		1875		2261		3050					
Race/Ethnicity												
Whites	1875	45.3										
Blacks	2261	54.7										
Total	4136											
Education												
<highschool	3144	77.27	1235	66.7	1909	86.1	2751	90.2				
highschool	342	8.41	243	13.1	99	4.4	206	6.8				
>highschool	583	14.33	373	20.2	210	9.5	93	3.1				
Total	4069		1851		2218		3050					
Marital Status												
Married	1578	40.18	813	45.6	765	35.7	1693	55.5				
Single/Divorced	325	8.28	92	5.1	233	10.9	390	12.8				
Widowed	2024	51.54	880	49.3	1144	53.4	967	31.7				
Total	3927		1785		2142		3050					
BMI												
< 18.5	506	12.23	193	10.3	313	13.8	334	10.9				
18.5-25	1513	36.58	844	45	669	29.6	791	25.9				
25-30	1368	33.08	615	32.8	753	33.3	1097	36.0				
30+	749	18.11	223	11.9	526	23.3	828	27.2				
Total	4136		1875		2261		3050					
Disability												
0 ADL	3335	80.8	1534	82.0	1801	79.8	2620	86.2				
1 ADL	318	7.7	148	7.9	170	7.5	99	3.2				
2+ ADL	473	11.5	188	10.1	285	12.7	322	10.6				
Total	4126		1870		2256		3041					
0 IADL	2772	67.2	945	50.5	1416	62.82	1356	72.47				
1 IADL	510	12.36	300	16.0	313	13.89	197	10.53				
2+ IADL	843	20.44	626	33.5	525	23.29	318	17.0				
Total	4125		1871		2254		1871					
Cognition												
SPMSQ (0-9)	(n=4044)	7.2 (1.7)										
MMSE (0-30)												
Depressive Symptoms												
CESD	(n=3972)	3.2 (3.4)										
Chronic Conditions												
0	1113	26.9	546	29.1	567	25.1	843	27.6				
1	1713	41.4	755	40.3	958	42.4	942	30.9				
2+	1310	31.7	574	30.6	736	32.5	1265	41.5				
Total	4136		1875		2261		3050					
Social Support												
Count on Friends/Family												
Hardly Ever	138	3.52	41	2.3	97	4.6	282	10.4				
Some of the Time	368	9.39	102	5.6	266	12.6	407	15				
Most of the Time	3415	87.1	1663	92.1	1752	82.8	2024	74.6				
Total	3921		1806		2115		2713					
Talk to Friends/Family												
Hardly Ever	338	8.63	149	8.3	189	8.9	297	10.9				
Some of the Time	728	18.59	238	13.2	490	23.2	447	16.5				
Most of the Time	2850	72.78	1415	78.5	1435	67.9	1968	72.6				
Total	3916		1802		2114		2712					
Social Support	(n=3951)	3.4 (1.0)										
Social Network**												
Number of Children	(n=3194)											
Number of Relatives	(n=3350)											
Number of Friends	(n=3443)											
Total Network Size	(n=4048)											
Proportion Friends/Kin	(n=3443)											
Total Network Size	(n=4048)											
Proportion Friends in Network	(n=3443)											

**Social network variables were computed using the Fifth Wave of data for Mexican-Americans, the initial wave social network information was available in the Hispanic EPESE data. (N=2069)

These results are important-Mexican Americans reported much smaller social network size than blacks and whites (statistical tests to determine the magnitude of difference were not made, since the data could not be pooled) and had smaller proportions of friends in their social networks.

AIM 1 RESULTS

Hypothesis 1a

Hypothesis 1a states is that **greater social support will be associated with lower rates of disability in whites, blacks, and Mexican Americans across time**. Table 4.2 shows the results from the longitudinal analyses that address hypothesis 1a. In Model 1 for blacks and whites from the Duke EPESE, social support is negatively associated with ADL disability ($p < 0.001$) when time is controlled for in the model. In Model 2, the effect of social support on ADL disability ($p < 0.001$) remains negative and significant when controlling for sociodemographics. However, after controlling for sociodemographics, race was not associated with ADL disability ($p > 0.05$) in Model 2. Health variables were added into the Model 3 analysis. The addition of BMI, chronic conditions, depressive symptoms, and cognitive function into the model partially attenuated the effect of social support on ADL disability ($p < 0.05$) among older blacks and whites in the Duke EPESE. However, higher social support was associated with decreased ADL disability, which was in the hypothesized direction.

Table 4.2 also shows the three models that analyzed the association between social support and ADL disability among Mexican Americans from the Hispanic EPESE dataset. In Model 1 and Model 2, there is no association between social support and ADL

disability among Mexican Americans. When health variables, including BMI, chronic conditions, depressive symptoms, and cognitive function are added into the model, as shown in Model 3, social support becomes positively associated with ADL disability ($p < 0.01$). The direction of the association is opposite of that hypothesized for Aim 1, indicating that there may be some differences occurring, perhaps cultural differences that were not examined, in the Hispanic EPESE sample compared to the Duke EPESE. There was a change in significance when the health variables were added into the model in the Hispanic EPESE, which indicates that there is a suppressor effect. This suppression effect will be briefly examined at the end of Chapter 4 to better determine why it exists and what health variables may be contributing to it.

Table 4.3 shows the results for the association between social support and IADL disability among older blacks and whites from the Duke EPESE as well as older Mexican Americans from the Hispanic EPESE. In Model 1 for the Duke EPESE data, social support is significantly associated with IADL disability ($p < 0.001$), with higher social support associated with reduced disability. In Model 2, after accounting for sociodemographics, social support continues to be significantly associated with IADL disability ($p < 0.001$) in the hypothesized direction. After adding sociodemographic variables into the model, older blacks reported more IADL disabilities than whites ($p < 0.01$). However, the association between race and IADL disability ($p > 0.05$) is completely attenuated once health variables are included in the model. After adding health variables into Model 3, social support is no longer associated with IADL disability ($p > 0.05$) across time.

For the Hispanic EPESE, social support acts differently than for the results seen in the Duke EPESE data. Initially, in the first two models, social support is not significantly associated with IADL disability ($p>0.05$), although the relationship is in the hypothesized direction. However, when health variables are included into the models, similar to the results that were found for the association between social support and ADL disability among Mexican Americans, social support is positively associated with IADL disability ($p<0.01$). Once again, it appears that there is a suppression effect that is occurring. However, the results are in the opposite direction of that hypothesized, with greater social support among Mexican Americans being associated with greater IADL disability. Apparently, the older Mexican Americans in this study are seeking, or mobilizing social support after they begin to experience disability. The suppressor effect of depressive symptoms in this analysis will be examined later in this chapter.

Hypothesis 1b

Hypothesis 1b, **blacks will have higher rates of disability than whites and social support will mediate the association between race and disability among respondents from the Duke EPESE** was tested and the results are shown in tables 4.4 and 4.5. Using Baron and Kenny's (1986) four steps to test for a mediation effect, these two tables test whether social support mediates the relationship between race and ADL and IADL disabilities.

Table 4.2: Generalized Linear Mixed Models for the Association of Social Support with ADL Disabilities Across Time Among Whites and Blacks in the Duke EPESE and Mexican Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)				Hispanic EPESE (N=3,050), Waves 1-6 (1993-2007)			
	Model 1 ^g	p-value	Model 2 ^g	p-value	Model 1 ^g	p-value	Model 2 ^g	p-value
Intercept	-109.48 (19.971)	<0.001	-3.977 (21.187)	<0.001	-227.996 (10.734)	<0.001	-129.666 (13.288)	<0.001
Time	0.055 (0.01)	<0.001	-0.001 (0.011)	<0.001	0.114 (0.005)	<0.001	0.061 (0.007)	<0.001
Demographics								
Age			0.076 (0.005)	<0.001			0.078 (0.005)	<0.001
Female ^a			0.161 (0.083)	0.053			0.225 (0.073)	0.002
Black ^b			0.109 (0.070)	0.118			0.156 (0.067)	0.020
< Highschool ^c			0.361 (0.121)	0.003			0.391 (0.289)	0.176
Highschool ^c			0.213 (0.183)	0.245			0.152 (0.321)	0.635
Widowed ^d			0.022 (0.087)	0.806			0.055 (0.111)	0.619
Single ^d			-0.046 (0.139)	0.742			0.050 (0.072)	0.489
Health Variables								
BMI < 18.5 ^e				0.209 (0.092)				1.186 (0.079)
25<BMI<30 ^e				-0.033 (0.076)				-0.134 (0.083)
BMI>30 ^e				0.381 (0.082)				0.148 (0.088)
Chronic Conditions				0.381 (0.029)				0.172 (0.018)
Depressive Symptoms				0.087 (0.007)				0.029 (0.003)
Cognitive Function ^f				-0.183 (0.019)				-0.045 (0.004)
Social Variable								
Social Support	-0.196 (0.025)	<0.001	-0.157 (0.025)	<0.001	-0.006 (0.021)	0.765	0.0003 (0.025)	0.991
Notes:								0.004

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMISQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Unstandardized betas and standard errors are presented

Table 4.3: Generalized Linear Mixed Models for the Association of Social Support with IADL Disabilities Across Time Among Whites and Blacks in the Duke EPESE and Mexican Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)				Hispanic EPESE (N=3,050), Waves 1-6 (1993-2007)			
	Model 1 ^g	p-value	Model 2 ^g	p-value	Model 1 ^g	p-value	Model 2 ^g	p-value
Intercept	-91.996 (15.414)	<0.001	11.920 (16.671)	0.475	-128.838 (5.450)	<0.001	-46.361 (6.693)	<0.001
Time	0.046 (0.008)	<0.001	-0.009 (0.008)	0.28	0.065 (0.003)	<0.001	0.021 (0.003)	<0.001
Demographics								
Age			0.071 (0.004)	<0.001			0.061 (0.003)	<0.001
Female ^a			0.065 (0.066)	0.319			0.255 (0.042)	<0.001
Black ^b			0.166 (0.053)	0.002			0.184 (0.037)	<0.001
< Highschool ^c			0.599 (0.097)	<0.001			0.455 (0.166)	0.006
Highschool ^c			0.140 (0.160)	0.381			0.017 (0.188)	0.928
Widowed ^d			0.108 (0.068)	0.111			0.086 (0.059)	0.147
Single ^d			0.042 (0.107)	0.694			0.124 (0.040)	0.002
Health Variables								
BMI < 18.5 ^e								
25 < BMI < 30 ^e								
BMI > 30 ^e								
Chronic Conditions								
Depressive Symptoms								
Cognitive Function ^f								
Social Variable								
Social Support	-0.137 (0.020)	<0.001	-0.084 (0.020)	<0.001	-0.011 (0.012)	0.321	-0.014 (0.013)	0.277
							0.032 (0.011)	0.004

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMSQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Unstandardized betas and standard errors are presented

Figure 4.1 is a representation of the changes in mean ADL disability across time among older blacks and whites. Analysis of variance was used to determine whether the mean ADL scores were different in each wave of data between blacks and whites from the Duke EPESE. In the first four waves, there were no significant differences in the mean ADL scores between blacks and whites. In the fifth wave of data that was collected in 1990, however, there was a significant difference in mean ADL scores ($p<0.01$) between older blacks and whites. The trend shows a widening gap in the mean ADL scores between blacks and whites, with the ADL scores for whites remaining at a shallower trend while there was a greater increase in mean ADL scores for blacks.

Figure 4.2 shows that there are significant differences in mean IADL scores across time between blacks and whites, with blacks showing higher mean IADL scores ($p<0.001$) than older whites at each time interval. Since there are differences in disability by race across time, the mediation effect of social support on the association between race and disability can be tested.

The first step in table 4.4 establishes that there is an association between race and ADL disability ($p=0.002$) across time, with blacks reporting more ADL disability than whites. Step 2 shows that race is significantly associated with social support ($p<0.001$), with blacks reporting less social support compared to older whites. Step 3 shows that there is an association between social support and ADL disability ($p<0.001$), with higher social support associated with less ADL disability.

Figure 4.1: Graph of Mean ADL Disability across Time by Race Among Duke EPESE Respondents

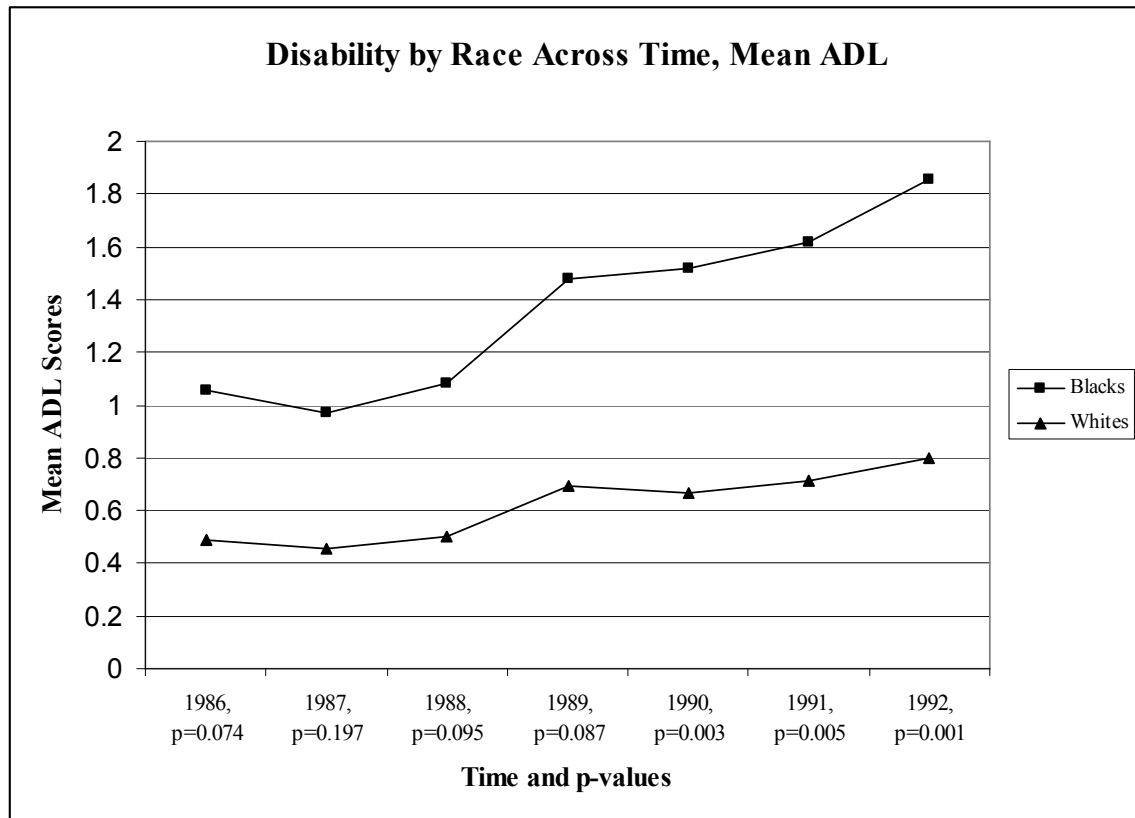
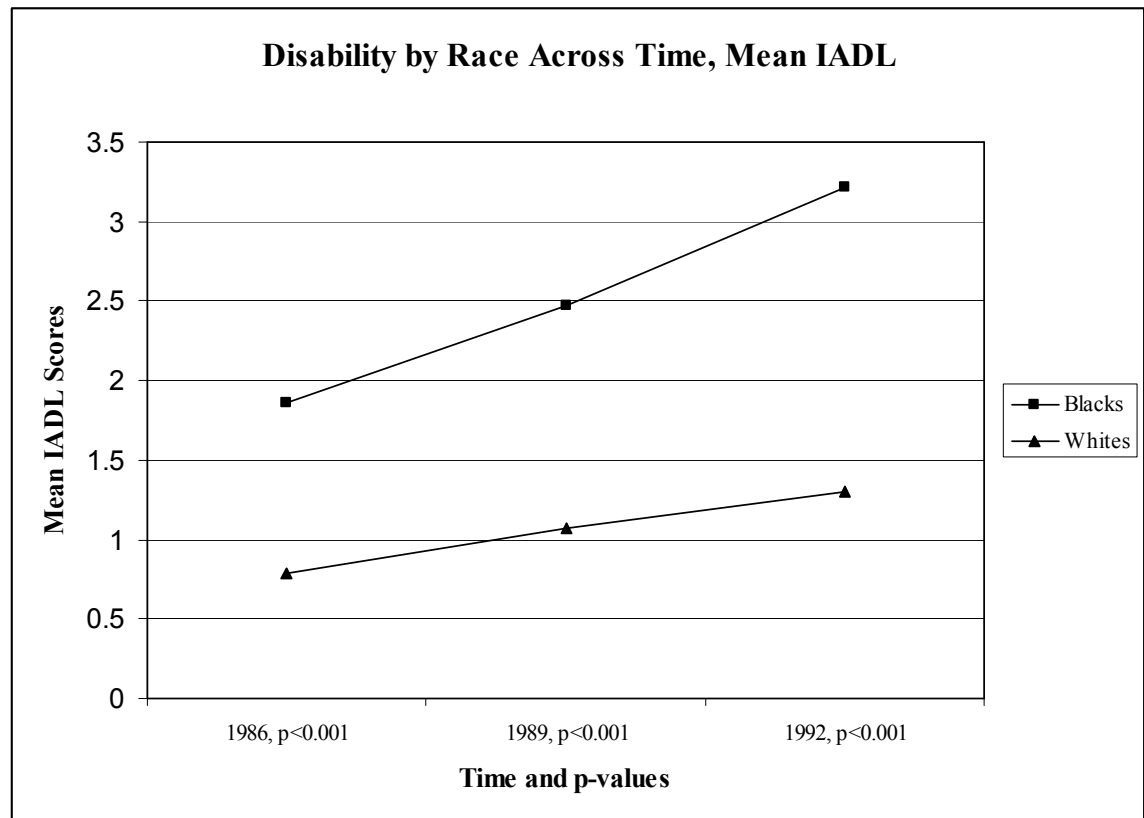


Figure 4.2: Graph of Mean IADL Disability across Time by Race Among Duke EPESE Respondents



The fourth step tests whether the effect of race on ADL disability diminishes after social support is included in the model. It can be seen that although the reduction in significance is very small, after social support is included in the model, the effect of race on ADL disability ($p=0.006$) is slightly attenuated, by 1.6% ($p<0.01$), which was determined by subtracting the value in step 4 from the value in step 1, then dividing by the value in step 1. Therefore, social support does partially mediate the association between race and ADL disability. A Sobel test was conducted to determine whether the mediation effect was significant. Those results will be discussed later.

Table 4.5 shows the results that show the four steps that test the mediation of social support on the association between race and IADL disability. Step 1 shows that race is significantly associated with IADL disability ($p<0.001$), with older blacks reporting more IADL disability than whites. The second step establishes that race is associated with social support ($p<0.001$), with blacks reporting less social support. The third step establishes that social support is associated with IADL disability ($p<0.001$), with higher social support being associated with less IADL disability. The fourth step shows the association between race and IADL disability, with social support included in the model as well. Although the association between race and IADL disability is still significant ($p<0.001$) the unstandardized beta was reduced by 10.5% ($p<0.001$), and therefore social support partially mediates the association between race and IADL disability.

Sobel tests were conducted to determine whether the mediation effect of social support on the association between race and disability was meaningful, and that the reduction of disability due to social support was greater than zero. The results from the

Table 4.4: Generalized Linear Mixed Models to Test the Mediation Effect of Social Support on the Association between Race and ADL Disability Across Time Among Respondents in the Duke EPESE

Step 1. Establish the association between race and disability.		
	Model 1 ^b	p-value
Black ^a	0.190 (0.062)	0.002
Step 2. Establish that race is associated with social support.		
	Model 1 ^b	p-value
Black ^a	-0.062 (0.007)	<0.001
Step 3. Establish the association between social support and disability.		
	Model 1 ^b	p-value
Social Support	-0.196 (0.025)	<0.001
Step 4. Does the effect of race on disability diminish after adding social support into the model?		
	Model 1 ^b	p-value
Black ^a	0.187 (0.068)	0.006
Social Support	-0.186 (0.025)	<0.001

Notes:

^a Compared to whites

^b Unstandardized betas and standard errors are presented

Table 4.5: Generalized Linear Mixed Models to Test the Mediation Effect of Social Support on the Association between Race and IADL Disability Across Time Among Respondents in the Duke EPESE

Step 1. Establish the association between race and disability.		
	Model 1 ^b	p-value
Black ^a	0.294 (0.049)	<0.001
Step 2. Establish that race is associated with social support.		
	Model 1 ^b	p-value
Black ^a	-0.062 (0.007)	<0.001
Step 3. Establish the association between social support and disability.		
	Model 1 ^b	p-value
Social Support	-0.137 (0.020)	<0.001
Step 4. Does the effect of race on disability diminish after adding social support into the model?		
	Model 1 ^b	p-value
Black ^a	0.263 (0.053)	<0.001
Social Support	-0.123 (0.020)	<0.001

Notes:

^a Compared to whites

^b Unstandardized betas and standard errors are presented

two tests conducted for the mediation of social support on the association between race and disability are shown in table 4.6. The mediation effect of social support on the association between race and ADL disability is significantly different than zero ($p<0.01$). The mediation effect of social support on the association between race and IADL disability is significantly different than zero ($p<0.001$).

Table 4.6: Results of Sobel Tests of the Mediating Effect of Social Support on the Association between Race and ADL/ IADL Disability among Older Adults from the Duke EPESE Study (1986-1992)

Race with	Test Statistic (Standard Error)	P-value
ADL	$z = -2.854 (0.013)$	0.004
IADL	$z = -4.513 (0.009)$	<0.001

SUPPRESSION EFFECT IN THE ASSOCIATION BETWEEN SOCIAL SUPPORT AND DISABILITY IN THE HISPANIC EPESE

Last, tables 4.7 and 4.8 show the results of the Models that were developed to examine the suppression that was found in the Hispanic EPESE when examining the association between social support and disability. In order to determine which health variable influenced the suppression effect among Mexican Americans, each of the health variables was added in separately. Table 4.7 shows that in Models 1, body-mass index (BMI) is significantly associated with ADL disability, with underweight respondents reporting fewer disabilities than obese adults ($p<0.001$), normal weight individuals having fewer disabilities than those who are obese ($p<0.01$), and overweight also reporting less disability than those in the obese category ($p<0.001$), but in this Models,

social support is not associated with disability ($p>0.05$), so BMI was not the suppressor variable. Models 2 shows that chronic conditions are positively associated with ADL disability ($p<0.001$) but social support is not significantly associated with disability. Depressive symptoms, when added into the Models, are also significantly associated with ADL disability ($p<0.001$). When depressive symptoms are added into the Models, as shown in Models 3, social support becomes significantly positively associated with ADL disability ($p<0.01$), indicating that depressive symptoms may be suppressing the association between social support and disability. In Models 4, results show that cognitive function is negatively associated with ADL disability ($p<0.001$), but social support remains not significantly associated with disability. It appears that in the association between social support and ADL disability in the Hispanic EPESE data, depressive symptoms suppress the effect of social support on disability. This may mean that older adults with more depressive symptoms do not mobilize social support as effectively when disability develops as their counterparts who report fewer depressive symptoms. This is of concern, because it appears from the analyses that Mexican Americans do not rely on emotional support before disability occurs, but actually begin to mobilize social support after disability begins to affect them. This may be problematic, because disability may become greater among those with depressive symptoms who may not be as able to cope with disability as a result of depression.

Table 4.8 shows that the association between social support and IADL disability is also suppressed by depressive symptoms, similar to the findings in the association of social support with ADL disability among Mexican Americans. Models 1 shows that BMI, when added into the Models, is significantly associated with IADL disability

($p < 0.001$), but social support remains non-significant. In Models 2, chronic conditions are positively associated with IADL disability ($p < 0.001$), but is not the suppressor in the association between social support and disability. Once again, when depressive symptoms are added into Models 3, depressive symptoms are positively associated with IADL disability ($p < 0.001$), and social support becomes positively associated with IADL disability ($p < 0.05$). Therefore, depressive symptoms suppress the effect of social support on IADL disability among older Mexican Americans. Cognitive function is negatively associated with IADL disability ($p < 0.001$), but in Model 4, social support does not show a relationship with IADL disability, and so cognitive function is not a suppressor of the effect of social support on IADL disability.

Interaction Tests of Social Support with Depression

In order to test whether some of the effects of depression on the association of social support with disability among Mexican Americans might change if an interaction term was added into the model, more analyses were performed. It was found that the interaction term that included social support and depression were non-significant. This means that social support did not moderate the effect of depression on the change in either ADL or IADL disability across time. The models were then stratified by gender to examine whether social support moderated the effect of depression differently for either gender. Again, the interaction term for social support and depression were non-significant in the stratified models, for both IADL and ADL disability. This means that social support did not moderate the effect of depression on disability among either Mexican American men or women.

Table 4.7: Generalized Linear Mixed Models for the Association of Social Support with ADL Disabilities Across Time Among Mexican Americans in the Hispanic EPESE

Hispanic EPESE (N=3,050), Waves 1-6 (1993-2007)						
	Model 1 ^f	p-value	Model 2 ^f	p-value	Model 3 ^f	p-value
Intercept	-122.263 (13.342)	<0.001	20.805 (21.388)	0.331	-131.121 (13.202)	<0.001
Time	0.058 (0.007)	<0.001	-0.014 (0.011)	0.184	0.062 (0.007)	<0.001
Demographics						
Age	0.058 (0.005)	<0.001	0.080 (0.005)	<0.001	0.073 (0.005)	<0.001
Female ^a	-0.192 (0.005)	<0.001	0.178 (0.073)	0.014	0.136 (0.074)	0.066
< Highschool ^b	0.406 (0.236)	0.085	0.399 (0.290)	0.168	0.257 (0.287)	0.370
Highschool ^b	0.120 (0.221)	0.654	0.166 (0.321)	0.605	0.161 (0.315)	0.611
Widowed ^c	-0.103 (0.103)	0.318	0.064 (0.111)	0.561	0.010 (0.114)	0.927
Single ^c	0.017 (0.067)	0.797	0.039 (0.072)	0.584	-0.039 (0.073)	0.597
Health Variables						
BMI < 18.5 ^d	1.432 (0.074)	<0.001				
25<BMI<30 ^d	-0.160 (0.085)	0.059				
BMI>30 ^d	0.188 (0.090)	0.037				
Chronic Conditions			0.167 (0.019)	<0.001		
Depressive Symptoms					0.047 (0.002)	<0.001
Cognitive Function ^e						
Social Variable						
Social Support	0.013 (0.023)	0.579	0.004 (0.025)	0.874	0.084 (0.026)	0.001
					-0.069 (0.004)	<0.001
					-0.002 (0.024)	0.923

Notes:

^a Compared to males

^b Compared to greater than high school education

^c Compared to married^dCompared to normal BMI (greater than 18.5 and less than 25)^eCognitive function assessments were carried out using the SPMSQ for the Duke EPESE and the MMSE for the Hispanic EPESE^f Unstandardized betas and standard errors are presented

Table 4.8: Generalized Linear Mixed Models for the Association of Social Support with IADL Disabilities Across Time Among Mexican Americans in the Hispanic EPESE

	Hispanic EPESE (N=3,050), Waves 1-6 (1993-2007)							
	Model 1 ^f	p-value	Model 2 ^f	p-value	Model 3 ^f	p-value	Model 4 ^f	p-value
Intercept	-41.238 (6.628)	<0.001	85.061 (9.700)	<0.001	-46.751 (6.509)	<0.001	-27.368 (6.717)	<0.001
Time	0.019 (0.003)	<0.001	-0.045 (0.005)	<0.001	0.021 (0.003)	<0.001	0.013 (0.003)	<0.001
Demographics								
Age	0.054 (0.003)	<0.001	0.063 (0.003)	<0.001	0.059 (0.003)	<0.001	0.045 (0.003)	<0.001
Female ^a	0.232 (0.039)	<0.001	0.210 (0.041)	<0.001	0.186 (0.040)	<0.001	0.297 (0.038)	<0.001
< Highschool ^b	0.458 (0.146)	0.002	0.465 (0.167)	0.005	0.369 (0.161)	0.022	0.182 (0.161)	0.259
Highschool ^b	0.004 (0.168)	0.979	0.030 (0.188)	0.874	0.014 (0.181)	0.938	-0.091 (0.182)	0.616
Widowed ^c	0.114 (0.039)	0.003	0.114 (0.039)	0.004	0.078 (0.039)	0.044	0.077 (0.038)	0.043
Single ^c	0.032 (0.056)	0.575	0.093 (0.058)	0.11	0.058 (0.058)	0.315	0.026 (0.055)	0.632
Health Variables								
BMI < 18.5 ^d	0.682 (0.041)	<0.001						
25<BMI<30 ^d	-0.069 (0.039)	0.082						
BMI>30 ^d	0.113 (0.043)	0.009						
Chronic Conditions			0.156 (0.009)	<0.001				
Depressive Symptoms					0.033 (0.001)	<0.001		
Cognitive Function ^e							-0.054 (0.002)	<0.001
Social Variable								
Social Support	-0.009 (0.012)	0.447	-0.009 (0.013)	0.458	0.042 (0.013)	0.001	-0.012 (0.011)	0.300

Notes:

^a Compared to males

^b Compared to greater than high school education

^c Compared to married

^d Compared to normal BMI (greater than 18.5 and less than 25)

^e Cognitive function assessments were carried out using the SPMSQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^f Unstandardized betas and standard errors are presented

SUMMARY AIM 1

In this section, the results from chapter 4 are summarized. In this chapter, it was found that social support was associated with disability among blacks, whites, and Mexican Americans. There were some surprises in the results, with health conditions attenuating the association of social support with disability among respondents from the Duke EPESE, and depressive symptoms suppressing the positive association between social support and disability among respondents from the Hispanic EPESE.

Among older blacks and whites, social support is significantly associated with ADL disability. This association was partly attenuated by the health variables when they were added into the model, but the association between social support and ADL disability remained significant and in the hypothesized direction, with social support being associated with decreased disability across time. Among older Mexican Americans, social support was not associated with ADL disability until health variables were added into the model. When health variables were added into the model, social support was associated with ADL disability, but the direction of the association was opposite than expected. Social support was positively associated with ADL disability when health variables were included in the model. Further analyses showed that depressive symptoms were mainly responsible for the suppression that occurred in that association.

Among older blacks and whites, social support was associated with decreased IADL disability. Once health variables were included in the model, the affect of social support on IADL disability was fully attenuated and social support was no longer associated with IADL disability. Among Mexican Americans, there was no association

between social support and IADL disability. However, once health variables were added into the model, particularly once depressive symptoms were included in the model, there was an association between social support and increased IADL disability. Once again, the direction of the association was not in the expected direction. Social support is positively associated with IADL disability among Mexican Americans when it was hypothesized that social support would be negatively associated with IADL disability. Further analyses showed that depressive symptoms were mainly responsible for the suppression effect in the association between social support and IADL disability among older Mexican Americans.

For the second hypothesis that tested the mediation effect of social support on the association between race and disability, there was some support. The four steps to test a mediation effect was conducted (Baron & Kenny, 1986), and it was found that social support mediated the effect between race and ADL disability. There was also evidence that supported the mediation effect of social support on the association between race and IADL disability, although the effect was minor.

Chapter 5: Aim 2 Results

In Chapter 5, the results from the longitudinal data analyses for Aim 2 that describes the association between social network size and disability as well as social network composition (proportion of friends in the social network) and disability among different race/ ethnic groups are presented.

AIM 2 RESULTS

Hypothesis 2a

Hypothesis 2a which is that **larger social networks will be associated with less disability in whites, blacks, and Mexican Americans**, was tested using generalized linear mixed model with a log link and Poisson distribution. As shown in table 5.1, larger social networks are associated with less ADL disability among older blacks and whites ($p < 0.001$). After adding in sociodemographic characteristics in Model 2, larger social networks are still associated with fewer ADL disabilities ($p < 0.001$). However, after adding health variables into Model 3, the association between social network size and ADL disability was attenuated ($p > 0.05$), and social network size was marginally associated with ADL disability. Race was not associated with ADL disability ($p > 0.05$) after accounting for sociodemographics or after adding health variables into the model.

In the Hispanic EPESE, social network size was associated with a lower decline in ADL disability ($p < 0.001$) across waves 5 and 6 of the study (2004-2007). After adding sociodemographic characteristics into Model 2, social network size was still associated with less ADL disability ($p < 0.001$) among older Mexican Americans. However, once

health variables were added into the model, the association between social network size and ADL disability was fully attenuated ($p>0.05$).

Table 5.2 shows in the first model, that among older blacks and whites, social network size is associated with decreased IADL disability ($p<0.001$). In the second model, when sociodemographics are added, social network size remained negatively associated with IADL disability ($p<0.001$). In the third model, after health variables are added, the association between social network size and IADL disability ($p>0.05$) is fully attenuated. Race was initially associated with IADL disability ($p<0.001$) when added into the model with sociodemographics, with blacks having more IADL disability than whites as hypothesized. However, when health variables are added into the model, the association between race and IADL disability ($p>0.05$) is completely attenuated, and race is no longer associated with IADL disability.

Among older Mexican Americans from the Hispanic EPESE, social network size is negatively associated with IADL disability ($p<0.001$) across time. When sociodemographic variables are added into the Model 2, social network size remains negatively associated ($p<0.001$) with IADL disability. In Model 3, when health variables are added, the association between social network size and IADL disability ($p>0.05$) is fully attenuated. This means that among healthier Mexican Americans aged 75 years and older, larger social network size is associated with a decrease in IADL disability across time.

Table 5.1: Generalized Linear Mixed Models for the Association of Social Network Size with ADL Disabilities Across Time Among Whites and Blacks in the Duke EPESE and Mexican Americans in the Hispanic EPESE

Duke EPESE (N=4,136), Waves 1-7 (1986-1992)				Hispanic EPESE (N=2,069), Waves 5-6 (2004-2007)				
	Model 1 ^a	p-value	Model 2 ^a	p-value	Model 1 ^b	p-value	Model 3 ^b	p-value
Intercept	-91.521 (20.965)	<0.001	2.652 (21.442)	0.902	-117.238 (42.024)	0.005	-213.348 (49.163)	<0.001
Time	0.046 (0.01)	<0.001	-0.002 (0.011)	0.848	0.059 (0.021)	0.005	0.105 (0.025)	<0.001
Demographics								
Age			0.076 (0.004)	<0.001	0.067 (0.005)	<0.001	0.030 (0.006)	<0.001
Female ^a			0.085 (0.079)	0.282	-0.043 (0.083)	0.602	0.251 (0.069)	<0.001
Black ^b			0.090 (0.067)	0.175	-0.099 (0.069)	0.150		
< Highschool ^c			0.493 (0.117)	<0.001	0.031 (0.122)	0.802	0.213 (0.284)	0.454
Highschool ^c			0.291 (0.176)	0.099	0.094 (0.173)	0.589	-0.188 (0.325)	0.564
Widowed ^d			0.493 (0.117)	0.618	-0.046 (0.085)	0.588	-0.018 (0.104)	0.86
Single ^d			-0.081 (0.134)	0.546	-0.196 (0.144)	0.175	-0.046 (0.068)	0.502
Health Variables								
BMI < 18.5 ^e					0.262 (0.093)	0.005	0.942 (0.087)	<0.001
25<BMI<30 ^e					-0.027 (0.078)	0.726	0.044 (0.091)	0.628
BMI>30 ^e					0.396 (0.084)	<0.001	0.339 (0.092)	<0.001
Chronic Conditions					0.387 (0.029)	<0.001	0.141 (0.039)	<0.001
Depressive Symptoms					0.089 (0.007)	<0.001	0.022 (0.003)	<0.001
Cognitive Function ^f					-0.178 (0.020)	<0.001	-0.045 (0.004)	<0.001
Social Variable								
Social Network Size	-0.047 (0.005)	<0.001	-0.037 (0.005)	<0.001	-0.009 (0.005)	0.063	-0.038 (0.007)	<0.001
					-0.051 (0.007)	<0.001	-0.009 (0.006)	0.086

Notes:

Notes:

^a Compared to males^b Compared to whites^c Compared to greater than high school education^d Compared to married^e Compared to normal BMI (greater than 18.5 and less than 25)

^fCognitive function assessments were carried out using the SPMSO for the Duke EPESE and the MMSE for the Hispanic EPESE

Unstandardized betas and standard errors are presented

Table 5.2: Generalized Linear Mixed Models for the Association of Social Network Size with IADL Disabilities Across Time Among Whites and Blacks in the Duke EPESE and Mexican Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)				Hispanic EPESE (N=2,069), Waves 5-6 (2004-2007)			
	Model 1 ^g	p-value	Model 2 ^g	p-value	Model 1 ^g	p-value	Model 2 ^g	p-value
Intercept	-61.821 (16.125)	<0.001	6.648 (16.663)	0.690	-44.499 (22.434)	0.047	18.840 (21.571)	0.383
Time	0.031 (0.008)	<0.001	-0.006 (0.008)	0.446	0.023 (0.011)	0.04	-0.011 (0.011)	0.301
Demographics								
Age			0.071 (0.004)	<0.001			0.051 (0.003)	<0.001
Female ^a			-0.005 (0.061)	0.016			0.268 (0.042)	<0.001
Black ^b			0.181 (0.050)	<0.001			0.248 (0.039)	<0.001
< Highschool ^c			0.692 (0.094)	<0.001			0.544 (0.206)	0.008
Highschool ^c			0.209 (0.156)	0.182			0.188 (0.241)	0.434
Widowed ^d			0.121 (0.064)	0.059			-0.024 (0.060)	0.69
Single ^d			0.012 (0.101)	0.908			0.025 (0.041)	0.549
Health Variables								
BMI < 18.5 ^e				0.212 (0.068)			0.411 (0.045)	<0.001
25 < BMI < 30 ^e				-0.107 (0.059)			0.037 (0.044)	0.393
BMI > 30 ^e				-0.222 (0.067)			0.140 (0.045)	0.002
Chronic Conditions				0.184 (0.023)			0.137 (0.021)	<0.001
Depressive Symptoms				0.083 (0.005)			0.017 (0.001)	<0.001
Cognitive Function ^f				-0.050 (0.004)			-0.041 (0.002)	<0.001
Social Variable								
Social Network Size	-0.040 (0.004)	<0.001	-0.030 (0.004)	<0.001	-0.029 (0.003)	<0.001	-0.020 (0.003)	<0.001
				0.516			-0.005 (0.003)	0.098

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^g Unstandardized betas and standard errors are presented

Hypothesis 2b

Hypothesis 2b is **a higher proportion of non-kin in the network of older adults will be associated with less disability in whites, blacks, and Mexican Americans.**

Table 5.3 shows that, initially, a higher proportion of friends in the social network is not associated with ADL disability ($p > 0.05$) among blacks and whites. In Model 2, once sociodemographic characteristics are added, a higher proportion of friends becomes significantly positively associated with ADL disability ($p < 0.05$), which is in the opposite direction than was hypothesized. However, when health variables are added into the models, the association between the proportion of friends in the network and ADL disability ($p > 0.05$) is attenuated, and the proportion of friends in the social network is only marginally associated with reduced ADL disability. When race is added into the second models, initially blacks report greater ADL disability ($p < 0.05$) than whites when sociodemographics are controlled for and when the proportion of friends in the social network are also added into the model. However, this association is fully attenuated when health variables are added into the model, and race is no longer associated with ADL disability.

Table 5.3 also shows the results for the association between the proportion of friends in the social network and ADL disability among Mexican Americans from the Hispanic EPESE. Initially, in Model 1, a higher proportion of friends in the social network is associated with fewer ADL disabilities ($p < 0.01$) across time. When sociodemographic variables are added into the model, the proportion of friends in the social network remains significantly associated with ADL disability ($p < 0.01$), with a

greater proportion of friends being associated with fewer ADL disabilities. However, in the full model, once the health variables were added in, the association between the proportion of friends in the social network and ADL disability was fully attenuated ($p>0.05$).

In table 5.4, among the respondents of the Duke EPESE, in the first model, a higher proportion of friends in the social network was associated with fewer IADL disabilities ($p<0.05$). However, once sociodemographic variables were added into the model, the association between the proportion of friends in the social network and IADL disability ($p>0.05$) was attenuated. Then, when health variables were included in the model, a higher proportion of friends was associated with less IADL disability ($p<0.001$), in the hypothesized direction. This result could mean that when health is accounted for, then friends become important in the development of IADL disability across time. For the association between race and IADL disability in this model, race is associated with IADL disability ($p<0.001$) when it is added into the second model, with blacks reporting more IADL disability than whites. However, the association between race and IADL disability ($p>0.05$) is fully attenuated once health variables are included in the model.

Among older Mexican Americans, a higher proportion of friends in the social network is associated with lower IADL disability ($p<0.001$) across time as shown in Model 1. When sociodemographic variables are added into Model 2, the relationship between the proportion of friends in the social network and IADL disability ($p<0.001$) remains significant. The association between the proportion of friends in the social network and IADL disability ($p>0.05$) is fully attenuated once health variables are added into Model 3.

Table 5.3: Generalized Linear Mixed Models for the Association of Friends in the Social Network with ADL Disabilities Across Time Among Whites and Blacks in the Duke EPESE and Mexican Americans in the Hispanic EPESE

	Duke EPESE (N=4,130), Waves 1-7 (1986-1992)			Hispanic EPESE (N=2,069), Waves 5-6 (2004-2007)		
	Model 1 ^g	p-value	Model 2 ^g	p-value	Model 1 ^g	p-value
Intercept	-87.414 (23.100)	<.0001	20.276 (24.601)	0.410	-355.286 (43.736)	<.0001
Time	0.044 (0.012)	<.0001	-0.014 (0.012)	0.246	0.118 (0.022)	<.0001
Demographics						
Age			0.074 (0.005)	<.0001	0.065 (0.005)	<.0001
Female ^a			0.150 (0.091)	0.099	0.371 (0.074)	<.0001
Black ^b			0.179 (0.076)	0.018	0.030 (0.006)	<.0001
<Highschool ^c			0.417 (0.130)	0.001	0.251 (0.071)	<.0001
Highschool ^c			0.288 (0.195)	0.141	0.181 (0.279)	0.515
Widowed ^d			0.048 (0.094)	0.608	-0.200 (0.322)	0.535
Single ^d			-0.073 (0.152)	0.634	0.028 (0.107)	0.79
Health Variables					-0.085 (0.071)	0.232
BMI < 18.5 ^e				0.279 (0.100)	0.938 (0.089)	<.0001
25<BMI<30 ^e				-0.004 (0.083)	0.041 (0.093)	0.660
BMI>30 ^e				0.429 (0.090)	0.345 (0.093)	<.0001
Chronic Conditions				0.411 (0.030)	0.142 (0.040)	<.0001
Depressive Symptoms				0.093 (0.007)	0.023 (0.003)	<.0001
Cognitive Function ^f				-0.185 (0.022)	-0.047 (0.004)	<.0001
Social Variable						
Proportion Friends in Network	0.275 (0.149)	0.065	0.319 (0.146)	0.029	-0.408 (0.121)	0.001
					-0.400 (0.118)	0.001
					-0.043 (0.047)	0.359

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMISQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Unstandardized betas and standard errors are presented

Table 5.4: Generalized Linear Mixed Models for the Association of Friends in the Social Network with IADL Disabilities Across Time Among Whites and Blacks in the Duke EPESE and Mexican Americans in the Hispanic EPESE

	Duke EPESE (N=4,130), Waves 1-7 (1986-1992)			Hispanic EPESE (N=2,069), Waves 5-6 (2004-2007)		
	Model 1 ^g	p-value	Model 2 ^g	p-value	Model 3 ^g	p-value
Intercept	-99.423 (17.404)	<0.001	16.621 (18.894)	0.379	145.523 (19.966)	<0.001
Time	0.050 (0.009)	<0.001	-0.012 (0.010)	0.223	-0.075 (0.010)	<0.001
Demographics						
Age			0.072 (0.004)	<0.001	0.058 (0.004)	<0.001
Female ^a			0.091 (0.073)	0.213	-0.068 (0.070)	0.329
Black ^b			0.210 (0.058)	<0.001	-0.020 (0.056)	0.727
<Highschool ^c			0.615 (0.106)	<0.001	0.210 (0.103)	0.041
Highschool ^c			0.191 (0.176)	0.277	-0.005 (0.170)	0.976
Widowed ^d			0.115 (0.073)	0.118	0.048 (0.068)	0.485
Single ^d			-0.004 (0.121)	0.973	-0.110 (0.119)	0.352
Health Variables						
BMI < 18.5 ^e					0.243 (0.072)	<0.001
25<BMI<30 ^e					-0.129 (0.064)	0.044
BMI>30 ^e					0.251 (0.071)	<0.001
Chronic Conditions					0.213 (0.024)	<0.001
Depressive Symptoms					0.086 (0.006)	<0.001
Cognitive Function ^f					-0.213 (0.016)	<0.001
Social Variable						
Proportion Friends in Network	-0.239 (0.113)	0.035	-0.142 (0.109)	0.196	-0.442 (0.102)	<0.001
					-0.229 (0.061)	<0.001
					-0.208 (0.057)	<0.001
					-0.037 (0.024)	0.119

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMISQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Unstandardized betas and standard errors are presented

Hypothesis 2c

Hypothesis 2c, **blacks will have higher rates of disability than whites and the association of race with disability will be partially mediated by social network size and composition (proportion of non-kin in network) among respondents from the Duke EPESE** was tested and the results are shown in tables 5.5 through 5.8 using Baron and Kenny's (1986) four steps to test a mediation effect.

Table 5.5 shows the results for the testing of whether social network size mediates the relationship between race and ADL disability. In step 1, it is established that blacks have a greater decline in ADL disability across time than older whites ($p=0.002$). Step 2 establishes that blacks have a smaller network size than whites ($p=0.069$). The association between race and social network size is marginal, however, and this must be considered as part of the results when the effect of social network size on the association between race and ADL disability is tested. Step 3 establishes that social network size is associated with less ADL disability (0.001). Step 4 shows that when race and social network size are both included in the model, the effect of race on ADL disability increases slightly (0.003). This effect is not in the direction hypothesized, as social network size was expected to decrease the effect of race on ADL disability.

Table 5.6 illustrates the results that test the mediation effect of social network size on the association between race and IADL disability. The first step establishes that race is associated with IADL disability ($p<0.001$), with blacks reporting more IADL disability compared to whites. Step 2 establishes that race has a marginally significant association

Table 5.5: Generalized Linear Mixed Models to Test the Mediation Effect of Social Network Size on the Association between Race and ADL Disability Across Time Among Respondents in the Duke EPESE

Step 1. Establish the association between race and disability.		
	Model 1 ^b	p-value
Black ^a	0.190 (0.062)	0.002
Step 2. Establish that race is associated with social network size.		
	Model 1 ^b	p-value
Black ^a	-0.028 (0.015)	0.069
Step 3. Establish the association between social network size and disability.		
	Model 1 ^b	p-value
Social Network Size	-0.047 (0.005)	<0.001
Step 4. Does the effect of race on disability diminish after adding social network size into the model?		
	Model 1 ^b	p-value
Black ^a	0.192 (0.064)	0.003
Social Network Size	-0.046	<0.001

Notes:

^a Compared to whites

^b Unstandardized betas and standard errors are presented

Table 5.6: Generalized Linear Mixed Models to Test the Mediation Effect of Social Network Size on the Association between Race and IADL Disability Across Time Among Respondents in the Duke EPESE

Step 1. Establish the association between race and disability.		
	Model 1 ^b	p-value
Black ^a	0.294 (0.049)	<0.001
Step 2. Establish that race is associated with social network size.		
	Model 1 ^b	p-value
Black ^a	-0.028 (0.015)	0.069
Step 3. Establish the association between social network size and disability.		
	Model 1 ^b	p-value
Social Network Size	-0.040 (0.004)	<0.001
Step 4. Does the effect of race on disability diminish after adding social network size into the model?		
	Model 1 ^b	p-value
Black ^a	0.297 (0.050)	<0.001
Social Network Size	-0.039	<0.001

Notes:

^a Compared to whites

^b Unstandardized betas and standard errors are presented

with social network size ($p=0.069$), with blacks reporting a smaller social network compared to whites. The third step establishes that social network size is associated with IADL disability ($p<0.001$), with larger social networks being associated with less IADL disability. Step 4 shows the model that includes both race and social network size included. When social network size is included in the model, the effect of race on IADL disability was increased ($p<0.001$) slightly. Once again, the increase in the difference in IADL disability between older blacks and whites was opposite of that hypothesized, but social network size does mediate the effect of race on IADL disability.

Table 5.7 shows the results for the test of the mediation effect of the proportion of friends in the social network on the association between race and ADL disability. The first step establishes the association between race and ADL disability ($p=0.002$), with blacks reporting greater ADL disability compared to whites. Step 2 establishes that race is associated with the proportion of friends in the social network ($p<0.001$), with blacks reporting a smaller proportion of friends in the social network compared to older whites. Step 3 shows that a higher proportion of friends in the social network is marginally associated with greater ADL disability. The fourth step shows a model that includes both race and the proportion of friends in the social network. When included in the model together, the effect of race on ADL disability actually increases ($p<0.001$), and blacks have more ADL disability than whites, with the proportion of friends in the social network increasing the difference between blacks and whites in the association with ADL disability.

Table 5.8 tests the mediation effect of the proportion of friends in the social network on the association between race and IADL disability. The four steps as described

in the Baron and Kenny (1986) article to establish mediation are shown. Step 1 establishes that there is an association between race and IADL disability ($p < 0.001$), with older blacks having higher IADL disability across time compared to older whites. Step 2 establishes that race is associated with the proportion of friends in the social network ($p < 0.001$), with older blacks having a smaller proportion of friends in their social network than whites. Step 3 establishes the association between the proportion of friends in the social network and IADL disability ($p < 0.05$), with a higher proportion of friends associated with reduced IADL disability. Step 4 shows that when the proportion of friends in the social network is included in the model with race, the standardized Beta for race increases, which indicates that including the proportion of friends in the social network in the Models increases the difference in IADL disability ($p < 0.001$) between blacks and whites, with blacks having an increased level of IADL disability compared to whites.

SUMMARY AIM 2 RESULTS

This section summarizes the results of chapter 5. In general, social network size is important in reducing the level of disability in older blacks, whites, and Mexican Americans across time. Once again, health conditions either partially or completely attenuated the association between social network size and disability for all of the racial/ethnic groups. The results for the proportion of friends in the social network were not as consistent between the different groups. In addition, social network size and the proportion of friends in the social network did not mediate the association of race and disability levels across time.

Table 5.7: Generalized Linear Mixed Models to Test the Mediation Effect of the Proportion of Friends in the Social Network on the Association between Race and ADL Disability Across Time Among Respondents in the Duke EPESE

Step 1. Establish the association between race and disability.		
	Model 1 ^b	p-value
Black ^a	0.190 (0.062)	0.002
Step 2. Establish that race is associated with the proportion of friends in the social network.		
	Model 1 ^b	p-value
Black ^a	-0.097 (0.012)	<0.001
Step 3. Establish the association between the proportion of friends in the social network and disability.		
	Model 1 ^b	p-value
Proportion Friends	0.275 (0.149)	0.065
Step 4. Does the effect of race on disability diminish after adding the proportion of friends in the social network into the model?		
	Model 1 ^b	p-value
Black ^a	0.279 (0.063)	<0.001
Proportion Friends	0.340 (0.149)	0.028

Notes:

^a Compared to whites

^b Unstandardized betas and standard errors are presented

Table 5.8: Generalized Linear Mixed Models to Test the Mediation Effect of the Proportion of Friends in the Social Network on the Association between Race and IADL Disability Across Time Among Respondents in the Duke EPESE

Step 1. Establish the association between race and disability.		
	Model 1 ^b	p-value
Black ^a	0.294 (0.049)	<0.001
Step 2. Establish that race is associated with the proportion of friends in the social network.		
	Model 1 ^b	p-value
Black ^a	-0.097 (0.012)	<0.001
Step 3. Establish the association between the proportion of friends in the social network and disability.		
	Model 1 ^b	p-value
Proportion Friends	-0.239 (0.113)	0.035
Step 4. Does the effect of race on disability diminish after adding the proportion of friends in the social network into the model?		
	Model 1 ^b	p-value
Black ^a	0.309 (0.059)	<0.001
Proportion Friends	-0.160 (0.113)	0.156

Notes:

^a Compared to whites

^b Unstandardized betas and standard errors are presented

Some of the results for aim 2 were a bit unclear, especially for the third hypothesis that proposed a mediation effect of social networks and proportion of friends in the social networks on the association between race and disability in the Duke EPESE study. The first hypothesis was supported among blacks, whites, and Mexican Americans. Greater social network size was associated with decreased ADL and IADL disability among older blacks, whites, and Mexican Americans. For both samples, when health variables were included in the model, the association between social network size and ADL disability was attenuated, but there was still a marginal association in both samples, and the relationship remained negative. Among older blacks and whites, a larger social network size was associated with decreased IADL disability until health variables were introduced into the model. Health variables fully attenuated the relationship between social network size and IADL disability among older blacks and whites. Among older Mexican Americans, a larger social network was associated with less IADL disability across time. When health variables were included in the model, the association between social network size and IADL disability was attenuated, although the association between them remained marginal.

For the second hypothesis, a higher proportion of friends in the social network was associated with increased ADL disability among the Duke EPESE respondents only when sociodemographic variables were added into the model. In the most parsimonious model, the association between the proportion of friends in the social network and ADL disability was marginal. In the full model, the proportion of friends in the social network was not associated with ADL disability. However, the proportion of friends in the social network was positively associated with ADL disability in the Duke EPESE, which was

the opposite of the negative relationship that was proposed in hypothesis 2b. Among Mexican Americans, the proportion of friends in the social network was associated with less ADL disability. However, when health variables were added into the model, the association between the proportion of friends in the network and ADL disability was fully attenuated.

The proportion of friends in the social network was negatively associated with IADL disability across time among respondents in the Duke EPESSE, as was hypothesized, even in the full model with sociodemographics and health variables added in. Among Mexican Americans, the proportion of friends in the social network was also negatively associated with IADL disability, until the full model. In the final model, after health variables were added in, the association between the proportion of friends in the social network and IADL disability was fully attenuated.

The third hypothesis had less clear findings. Both social network size and the proportion of friends in the social network increased the difference in disability between blacks and whites across time, with blacks having greater levels of disability than whites, and that gap growing larger with the addition of the social network variables. Therefore, the association between race and disability was not mediated by social network size or the proportion of friends in the social network, although it could be argued that there is a suppression effect at work.

Chapter 6: Aim 3 Results

Chapter 6 describes the results from Aim 3, which describe the relationship between social support and the onset of disability, as well as recovery from disability, among blacks, whites, and Mexican Americans. Chapter 6 also describes the frequencies for developing disability as well as recovering from disability.

DESCRIPTION OF DEVELOPMENT OF DISABILITY AND RECOVERY FROM DISABILITY

Table 6.1 shows the development of disability and recovery from disability across the seven waves of data that were measured in the Duke EPESE. Between the first two waves, 7.6% of those who had not previously had an ADL disability reported experiencing at least one ADL disability. Between 1987 and 1988, 6.8% of non-disabled respondents developed at least one ADL disability, and during the next year, 11.4% of the at-risk sample developed an ADL disability. In 1990, 10.7% of the at risk respondents developed an ADL disability, and in 1991 that proportion was 9.9% and in 1992 the proportion reporting a new ADL disability was 8.7 percent. Among Duke EPESE respondents who reported that they did not experience an IADL disability in the baseline interview in 1986, 19.0% reported that they had developed at least one IADL disability by 1989 and 22.9% developed at least one new IADL disability in 1992. The average value of ADL disablement between the intervals was 9.18 percent, slightly higher than the 8.75 percent that was found across waves in another study (Mendes de Leon et al., 1997).

Among Duke EPESE respondents who reported experiencing at least one ADL disability in 1986, 39.8% reported no ADL disability the following year. Between 1987 and 1988, 22.7% of older adults reported full recovery while between 1988 and 1989, that proportion was 11.6% of disabled adults fully recovered. Among the Duke EPESE respondents who reported that they had experienced at least one IADL disability at baseline, in 1986, 15.7 reported that they had no IADL disability in 1989. Among the sample who reported IADL disability in 1989, 70.7% reported that they had fully recovered. The average of the development of ADL between each interval is 20.65 percent, which is similar to values found in another study, though it is a bit lower than the 22.45 percent that was found in the other study that looked at full recovery among blacks and whites in the Duke EPESE (Mendes de Leon et al., 1997).

Table 6.2 shows the frequencies of development and recovery from ADL and IADL disability among older Mexican Americans. Between the first wave of data collection and the second, 14.6% of non-disabled Mexican Americans developed at least one ADL disability. The proportion of Mexican Americans who reported a new ADL disability rose each wave of data collection until the final wave, when 33.7% of previously non-disabled Mexican Americans reported at least one ADL disability. Between the first wave of data collection and the second wave of data collection, 88.6% of Mexican Americans who had not reported an IADL disability reported at least one IADL disability during the next data collection in 1995-1996. During the next interval, 27.9% reported developing an IADL disability, and then the proportion rose sharply in 2000-2001 with 73.1% reporting an IADL disability who had not reported one during the previous data collection.

Among Mexican Americans who had previously reported at least one ADL disability in 1993-1994, 24.7% reported full recovery during the next wave of data collection in 1995-1996. During the last interval, 7.8% of older Mexican Americans had full recovery from ADL disability that was reported in the previous wave. Of the 1621 older Mexican Americans who had reported at least one IADL disability in 1993-1994, 22.6% had recovered by the next wave of data collection in 1995-1996. The proportion of Mexican Americans who reported full recovery from IADL disability reduced each wave of data collection until the last wave, in 2006-2007, when 7.8% of disabled Mexican Americans reported fully recovering from IADL disability. This slight increase is likely due to the 902 new respondents who were added to the sample during the 2004-2005 data collection.

AIM 3 RESULTS

Hypothesis 3a

The Effect of Social Support on the Risk of Developing Disability

The results for hypothesis 3a, **that a greater social support will be associated with a decreased risk of developing disability and increased risk of recovery from disability in whites, blacks, and Mexican Americans**, can be found in table 6.3. Among older blacks and whites in the Duke EPESE, higher levels of social support reduces the risk of developing ADL disability between any interval by 14.5 percent in the unadjusted first model. In Model 2, addition of sociodemographic variables reduces the effect of

social support on the risk of developing disability, to reducing the risk of developing ADL disability between any interval to 11.5 percent. When health variables are added

Table 6.1: Frequency of Blacks and Whites from the Duke EPESE (N=4,136) that Developed ADL or IADL Disability and Frequency of Blacks and Whites that Recovered from ADL and IADL Disability

Duke EPESE (N=4,136), Waves 1-7 (1986-1992)							
Development of Disability							
	1986	1987	1988	1989	1990	1991	1992
ADL Disability							
Black	0	161	130	212	166	148	119
White	0	92	92	135	104	90	71
Total	0	253	222	347	270	238	190
Total at Risk	3335	3254	3049	2526	2400	2172	1890
% Developed ADL Disability		7.6%	6.8%	11.4%	10.7%	9.9%	8.7%
IADL Disability							
Black	0	-	-	293	-	-	294
White	0	-	-	233	-	-	158
Total	0	-	-	526	-	-	452
Total at Risk	2772	-	-	1970	-	-	1312
% Developed IADL Disability		-	-	19.0%	-	-	22.9%
Recovery From Disability							
	1986	1987	1988	1989	1990	1991	1992
ADL Disability							
Black	0	180	93	43	99	69	77
White	0	135	49	29	69	34	47
Total	0	315	142	72	168	103	124
Total at Risk	791	626	621	779	802	801	660
% Recovered ADL Disability		39.8%	22.7%	11.6%	21.6%	12.8%	15.4%
IADL Disability							
Black	0	-	-	131	-	-	518
White	0	-	-	81	-	-	371
Total	0	-	-	212	-	-	889
Total at Risk	1353	-	-	1258	-	-	1118
% Recovered IADL Disability		-	-	15.7%	-	-	70.7%

Table 6.2: Frequency of Mexican Americans from the Hispanic EPESE (N=3,952) that Developed ADL and IADL Disability and the Frequency of Mexican Americans that Recovered from ADL or IADL Disability

Hispanic EPESE (N=3,952), Waves 1-6 (1993-2007)						
Development of Disability						
	1993-1994	1995-1996	1998-1999	2000-2001	2004-2005	2006-2007
ADL Disability						
Mexican American	0	383	283	296	651	440
Total at Risk	2620	2052	1511	1245	1307	756
% Developed ADL Disability		14.6%	13.8%	19.6%	52.3%	33.7%
IADL Disability						
Mexican American	0	1262	328	701	365	196
Total at Risk	1424	1175	959	812	529	368
% Developed IADL Disability		88.6%	27.9%	73.1%	45.0%	37.1%
Recovery From Disability						
	1993-1994	1995-1996	1998-1999	2000-2001	2004-2005	2006-2007
ADL Disability						
Mexican American	0	104	32	73	33	59
Total at Risk	421	383	459	420	761	785
% Recovered ADL Disability		24.7%	8.4%	15.9%	7.9%	7.8%
IADL Disability						
Mexican American	0	366	205	179	26	120
Total at Risk	1621	1262	1011	860	1540	1173
% Recovered IADL Disability		22.6%	16.2%	17.7%	3.0%	7.8%

into Model 3, the effect of social support is fully attenuated, and social support is no longer associated with ADL disability.

Among Mexican Americans, the association between social support and ADL disability is not significant in Model 1 or Model 2. However, in Model 3, there is evidence of a suppression effect. Among Mexican Americans in the Hispanic EPESE, when sociodemographics and health variables are adjusted for, higher social support increases the risk of developing ADL disability by 13.1 percent between any interval of time.

Table 6.4 illustrates the results for the association between social support and IADL disability among blacks, whites, and Mexican Americans. Among older blacks and whites, social support reduces the risk of developing IADL disability by 15.9 percent in Model 1, which is the unadjusted model. In Model 2 after adjusting for sociodemographics, social support is associated with a 12.8 percent reduction in risk of developing IADL disability during any interval. However, after adding health variables into Model 3, the association between social support and development of IADL disability is completely attenuated.

Among Mexican Americans, social support is not associated with IADL disability in the unadjusted first model, or in Model 2 which adjusts for sociodemographics. However, Model 3 includes the health variables, and once again a suppression effect can be seen in the model. After health variables are added into the model, social support is associated with a 11.7 percent increase in risk of developing IADL disability in any interval of data among older Mexican Americans.

Table 6.3: Discrete Time Hazard Analysis Using Logistic Regression for the Association of Social Support with Risk of Developing ADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)			Hispanic EPESE (N=3,050), Waves 1-6 (1993-2007)		
	Model 1 ^a	Model 2 ^a	Model 3 ^a	Model 1 ^a	Model 2 ^a	Model 3 ^a
Demographics						
Age		1.085 (1.074-1.096)	1.086 (1.075-1.098)		1.095 (1.082-1.109)	1.082 (1.066-1.098)
Female ^a		1.062 (0.916-1.233)	0.890 (0.764-1.037)		1.293 (1.104-1.514)	1.167 (0.976-1.396)
Black ^b		1.256 (1.107-1.425)	1.095 (0.958-1.253)			
< Highschool ^c		1.647 (1.348-2.012)	1.273 (1.035-1.566)		1.596 (1.010-2.520)	1.068 (0.644-1.770)
Highschool ^c		1.118 (0.816-1.533)	1.051 (0.764-1.445)		1.089 (0.637-1.863)	0.939 (0.521-1.693)
Widowed ^d		1.257 (1.079-1.463)	1.169 (1.002-1.363)		1.228 (1.044-1.445)	1.051 (0.877-1.258)
Single ^d		1.098 (0.854-1.410)	0.974 (0.754-1.260)		1.232 (0.967-1.571)	0.929 (0.704-1.227)
Health Variables						
BMI < 18.5 ^e			1.432 (1.179-1.739)			4.763 (3.739-6.069)
25<BMI<30 ^e			1.050 (0.900-1.225)			0.890 (0.722-1.098)
BMI>30 ^e			1.600 (1.344-1.904)			1.414 (1.144-1.748)
Chronic Conditions			1.428 (1.314-1.552)			1.346 (1.266-1.432)
Depressive Symptoms			1.098 (1.080-1.115)			1.049 (1.040-1.058)
Cognitive Function ^f			0.905 (0.867-0.946)			0.935 (0.922-0.948)
Social Variable						
Social Support	0.855 (0.810-0.903)	0.885 (0.835-0.938)	0.961 (0.904-1.020)	1.015 (0.964-1.068)	1.008 (0.944-1.076)	1.131 (1.049-1.220)

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPM3Q for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Hazard ratios and 95% confidence intervals are presented

Table 6.4: Discrete Time Hazard Analysis Using Logistic Regression for the Association of Social Support with Risk of Developing IADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)			Hispanic EPESE (N=3,050), Waves 1-6 (1993-2007)		
	Model 1 ^a	Model 2 ^a	Model 3 ^a	Model 1 ^a	Model 2 ^a	Model 3 ^a
Demographics						
Age		1.075 (1.064-1.086)	1.063 (1.051-1.075)		1.095 (1.083-1.108)	1.094 (1.081-1.108)
Female ^a		1.310 (1.140-1.505)	1.080 (0.934-1.249)		1.890 (1.665-2.146)	1.758 (1.531-2.020)
Black ^b		1.080 (0.960-1.214)	0.854 (0.752-0.970)			
< Highschool ^c		2.355 (1.954-2.838)	1.655 (1.362-2.010)		2.164 (1.520-3.079)	1.764 (1.206-2.579)
Highschool ^c		0.985 (0.731-1.327)	0.874 (0.644-1.185)		0.962 (0.634-1.460)	0.888 (0.568-1.388)
Widowed ^d		1.118 (0.974-1.283)	1.032 (0.895-1.190)		1.252 (1.096-1.430)	1.142 (0.989-1.319)
Single ^d		1.286 (1.025-1.614)	1.209 (0.953-1.534)		1.026 (0.844-1.247)	0.924 (0.746-1.145)
Health Variables						
BMI < 18.5 ^e			1.377 (1.127-1.682)			1.858 (1.448-2.385)
25<BMI<30 ^e			0.871 (0.755-1.006)			0.876 (0.746-1.030)
BMI>30 ^e			1.043 (0.880-1.236)			1.147 (0.969-1.359)
Chronic Conditions			1.438 (1.320-1.567)			1.578 (1.497-1.665)
Depressive Symptoms			1.127 (1.108-1.146)			1.046 (1.037-1.055)
Cognitive Function ^f			0.744 (0.711-0.779)			0.934 (0.921-0.946)
Social Variable						
Social Support	0.841 (0.798-0.885)	0.872 (0.824-0.924)	1.008 (0.947-1.072)	1.040 (0.992-1.090)	1.037 (0.980-1.097)	1.117 (1.049-1.189)

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMSQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Hazard ratios and 95% confidence intervals are presented

The Effect of Social Support on the Risk of Recovering from Disability

Table 6.5 shows the results for the risk of recovering completely from an ADL disability across the seven waves of the Duke EPESE and the six waves of the Hispanic EPESE. In Model 1, among older blacks and whites from the Duke EPESE, social support increases the risk of recovering from ADL disability by 9.8 percent in any interval. In Model 2, after adjusting for sociodemographics in the model, social support increases the risk of recovering from ADL disability by 9.2 percent in any interval in the Duke EPESE. In Model 3, the effect of social support is completely attenuated by health variables that were included in the model, and social support is not associated with the risk of recovering. Among Mexican Americans, social support is not significantly associated with the risk of recovering from ADL disability.

Table 6.6 shows the association between social support and recovery from IADL disability. In both the Duke EPESE study and in the Hispanic EPESE, social support is not significantly associated with recovery from IADL disability.

Table 6.5: Discrete Time Hazard Analysis Using Logistic Regression for the Association of Social Support with Risk of Recovering from ADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

Discrete Time Hazard Analysis Using Logistic Regression for the Association of Social Support with Risk of Recovering from ADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)			Hispanic EPESE (N=3,050), Waves 1-6 (1993-2007)		
	Model 1 ^a	Model 2 ^a	Model 3 ^a	Model 1 ^a	Model 2 ^a	Model 3 ^a
Demographics						
Age		0.960 (0.947-0.972)	0.957 (0.944-0.970)		0.950 (0.929-0.971)	0.962 (0.939-0.986)
Female ^a		1.133 (0.928-1.384)	1.246 (1.012-1.533)		1.170 (0.863-1.585)	1.251 (0.911-1.719)
Black ^b		1.032 (0.876-1.215)	1.205 (1.016-1.430)			
< Highschool ^c		0.840 (0.653-1.082)	1.021 (0.788-1.324)		1.106 (0.465-2.626)	1.231 (0.507-2.992)
Highschool ^c		0.785 (0.524-1.176)	0.874 (0.579-1.318)		0.706 (0.242-2.064)	0.680 (0.228-2.028)
Widowed ^d		0.963 (0.789-1.177)	1.045 (0.852-1.282)		0.963 (0.712-1.302)	1.018 (0.748-1.387)
Single ^d		0.898 (0.651-1.238)	0.929 (0.670-1.289)		0.668 (0.411-1.087)	0.753 (0.455-1.249)
Health Variables						
BMI < 18.5 ^e			0.822 (0.630-1.073)			0.396 (0.255-0.617)
25<BMI<30 ^e			1.129 (0.926-1.377)			1.266 (0.888-1.805)
BMI>30 ^e			0.860 (0.687-1.076)			1.010 (0.695-1.469)
Chronic Conditions			0.620 (0.556-0.690)			0.767 (0.689-0.855)
Depressive Symptoms			0.994 (0.974-1.015)			0.959 (0.942-0.975)
Cognitive Function ^f			1.145 (1.086-1.208)			1.046 (1.020-1.072)
Social Variable						
Social Support	1.098 (1.020-1.183)	1.092 (1.012-1.180)	1.072 (0.989-1.162)	0.991 (0.884-1.111)	0.975 (0.868-1.094)	0.886 (0.783-1.003)

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMSQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Hazard ratios and 95% confidence intervals are presented

Table 6.6: Discrete Time Hazard Analysis Using Logistic Regression for the Association of Social Support with Risk of Recovering from IADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)			Hispanic EPESE (N=3,050), Waves 1-6 (1993-2007)		
	Model 1 ^a	Model 2 ^a	Model 3 ^a	Model 1 ^a	Model 2 ^a	Model 3 ^a
Demographics						
Age		0.942 (0.929-0.956)	0.947 (0.932-0.961)		0.936 (0.923-0.949)	0.946 (0.932-0.960)
Female ^a		0.797 (0.653-0.974)	0.823 (0.667-1.017)		0.695 (0.590-0.819)	0.727 (0.612-0.864)
Black ^b		0.971 (0.815-1.158)	1.093 (0.907-1.318)			
< Highschool ^c		0.721 (0.549-0.948)	0.880 (0.663-1.166)		1.355 (0.765-2.401)	1.852 (1.008-3.403)
Highschool ^c		0.775 (0.493-1.220)	0.794 (0.501-1.261)		1.851 (0.974-3.517)	2.050 (1.041-4.037)
Widowed ^d		0.810 (0.662-0.990)	0.846 (0.689-1.040)		0.976 (0.822-1.159)	1.050 (0.879-1.254)
Single ^d		0.575 (0.401-0.824)	0.600 (0.416-0.865)		0.862 (0.668-1.113)	0.919 (0.703-1.202)
Health Variables						
BMI < 18.5 ^e			1.003 (0.760-1.326)			0.394 (0.286-0.544)
25<BMI<30 ^e			0.910 (0.733-1.129)			0.892 (0.736-1.083)
BMI>30 ^e			1.103 (0.871-1.397)			0.854 (0.697-1.047)
Chronic Conditions			0.911 (0.806-1.029)			0.60 (0.636-0.726)
Depressive Symptoms			0.915 (0.893-0.939)			0.958 (0.948-0.969)
Cognitive Function ^f			1.227 (1.149-1.309)			1.077 (1.059-1.095)
Social Variable						
Social Support	1.062 (0.986-1.144)	1.009 (0.932-1.093)	0.925 (0.851-1.005)	0.990 (0.927-1.059)	0.992 (0.926-1.062)	0.937 (0.871-1.008)

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMISQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Hazard ratios and 95% confidence intervals are presented

Hypothesis 3b

Hypothesis 3b is: **blacks will have a higher risk of developing disability, and a decreased risk of recovering from disability compared to whites. Social support will mediate the association of race with developing disability and with recovery from disability among Duke EPESE respondents.** Tables 6.7-6.8 show the results of the test of mediation using Baron and Kenny's (1986) four steps to testing for a mediation effect. The first step establishes that race is associated with the risk of developing ADL disability. Blacks have a 41.9 percent increased risk of developing at least one ADL disability compared to whites in any interval. Step 2 uses generalized linear mixed models as the most appropriate method to determine the association between race and social support. Race is associated with social support, with blacks reporting significantly less social support ($p < 0.001$) compared to older whites. Step 3 establishes the association between social support and development of disability. Increased social support decreases the risk for developing ADL disability by 14.5 percent in any interval. Step 4 shows the decrease in the association between race and ADL disability when social support is included in the model. Older blacks have a reduction of 3.5 percent in the risk of developing ADL disability in any interval compared to older whites when social support is included in the model. (Reduction in risk was analyzed by subtracting the risk in step 4 from the risk in step 1, then dividing by the risk in step 1.) There is evidence that social support partially mediates the association between race and the risk of developing ADL disability.

Table 6.7: Discrete Time Hazard Analysis and Generalized Linear Mixed Models to Test the Mediation Effect of Social Support on the Association between Race and Development of ADL Disability among Respondents in the Duke EPESE

Step 1. Establish the association between race and development of disability.		
	<hr/> Model 1 ^b <hr/>	
Black ^a	1.419 (1.274-1.582)	
Step 2. Establish that race is associated with social support.		
	<hr/> Model 1 ^c <hr/>	<hr/> p-value <hr/>
Black ^a	-0.062 (0.007)	<0.001
Step 3. Establish the association between social support and development of disability.		
	<hr/> Model 1 ^b <hr/>	
Social Support	0.855 (0.810-0.903)	
Step 4. Does the effect of race on disability diminish after adding social support into the model?		
	<hr/> Model 1 ^b <hr/>	
Black ^a	1.369 (1.217-1.539)	
Social Support	0.871 (0.825-0.920)	

Notes:

^a Compared to whites

^b Hazard ratios and 95% confidence intervals are presented

^c Unstandardized betas and standard errors are presented

Table 6.8 shows the results for the test of whether social support mediates the association between race and the risk of developing IADL disability. Step 1 establishes that race is associated with the risk of developing IADL disability. Older blacks have a 32.1 percent increased risk of developing IADL disability in any interval compared to whites. Step 2 establishes the association between race and social support, and race is significantly associated with social support, with blacks reporting less social support ($p < 0.001$) compared to older whites. Step 3 establishes the association between social support and the development of IADL disability. Increased social support reduces the risk of developing IADL disability by 15.9 percent in any interval. The fourth step shows that the effect of race is diminished when social support is included in the model. When social support is included in the model, the increased risk of developing IADL disability of blacks compared to whites is reduced by 1.1 percent.

This reduction in risk is quite small; however, it is evidence that there is partial mediation of social support on the association between race and IADL disability. Sobel tests, shown in table 6.9, were conducted to test whether the mediation effect of social support on the association between race and disability were significantly different from zero. Social support does significantly mediate the association between race and ADL disability ($p < 0.001$) and social support also significantly mediates the association between race and IADL disability ($p < 0.001$).

Race was not associated with recovery from either ADL or IADL disability, so social support did not mediate the association between race and disability.

Table 6.8: Discrete Time Hazard Analysis and Generalized Linear Mixed Models to Test the Mediation Effect of Social Support on the Association between Race and Development of IADL Disability among Respondents in the Duke EPESE

Step 1. Establish the association between race and development of disability.		
	Model 1 ^b	
Black ^a	1.321 (1.196-1.459)	
Step 2. Establish that race is associated with social support.		
	Model 1 ^c	p-value
Black ^a	-0.062 (0.007)	<0.001
Step 3. Establish the association between social support and development of disability.		
	Model 1 ^b	
Social Support	0.841 (0.798-0.885)	
Step 4. Does the effect of race on disability diminish after adding social support into the model?		
	Model 1 ^b	
Black ^a	1.307 (1.176-1.452)	
Social Support	0.852 (0.809-0.897)	

Notes:

^a Compared to whites

^b Hazard ratios and 95% confidence intervals are presented

^c Unstandardized betas and standard errors are presented

Table 6.9: Results of Sobel Tests of the Mediating Effect of Social Support on the Association between Race and the Risk of developing ADL/ IADL Disability among Older Adults from the Duke EPESE Study (1986-1992)

Race with	Test Statistic (Standard Error)	P-value
ADL	$z = -4.213$ (0.013)	<0.001
IADL	$z = -4.220$ (0.011)	<0.001

INTERPRETING THE RESULTS AMONG MEXICAN AMERICANS

Table 6.2 had a noticeable increase in the incidence of ADL disability in the fifth wave. It was noted that more time had passed between the collections of 2000-2001 and 2004-2005 than between any of the other waves. However, the possibility that this change in the incidence could change the results was considered.

In order to test whether or not this made a difference, the same analyses were conducted for both development of ADL and IADL disability as an outcome. It was found that when the analysis was conducted in the first four waves of data for the development of ADL disability, different results were found than when analyzed for all six waves of data. It was found that social support was not associated with disability ($p > 0.05$) after the fifth (2004-2005) and sixth (2006-2007) waves were not included in the analysis.

For the association between social support and the risk of developing IADL disability, results stayed consistent whether all waves of data (1993-2007) or four waves of data (1993-2001) were included in the analyses.

SUMMARY AIM 3 RESULTS

This section summarizes the results from chapter 6. In general, it appeared that social support affects disability in blacks, whites, and Mexican Americans, although not always in the way that it was thought. This chapter also found that social support mediates the association between race and disability among respondents from the Duke EPESE study.

The results for the aim 3 hypotheses were mixed. For the first hypothesis, 3a, that **greater social support will be associated with a decreased risk of developing disability and increased risk of recovery from disability in whites, blacks, and Mexican Americans**, there were results that differed between the two studies. In the Duke EPESE, social support did reduce the risk of developing ADL disability, but among older Mexican Americans, social support actually appeared to increase the risk of developing ADL disability in any interval of the study.

In the Duke EPESE, social support reduced the risk of developing IADL disability until the third and full model with health variables included. In that model, social support was not associated with the risk of developing IADL disability. However, among Mexican Americans, social support was initially not associated with the risk of developing IADL disability. However, when health variables were included in the model, social support was associated with an increased risk of developing IADL disability among Mexican Americans.

There was not much evidence to support the second part of the hypothesis, that social support would be associated with an increased risk of recovery among blacks, whites, and Mexican Americans. Among older blacks and whites, social support was

associated with an increase in risk of recovering from ADL disability in the first two models. In the full models, higher social support was not associated with the risk of recovery. Among Mexican Americans, social support was not associated with the risk of recovering from ADL disability. Results for the association between social support and recovering from IADL disability among blacks and whites showed that social support was not associated with the risk of recovering from IADL disability in any of the models. Among older Mexican Americans, social support was not associated with the risk of recovery from IADL disability.

For the second hypothesis, there was some support for the mediation effect of social support on the association between race and disability. Social support partially mediated the association between race and the risk of developing ADL disability. Likewise, social support partially mediated the association between race and the risk of developing IADL disability, although the effect was very small. There was no evidence of a mediation effect of social support on the association of race with recovery from disability, however, because race was not significantly associated with the risk of recovering from either ADL or IADL disability.

Chapter 7: Aim 4 Results

Chapter 7 presents the results from Aim 4, which was to examine the effect of social networks in different racial/ ethnic groups on the development of disability and recovery from disability in older adults. The results that were calculated for aim 4 describe the association between social network size and the risk of developing disability. Also described is the association between social network size and recovery from disability. In addition, chapter 7 describes the results that were found for the proposed association between social network composition (proportion friends in the social network) and onset of disability.

AIM 4 RESULTS

Hypothesis 4a

Results for hypothesis 4a are presented in tables 7.1 through 7.4. Hypothesis 4a tests whether **a larger social network size will be associated with a decreased risk of developing disability and an increased risk of recovery from disability in whites, blacks, and Mexican Americans.**

The Effect of Social Network Size on the Risk of Developing Disability

Table 7.1 presents the results for the association between social network size and ADL disability. Among older blacks and whites from the Duke EPESE study, Model 1 shows that larger social network size accounts for a 3.2 percent reduction in risk of developing ADL disabilities in any interval of the study in the unadjusted model. After

Model 2 adjust for sociodemographics, and shows that larger social networks account for a 2.8 percent reduction of risk of developing ADL disability in any interval of the Duke EPESE study. After health variables are added into the third model, the association between social network size and ADL disability becomes marginal, yet still significant. Larger social networks decrease the risk of developing ADL disability by 1.8 percent in any interval of the study after including sociodemographics and health variables in the model.

Among Mexican Americans from the Hispanic EPESE study, larger social networks increase the risk of developing ADL disability by 3.9 percent between the last two waves of the study in the first unadjusted model, which is opposite of the hypothesized direction of the association. However, once sociodemographics are added into the model, as seen in Model 2, larger network size no longer increases the risk of developing ADL disability among Mexican Americans. Adding health variables into Model 3 did not change the non-significant results that were found in the second model.

Table 7.2 shows the results of the logistic regression models used to show the relationship between social network size and IADL disability. Among Mexican Americans, social network size is not significantly associated with a decrease in IADL disability in Model 1, the unadjusted model. Models 2 and 3 show that the addition of sociodemographics and health variables do not change the findings in the unadjusted model, and among older Mexican Americans, larger social networks are not associated with a decrease in the risk of developing IADL disability.

Table 7.1: Discrete Time Hazard Analysis Using Logistic Regression for the Association of Social Network Size with Risk of Developing ADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)			Hispanic EPESE (N=2,069), Waves 5-6 (2004-2007)		
	Model 1 ^a	Model 2 ^a	Model 3 ^a	Model 1 ^a	Model 2 ^a	Model 3 ^a
Demographics						
Age		1.087 (1.076-1.097)	1.087 (1.076-1.099)		0.934 (0.906-0.963)	0.932 (0.894-0.971)
Female ^a		1.005 (0.867-1.165)	0.858 (0.734-1.001)		0.691 (0.486-0.983)	0.826 (0.537-1.271)
Black ^b		1.317 (1.161-1.494)	1.114 (0.973-1.277)			
< Highschool ^c		1.758 (1.436-2.151)	1.311 (1.060-1.621)		0.940 (0.242-3.645)	1.117 (0.246-5.060)
Highschool ^c		1.196 (0.873-1.639)	1.089 (0.788-1.504)		0.457 (0.095-2.202)	0.432 (0.071-2.637)
Widowed ^d		1.252 (1.076-1.457)	1.168 (0.999-1.366)		0.886 (0.618-1.271)	0.727 (0.473-1.117)
Single ^d		1.079 (0.841-1.386)	0.954 (0.733-1.241)		0.716 (0.410-1.249)	0.574 (0.299-1.100)
Health Variables						
BMI < 18.5 ^e			1.465 (1.203-1.783)			0.230 (0.126-0.421)
25<BMI<30 ^e			1.030 (0.880-1.205)			0.430 (0.268-0.689)
BMI>30 ^e			1.631 (1.367-1.946)			0.352 (0.211-0.586)
Chronic Conditions			1.421 (1.305-1.546)			0.836 (0.641-1.091)
Depressive Symptoms			1.095 (1.077-1.112)			0.978 (0.958-0.998)
Cognitive Function ^f			0.911 (0.872-0.953)			1.033 (1.006-1.061)
Social Variable						
Social Network Size	0.968 (0.958-0.978)	0.972 (0.962-0.982)	0.988 (0.978-0.999)	1.039 (1.001-1.079)	1.024 (0.983-1.066)	1.014 (0.966-1.064)

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMISQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Hazard ratios and 95% confidence intervals are presented

Table 7.2: Discrete Time Hazard Analysis Using Logistic Regression for the Association of Social Network Size with Risk of Developing IADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

Discrete Time Hazard Analysis for the Association of Social Network Size with Risk of Developing IADL Disabilities Among Whites and Blacks in the Duke EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)			Hispanic EPESE (N=2,069), Waves 5-6 (2004-2007)		
	Model 1 ^g	Model 2 ^g	Model 3 ^g	Model 1 ^g	Model 2 ^g	Model 3 ^g
Demographics						
Age		1.080 (1.069-1.092)	1.066 (1.053-1.078)		0.915 (0.879-0.951)	0.916 (0.873-0.962)
Female ^a		1.311 (1.139-1.508)	1.123 (0.969-1.303)		0.482 (0.338-0.687)	0.481 (0.324-0.713)
Black ^b		1.111 (0.988-1.250)	0.843 (0.740-0.959)			
< Highschool ^c		2.424 (2.010-2.923)	1.618 (1.327-1.974)		0.196 (0.090-0.790)	0.242 (0.051-1.151)
Highschool ^c		0.935 (0.687-1.271)	0.793 (0.577-1.089)		0.438 (0.090-2.131)	0.841 (0.140-5.038)
Widowed ^d		1.032 (0.898-1.187)	0.978 (0.846-1.131)		0.781 (0.542-1.126)	0.812 (0.545-1.208)
Single ^d		1.315 (1.048-1.651)	1.225 (0.961-1.561)		0.593 (0.318-1.107)	0.517 (0.262-1.019)
Health Variables						
BMI < 18.5 ^e			1.444 (1.179-1.770)			0.575 (0.263-1.259)
25<BMI<30 ^e			0.883 (0.762-1.022)			0.905 (0.591-1.385)
BMI>30 ^e			1.072 (0.901-1.274)			0.833 (0.511-1.360)
Chronic Conditions			1.441 (1.320-1.572)			0.603 (0.468-0.777)
Depressive Symptoms			1.128 (1.109-1.147)			0.968 (0.947-0.991)
Cognitive Function ^f			0.738 (0.714-0.774)			1.079 (1.045-1.115)
Social Variable						
Social Network Size	0.985 (0.976-0.994)	0.989 (0.979-0.999)	1.011 (1.000-1.022)	1.014 (0.987-1.043)	1.004 (0.973-1.037)	0.994 (0.952-1.038)

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMISQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Hazard ratios and 95% confidence intervals are presented

The Effect of Social Network Size on the Risk of Recovering from Disability

Table 7.3 presents the results of the logistic regression models that examine the association of social network size with the risk of recovering from ADL disability. Among older blacks and whites from the Duke EPESE, a larger social network size increases the risk of recovering from ADL disability by 3.9 percent in any interval of the study, according to the first unadjusted model. The second model shows that the addition of sociodemographics to the equation does not change the size of the association very much. After adding sociodemographics, larger social network size increases the risk of recovering from ADL disability by 3.7 percent in any interval. When health variables are included into Model 3 the association is reduced but is still significant. After adding health variables, larger social network size increases the risk of recovering from ADL disability by 2.6 percent in any interval.

Among Mexican Americans, social network size is not associated with the risk of recovering from ADL disability in the first unadjusted model. After adding sociodemographics in Model 2, the association remains non-significant. In Model 3, after adding health variables into the model, social network size is still not associated with the risk of recovering from ADL disability between the last two waves of the study.

Table 7.4 shows the results of the analyses that examined the association between social network size and recovery from IADL disability. In the first unadjusted model, among older blacks and whites, larger social network size increases the risk of recovering from IADL disability by 1.4 percent between the first, fourth, and seventh waves of the study, although the effect is marginal. However, when sociodemographics are added into

Table 7.3: Discrete Time Hazard Analysis Using Logistic Regression for the Association of Social Network Size with Risk of Recovering from ADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)			Hispanic EPESE (N=2,069), Waves 5-6 (2004-2007)		
	Model 1 ^g	Model 2 ^g	Model 3 ^g	Model 1 ^g	Model 2 ^g	Model 3 ^g
Demographics						
Age		0.962 (0.949-0.976)	0.958 (0.944-0.972)		0.931 (0.872-0.994)	0.960 (0.887-1.039)
Female ^a		1.110 (0.892-1.380)	1.244 (0.993-1.560)		1.036 (0.543-1.977)	1.065 (0.515-2.204)
Black ^b		0.948 (0.794-1.133)	1.244 (0.993-1.352)			
< Highschool ^c		0.848 (0.648-1.109)	1.044 (0.790-1.379)		3.147 (0.257-38.508)	3.953 (0.383-40.820)
Highschool ^c		0.728 (0.471-1.125)	0.826 (0.530-1.287)		0.709 (0.030-16.933)	0.643 (0.031-13.387)
Widowed ^d		0.937 (0.755-1.163)	1.002 (0.804-1.249)		0.765 (0.403-1.452)	0.679 (0.341-1.352)
Single ^d		0.878 (0.613-1.256)	0.901 (0.625-1.298)		0.419 (0.118-1.490)	0.372 (0.101-1.374)
Health Variables						
BMI < 18.5 ^e			0.753 (0.562-1.010)			0.721 (0.243-2.145)
25<BMI<30 ^e			1.101 (0.889-1.363)			1.033 (0.469-2.275)
BMI>30 ^e			0.832 (0.653-1.060)			1.129 (0.475-2.683)
Chronic Conditions			0.608 (0.541-0.685)			0.838 (0.525-1.338)
Depressive Symptoms			0.991 (0.968-1.013)			0.979 (0.943-1.017)
Cognitive Function ^f			1.124 (1.060-1.193)			1.107 (1.043-1.176)
Social Variable						
Proportion Friends in Network	0.607 (0.431-0.856)	0.590 (0.411-0.848)	0.711 (0.492-1.029)	1.322 (1.020-1.714)	1.414 (1.063-1.882)	1.256 (0.928-1.701)

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMISQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Hazard ratios and 95% confidence intervals are presented

Table 7.4: Discrete Time Hazard Analysis Using Logistic Regression for the Association of Social Network Size with Risk of Recovering from IADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)			Hispanic EPESE (N=2,069), Waves 5-6 (2004-2007)		
	Model 1 ^a	Model 2 ^a	Model 3 ^a	Model 1 ^a	Model 2 ^a	Model 3 ^a
Demographics						
Age		0.943 (0.929-0.957)	0.948 (0.933-0.963)		0.884 (0.839-0.932)	0.898 (0.847-0.952)
Female ^a		0.832 (0.680-1.017)	0.830 (0.671-1.026)		0.517 (0.340-0.787)	0.573 (0.368-0.891)
Black ^b		0.967 (0.811-1.155)	1.126 (0.933-1.361)			
< Highschool ^c		0.672 (0.512-0.884)	0.853 (0.642-1.135)		0.956 (0.279-3.272)	1.743 (0.481-6.308)
Highschool ^c		0.751 (0.477-1.183)	0.819 (0.515-1.304)		1.310 (0.331-5.188)	1.825 (0.438-7.598)
Widowed ^d		0.810 (0.660-0.993)	0.856 (0.695-1.054)		1.008 (0.652-1.558)	0.950 (0.604-1.494)
Single ^d		0.604 (0.420-0.868)	0.606 (0.419-0.877)		0.648 (0.291-1.441)	0.518 (0.226-1.189)
Health Variables						
BMI < 18.5 ^e			0.980 (0.741-1.296)			0.303 (0.124-0.741)
25<BMI<30 ^e			0.915 (0.735-1.138)			0.636 (0.393-1.028)
BMI>30 ^e			1.105 (0.870-1.403)			0.603 (0.346-1.051)
Chronic Conditions			0.895 (0.790-1.014)			0.641 (0.484-0.847)
Depressive Symptoms			0.919 (0.896-0.943)			0.980 (0.955-1.006)
Cognitive Function ^f			1.213 (1.136-1.296)			1.082 (1.040-1.125)
Social Variable						
Social Network Size	1.014 (1.000-1.028)	1.009 (0.994-1.024)	0.990 (0.975-1.005)	1.011 (0.978-1.045)	0.998 (0.957-1.042)	0.978 (0.928-1.031)

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMISQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Hazard ratios and 95% confidence intervals are presented

the model, the association is attenuated and social network size no longer significantly increases the risk of recovery from IADL disability. In the third model after adding health variables, larger social network size is not associated with recovery from IADL disability.

Among Mexican Americans, larger social network size is not associated with the risk of recovering from IADL disability between the fifth and sixth waves of the study. Adding sociodemographics into Model 2 and health variables into Model 3 do not change the non-significant results of the unadjusted model, and among older Mexican Americans, larger social network size is not associated with the risk of recovering from IADL disability between the fifth and sixth waves of the Hispanic EPESE study.

Hypothesis 4b

Hypothesis 4b tests whether a higher proportion of non-kin (friends) in the social network will be associated with a decreased risk of developing disability and increased risk of recovery from disability in whites, blacks, and Mexican Americans. The results for this hypothesis are presented in tables 7.5 through 7.8.

The Effect of the Proportion of Friends in the Social Network on Risk of Developing Disability

Table 7.5 shows the results for the analyses that tested the association between the proportion of friends in the social network and the risk of developing ADL disability. Among older blacks and whites, the first unadjusted model shows that a higher proportion of friends in the social network is not associated with the risk of developing ADL disability. The proportion of friends in the social network is not associated the risk

of developing ADL disability between any interval when sociodemographics or health variables are included in the model.

Among Mexican Americans, a higher proportion of friends in the social network is not associated with the risk of developing ADL disability between the fifth and sixth waves in the unadjusted model. However, after adding sociodemographics into the second model, a larger proportion of friends in the social network increases the risk of developing ADL disability by 30.7 percent. After adding the health variables into the third model, a higher proportion of friends in the social network is not associated with the risk of developing ADL disability between the fifth and sixth waves of the study.

Table 7.6 shows the results from the analyses that examine the association between the proportion of friends in the social network and the development of IADL disability among blacks and whites, as well as Mexican Americans in the last two waves of the Hispanic EPESE study. Among older blacks and whites the first unadjusted model shows that a higher proportion of friends in the social network is not associated with the risk of developing IADL disability. In the second model after sociodemographics are included in the model, a higher proportion of friends in the social network is still not associated with the risk of developing IADL disability between the first, fourth, and seventh wave of the study. After adding health variables into the third model, the association between the proportion of friends in the social network and the development of IADL disability becomes significant. In the full model, a higher proportion of friends in the social network is associated with a 26.7 percent decrease in the risk of developing IADL disability in any interval.

Table 7.5: Discrete Time Hazard Analysis Using Logistic Regression for the Association of the Proportion of Friends in the Social Network with Risk of Developing ADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)			Hispanic EPESE (N=2,069), Waves 5-6 (2004-2007)		
	Model 1 [§]	Model 2 [§]	Model 3 [§]	Model 1 [§]	Model 2 [§]	Model 3 [§]
Demographics						
Age		1.089 (1.078-1.101)	1.090 (1.078-1.103)		0.929 (0.900-0.960)	0.928 (0.890-0.968)
Female ^a		1.030 (0.876-1.212)	0.860 (0.729-1.015)		0.651 (0.453-0.937)	0.830 (0.534-1.291)
Black ^b		1.322 (1.153-1.517)	1.113 (0.962-1.287)			
< Highschool ^c		1.665 (1.347-2.059)	1.226 (0.983-1.528)		1.005 (0.258-3.915)	1.162 (0.255-5.299)
Highschool ^c		1.189 (0.850-1.664)	1.067 (0.760-1.498)		0.333 (0.066-1.679)	0.439 (0.071-2.721)
Widowed ^d		1.241 (1.053-1.463)	1.174 (0.994-1.387)		0.876 (0.607-1.266)	0.729 (0.472-1.126)
Single ^d		1.045 (0.789-1.384)	0.944 (0.709-1.258)		0.612 (0.337-1.111)	0.504 (0.256-0.995)
Health Variables						
BMI < 18.5 ^e			1.425 (1.153-1.762)			0.216 (0.117-0.400)
25<BMI<30 ^e			1.054 (0.892-1.246)			0.440 (0.274-0.707)
BMI>30 ^e			1.679 (1.391-2.028)			0.362 (0.217-0.603)
Chronic Conditions			1.426 (1.302-1.563)			0.811 (0.619-1.063)
Depressive Symptoms			1.095 (1.076-1.115)			0.979 (0.959-1.000)
Cognitive Function ^f			0.897 (0.854-0.942)			1.034 (1.006-1.062)
Social Variable						
Proportion of Friends in Network	1.135 (0.863-1.493)	1.210 (0.908-1.612)	0.992 (0.742-1.328)	1.206 (0.961-1.514)	1.307 (1.003-1.703)	1.137 (0.875-1.478)

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMISQ for the Duke EPESE and the MMSE for the Hispanic EPESE

[§] Hazard ratios and 95% confidence intervals are presented

Table 7.6: Discrete Time Hazard Analysis Using Logistic Regression for the Association of the Proportion of Friends in the Social Network with Risk of Developing IADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)			Hispanic EPESE (N=2,069), Waves 5-6 (2004-2007)		
	Model 1 ^g	Model 2 ^g	Model 3 ^g	Model 1 ^g	Model 2 ^g	Model 3 ^g
Demographics						
Age		1.079 (1.067-1.091)	1.067 (1.054-1.080)		0.916 (0.881-0.953)	0.918 (0.874-0.963)
Female ^a		1.453 (1.249-1.691)	1.193 (1.018-1.399)		0.465 (0.325-0.665)	0.468 (0.315-0.695)
Black ^b		1.089 (0.960-1.235)	0.834 (0.726-0.958)			
< Highschool ^c		2.396 (1.964-2.923)	1.581 (1.283-1.947)		0.198 (0.049-0.797)	0.235 (0.049-1.124)
Highschool ^c		1.021 (0.740-1.407)	0.871 (0.627-1.209)		0.446 (0.091-2.176)	0.813 (0.135-4.881)
Widowed ^d		1.044 (0.901-1.209)	0.974 (0.836-1.135)		0.805 (0.557-1.163)	0.817 (0.549-1.218)
Single ^d		1.146 (0.892-1.472)	1.062 (0.816-1.382)		0.724 (0.384-1.363)	0.651 (0.327-1.293)
Health Variables						
BMI < 18.5 ^e			1.519 (1.228-1.880)			0.554 (0.251-1.222)
25<BMI<30 ^e			0.822 (0.703-0.961)			0.880 (0.575-1.349)
BMI>30 ^e			1.102 (0.919-1.321)			0.804 (0.492-1.313)
Chronic Conditions			1.437 (1.309-1.577)			0.597 (0.463-0.770)
Depressive Symptoms			1.126 (1.107-1.147)			0.969 (0.947-0.991)
Cognitive Function ^f			0.748 (0.711-0.787)			1.080 (1.046-1.116)
Social Variable						
Proportion of Friends in Network	0.880 (0.683-1.134)	0.881 (0.667-1.163)	0.733 (0.550-0.977)	0.957 (0.768-1.192)	0.936 (0.753-1.163)	0.813 (0.612-1.079)

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMISQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Hazard ratios and 95% confidence intervals are presented

Among older Mexican Americans, a higher proportion of friends in the social network is not associated with the risk of developing IADL disability in the unadjusted model, after adjusting for sociodemographics, and in the full model which adds health variables.

The Effect of the Proportion of Friends in the Social Network on Risk of Recovery from Disability

Table 7.7 shows the results of the analysis that examines the association between the proportion of friends in the social network and the risk of recovery from ADL disability. Among older blacks and whites, the first unadjusted model shows that a higher proportion of friends in the social network reduces the risk of recovery from ADL disability by 39.3 percent in any interval, which is opposite of the effect that was hypothesized. After adding sociodemographics into Model 2, the association between the proportion of friends in the social network decreases the risk of recovery from ADL disability by 41 percent in any interval. In the third and full model after adding health variables, a higher proportion of friends in the social network is not associated with the risk of developing ADL disability.

Among older Mexican Americans, a higher proportion of friends in the social network in the first unadjusted model increases the risk of recovery from ADL disability by 32.2 percent between the fifth and the sixth years of the Hispanic EPESE study. After adding sociodemographics into the second model, the risk of recovering from ADL disability among Mexican Americans increases to 41.4 percent between the fifth and sixth years of the study. After adding health variables into the third model, the association

Table 7.7: Discrete Time Hazard Analysis Using Logistic Regression for the Association of the Proportion of Friends in the Social Network with Risk of Recovering from ADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)			Hispanic EPESE (N=2,069), Waves 5-6 (2004-2007)		
	Model 1 ^g	Model 2 ^g	Model 3 ^g	Model 1 ^g	Model 2 ^g	Model 3 ^g
Demographics						
Age						
Female ^a		0.962 (0.949-0.976)	0.958 (0.944-0.972)		0.931 (0.872-0.994)	0.960 (0.887-1.039)
Black ^b		1.110 (0.892-1.380)	1.244 (0.993-1.560)		1.036 (0.543-1.977)	1.065 (0.515-2.204)
< Highschool ^c		0.948 (0.794-1.133)	1.244 (0.993-1.352)			
Highschool ^c		0.848 (0.648-1.109)	1.044 (0.790-1.379)		3.147 (0.257-38.508)	3.953 (0.383-40.820)
Widowed ^d		0.728 (0.471-1.125)	0.826 (0.530-1.287)		0.709 (0.030-16.933)	0.643 (0.031-13.387)
Single ^d		0.937 (0.755-1.163)	1.002 (0.804-1.249)		0.765 (0.403-1.452)	0.679 (0.341-1.352)
Health Variables		0.878 (0.613-1.256)	0.901 (0.625-1.298)		0.419 (0.118-1.490)	0.372 (0.101-1.374)
BMI < 18.5 ^e			0.753 (0.562-1.010)			0.721 (0.243-2.145)
25<BMI<30 ^e			1.101 (0.889-1.363)			1.033 (0.469-2.275)
BMI>30 ^e			0.832 (0.653-1.060)			1.129 (0.475-2.683)
Chronic Conditions			0.608 (0.541-0.685)			0.838 (0.525-1.338)
Depressive Symptoms			0.991 (0.968-1.013)			0.979 (0.943-1.017)
Cognitive Function ^f			1.124 (1.060-1.193)			1.107 (1.043-1.176)
Social Variable						
Proportion Friends in Network	0.607 (0.431-0.856)	0.590 (0.411-0.848)	0.711 (0.492-1.029)	1.322 (1.020-1.714)	1.414 (1.063-1.882)	1.256 (0.928-1.701)

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMISQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Hazard ratios and 95% confidence intervals are presented

Table 7.8: Discrete Time Hazard Analysis Using Logistic Regression for the Association of the Proportion of Friends in the Social Network with Risk of Recovering from IADL Disabilities Among Whites and Blacks in the Duke EPESE and Mexican-Americans in the Hispanic EPESE

	Duke EPESE (N=4,136), Waves 1-7 (1986-1992)			Hispanic EPESE (N=2,069), Waves 5-6 (2004-2007)		
	Model 1 ^a	Model 2 ^a	Model 3 ^a	Model 1 ^a	Model 2 ^a	Model 3 ^a
Demographics						
Age		0.947 (0.932-0.962)	0.949 (0.933-0.964)		0.886 (0.840-0.935)	0.898 (0.847-0.953)
Female ^a		0.739 (0.598-0.913)	0.783 (0.627-0.979)		0.543 (0.354-0.834)	0.613 (0.391-0.960)
Black ^b		0.953 (0.791-1.148)	1.089 (0.893-1.329)			
< Highschool ^c		0.703 (0.529-0.934)	0.890 (0.663-1.196)		1.004 (0.287-3.510)	1.767 (0.484-6.456)
Highschool ^c		0.620 (0.378-1.016)	0.663 (0.400-1.097)		1.433 (0.355-5.784)	1.959 (0.467-8.219)
Widowed ^d		0.773 (0.624-0.958)	0.811 (0.652-1.009)		0.958 (0.615-1.491)	0.901 (0.570-1.424)
Single ^d		0.613 (0.418-0.900)	0.620 (0.419-0.915)		0.654 (0.284-1.510)	0.551 (0.234-1.300)
Health Variables						
BMI < 18.5 ^e			0.966 (0.717-1.300)			0.313 (0.128-0.765)
25<BMI<30 ^e			1.009 (0.802-1.268)			0.643 (0.397-1.043)
BMI>30 ^e			1.113 (0.864-1.434)			0.586 (0.333-1.031)
Chronic Conditions			0.882 (0.773-1.005)			0.637 (0.480-0.846)
Depressive Symptoms			0.919 (0.895-0.944)			0.978 (0.952-1.004)
Cognitive Function ^f			1.207 (1.125-1.294)			1.076 (1.033-1.119)
Social Variable						
Proportion Friends in Network	1.118 (0.787-1.590)	1.101 (0.747-1.623)	1.272 (0.856-1.891)	1.132 (0.994-1.288)	1.120 (0.983-1.275)	1.093 (0.963-1.241)

Notes:

^a Compared to males

^b Compared to whites

^c Compared to greater than high school education

^d Compared to married

^e Compared to normal BMI (greater than 18.5 and less than 25)

^f Cognitive function assessments were carried out using the SPMISQ for the Duke EPESE and the MMSE for the Hispanic EPESE

^g Hazard ratios and 95% confidence intervals are presented

between the proportion of friends in the social network is fully attenuated, and is no longer associated with the risk of recovery from ADL disability among Mexican Americans.

Table 7.8 shows the results from the analyses that examine the association between the proportion of friends in the social network and the risk of recovery from IADL disability. Among older blacks and whites, a higher proportion of friends does not significantly increase or decrease the risk of recovering from IADL disability between the first, fourth, and seventh waves of the Duke EPESE. Among Mexican Americans, an increased proportion of friends in the social network is not significantly associated with an increased or decreased risk of recovering from IADL disability between the fifth and sixth waves of the Hispanic EPESE.

Hypothesis 4c

Hypothesis 4c stated that **blacks will have a higher risk of developing disability and a decreased risk of recovering from disability compared to whites. The association of race with developing disability and recovery from disability will be partially mediated by social network size and composition (proportion of non-kin in network) among respondents from the Duke EPESE.**

Table 7.9 shows the four steps described by Baron and Kenny (1986) to test whether a social network size mediates the association between race and the risk of developing ADL disability. Step 1 establishes that there is an association between race and ADL disability. Older blacks report a 41.9 percent greater risk in developing ADL disability in any interval compared to whites. Step 2 establishes that there is an

Table 7.9: Discrete Time Hazard Analysis and Generalized Linear Mixed Models to Test the Mediation Effect of Social Network Size on the Association between Race and Development of ADL Disability among Respondents in the Duke EPESE

Step 1. Establish the association between race and development of disability.		
	<hr/> Model 1 ^b <hr/>	
Black ^a	1.419 (1.274-1.582)	
Step 2. Establish that race is associated with social network size.		
	<hr/> Model 1 ^c <hr/>	<hr/> p-value <hr/>
Black ^a	-0.028 (0.015)	0.069
Step 3. Establish the association between social network size and development of disability.		
	<hr/> Model 1 ^b <hr/>	
Social Network Size	0.968 (0.958-0.978)	
Step 4. Does the effect of race on disability diminish after adding social network size into the model?		
	<hr/> Model 1 ^b <hr/>	
Black ^a	1.458 (1.298-1.638)	
Social Network Size	0.969 (0.959-0.979)	

Notes:

^a Compared to whites

^b Hazard ratios and 95% confidence intervals are presented

^c Unstandardized betas and standard errors are presented

association between race and social network size. Step 2 was performed using generalized linear mixed model, with a normal distribution, since social network was normally distributed. This association was marginal, with blacks reporting smaller social networks compared to whites. Step 3 shows that social network size is associated with the risk of developing ADL disability. A larger social network is associated with a 3.2 percent reduction in risk of developing ADL disability. Step 4 includes race and social network size in the model. When social network size and race are included in the model, the effect of race on the risk of developing ADL disability is increased. Social network size increases risk of blacks developing ADL disability by 8.5 percent, and blacks have a 45.8 percent increased risk of developing ADL disability in any interval compared to whites when social network size is included in the model. Social network size does not mediate the association between race and the risk of developing ADL disability.

Table 7.10 shows the results of the four steps to show whether social network size mediates the association between race and IADL disability. The first step establishes the association between race and IADL disability. Older blacks have a 32.1 percent increase in risk of developing IADL disability compared to whites between the first, fourth, and seventh waves of the study. Step 2 shows that race is marginally associated with social network size. Blacks report a smaller social network size compared to whites. Step 3 establishes that social network size is associated with IADL disability. A larger social network is associated with a 1.5 percent decrease in risk of developing IADL disability. Step 4 includes race and social network size in the model. When social network size is included in the model, the effect of race is increased by 13 percent, and blacks have an increased risk of 36.9 percent of developing IADL disability compared to whites.

Therefore, social network size does not mediate the association between race and IADL disability.

Table 7.11 shows the four steps to test whether the proportion of friends in the social network mediates the association between race and ADL disability. However, step 3 establishes that there is not an association between the proportion of friends in the social network and the risk of developing ADL disability. Therefore, the mediation effect cannot be tested, and it can be concluded that the proportion of friends in the social network does not mediate the association between race and ADL disability.

Table 7.12 shows the four steps to test whether the proportion of friends in the social network mediates the association between race and IADL disability. Similar to what was found in the previous table, step 3 establishes that there is not an association between the proportion of friends in the social network and the risk of developing IADL disability. Therefore, the test of mediation cannot be completed, and it can be concluded that the proportion of friends in the social network does not mediate the association between race and IADL disability.

The next part of hypothesis 4c was to test whether social network size and the proportion of friends in the social network mediated the association between race and risk of recovery. However, race is not associated with the risk of recovery from either ADL or IADL disability, and so social network size and the proportion of friends in the social network cannot mediate the association between race and the risk of recovery.

Table 7.10: Discrete Time Hazard Analysis and Generalized Linear Mixed Models to Test the Mediation Effect of Social Network Size on the Association between Race and Development of IADL Disability among Respondents in the Duke EPESE

Step 1. Establish the association between race and development of disability.		
	Model 1 ^b	
Black ^a	1.321 (1.196-1.459)	
Step 2. Establish that race is associated with social network size.		
	Model 1 ^c	p-value
Black ^a	-0.028 (0.015)	0.069
Step 3. Establish the association between social network size and development of disability.		
	Model 1 ^b	
Social Network Size	0.985 (0.976-0.994)	
Step 4. Does the effect of race on disability diminish after adding social network size into the model?		
	Model 1 ^b	
Black ^a	1.369 (1.231-1.522)	
Social Network Size	0.986 (0.977-0.996)	

Notes:

^a Compared to whites

^b Hazard ratios and 95% confidence intervals are presented

^c Unstandardized betas and standard errors are presented

Table 7.11: Discrete Time Hazard Analysis and Generalized Linear Mixed Models to Test the Mediation Effect of the Proportion of Friends in the Social Network on the Association between Race and Development of ADL Disability among Respondents in the Duke EPESE

Step 1. Establish the association between race and development of disability.		
	Model 1 ^b	
Black ^a	1.419 (1.274-1.582)	
Step 2. Establish that race is associated with the proportion of friends in the social network.		
	Model 1 ^c	p-value
Black ^a	-0.097 (0.012)	<0.001
Step 3. Establish the association between the proportion of friends in the social network and development of disability.		
	Model 1 ^b	
Proportion Friends	1.135 (0.863-1.493)	
Step 4. Does the effect of race on disability diminish after adding social support into the model?		
	Model 1 ^b	
Black ^a	1.448 (1.275-1.644)	
Proportion Friends	1.243 (0.945-1.636)	

Notes:

^a Compared to whites

^b Hazard ratios and 95% confidence intervals are presented

^c Unstandardized betas and standard errors are presented

Table 7.12: Discrete Time Hazard Analysis and Generalized Linear Mixed Models to Test the Mediation Effect of the Proportion of Friends in the Social Network on the Association between Race and Development of IADL Disability among Respondents in the Duke EPESE

Step 1. Establish the association between race and development of disability.		
	<div>Model 1^b</div>	
Black ^a	1.321 (1.196-1.459)	
Step 2. Establish that race is associated with the proportion of friends in the social network.		
	<div>Model 1^c</div>	<div>p-value</div>
Black ^a	-0.097 (0.012)	<0.001
Step 3. Establish the association between the proportion of friends in the social network and development of disability.		
	<div>Model 1^b</div>	
Proportion Friends	0.880 (0.683-1.134)	
Step 4. Does the effect of race on disability diminish after adding social support into the model?		
	<div>Model 1^b</div>	
Black ^a	1.345 (1.200-1.508)	
Proportion Friends	0.952 (0.738-1.229)	

Notes:

^a Compared to whites

^b Hazard ratios and 95% confidence intervals are presented

^c Unstandardized betas and standard errors are presented

SUMMARY AIM 4 RESULTS

This section summarizes the results from chapter 7. It was found that there were some associations between social network size and disability, although the results were not fully expected. In addition, the association between the proportion of friends in the social network and disability also had some interesting results, and similar to the literature, the results for these analyses were not entirely consistent.

The results for the aim 4 hypotheses were mixed. While social network size decreased the risk of developing ADL disability among older blacks and whites from the Duke EPESE study, among Mexican Americans it was initially associated with an increase in risk of developing ADL disability. Therefore, among older blacks and whites from the Duke EPESE, social network size did reduce the risk of developing ADL disability, and supported hypothesis 4a. Among Mexican Americans, social network size was associated with a slight increase in risk of developing ADL disability in the unadjusted model. This association was completely attenuated when sociodemographics was included in the model and remained non-significant when health variables were included. Among Mexican Americans, social support was not associated with the risk of developing ADL disability, and did not support hypothesis 4a-social network size will be associated with a decrease in risk of developing disability.

Among blacks and whites from the Duke EPESE study, social network size was associated with a slight increase in the risk of developing IADL disability when sociodemographics and health variables were included in the model, though the effect was marginal. This result did not support hypothesis 4a. Among older Mexican

Americans, social network size was not associated with the risk of developing IADL disability between the last two waves of the Hispanic EPESE study. Therefore, among older Mexican Americans, hypothesis 4a was not supported.

When analyzing the association between social network size and recovery from ADL disability, hypothesis 4a was partially supported. Among blacks and whites, a larger social network size was associated with an increased risk of recovery from ADL disability. However, among Mexican Americans, social network size was not associated with a risk of recovering from ADL disability between the last two waves of the study. So, among older blacks and whites, social network size was associated with an increased risk of recovery from ADL disability and did support hypothesis 4a. Among older Mexican Americans, social network size was not associated with the risk of recovery from ADL disability, and did not support hypothesis 4a.

In the unadjusted model, social network size was associated with an increased risk of recovering from IADL disability among blacks and whites between the first, fourth, and seventh waves of the study, although the effect was marginal. Once sociodemographics and then health variables were added into the model, the association was fully attenuated, and social network size was not associated with the risk of recovering from IADL disability among blacks and whites. Among Mexican Americans, social network size was not associated with recovering from IADL disability in the last two waves of the Hispanic EPESE study. Social network size is associated with increased risk of recovery from IADL disability among blacks and whites, which supports hypothesis 4a. Among older Mexican Americans, social network size is not associated with IADL disability, and so does not support hypothesis 4a.

For hypothesis 4b, a higher proportion of friends in the social network was not associated with the risk of developing ADL disability among whites and blacks. Among Mexican Americans, the proportion of friends in the social network was not associated with the risk of developing ADL disability. However, in the model with sociodemographics included, the proportion of friends in the social network was associated with an increased risk of developing ADL disability. Then, when health variables are included in the model, the proportion friends in the social network is no longer associated with ADL disability. Hypothesis 4b, that the proportion of friends in the social network would reduce the risk of developing disability, was not supported for blacks, whites, or Mexican Americans.

Among blacks and whites, the proportion of friends in the social network reduced the risk of developing IADL disability when sociodemographics and health variables were included in the model. This means that hypothesis 4b was supported among blacks and whites. Among Mexican Americans, the proportion of friends in the social network was not associated with IADL disability, and so hypothesis 4b was not supported.

When considering recovery, once again the results are mixed. In the Duke EPESE, a higher proportion of friends in the social network decreases the risk of recovery from ADL disability. This result holds true, after including sociodemographics in the model. After including health variables, the association between the proportion of friends in the social network and the risk of recovery from ADL disability was fully attenuated. Hypothesis 4b was not supported among older blacks and whites. Among older Mexican Americans, the proportion of friends in the social network increases the risk of recovering from ADL disability between the fifth and sixth waves in the

unadjusted model. This result is actually increased after adding sociodemographics into the model, with a higher proportion of friends in the social network increasing the risk of recovering ADL disability. When health variables are added into the model, among Mexican Americans, the proportion of friends in the social network is no longer associated with the risk of recovery from ADL disability between the fifth and sixth waves of the study. Among Mexican Americans, hypothesis 4b was partially supported.

Among blacks and whites, the proportion of friends in the social network is not associated with the risk of recovering from IADL disability. The same results are found among Mexican Americans, with the proportion of friends in the social network not associated with the risk of recovery from IADL in the Hispanic EPESE study.

Hypothesis 4c was not supported by the analyses for that section. Social network size and the proportion of friends in the social network actually increased the association between race and the risk of developing ADL and IADL disability. Then, since race was not associated with recovery from ADL or IADL disability, social network size and the proportion of friends in the social network could not mediate the association between race and the risk of recovery from disability, since that association did not exist.

Chapter 8: Discussion

Chapter 8 will first summarize the results for aims 1 and 3 that test the hypotheses about social support. Included in the discussion is a table, table 8.1 that summarizes the results of each hypothesis tested. The social support section also contains a brief discussion about the suppression effects of depressive symptoms on the association between social support and disability. The second section discusses social network results from aims 2 and 4, which test the hypotheses about social network size and social network characteristics. In addition, this chapter discusses the strengths and limitations of the study, as well as ideas for future research. Last is the conclusion section where the general conclusions from this study are discussed.

SOCIAL SUPPORT RESULTS

This study shows that perceived social support is closely associated with the disability process among older blacks, whites, and Mexican Americans. Social support is associated with a reduced level of disability across time, and decreased risk in developing disability among older blacks and whites. In addition, this study shows that social support partially mediates, or reduces, the association between race and disability among the Duke EPESE respondents. Among older Mexican Americans, it appears that increased social support is associated with an increased risk of developing disability. However, there may be an explanation for why social support appears to be associated with increased levels of disability across time, as well as increase the risk for developing disability that will be discussed in the section below.

Table 8.1: Summary of Hypotheses that Examine Relationships between Social Support, Disability, Development of Disability, and Recovery and whether Hypotheses were Supported, Not Supported, Partially Supported, or the Reverse of the Hypotheses was True

	ADL Disabilities				IADL Disabilities			
	S	NS	PS	RH	S	NS	PS	RH
H 1a. Social support reduces disability across time								
Blacks & Whites	X						X	
Mexican Americans				X				X
H 1b. Mediation of social support on association of race and disability								
Blacks Have Greater Disability Level than Whites	X				X			
Mediation	X				X			
H 3a. Social support will decrease risk of developing disability								
Blacks & Whites			X				X	
Mexican Americans				X				X
H 3b. Social support will mediate that association between race and disability								
Blacks at higher risk of developing disability than whites	X				X			
Mediation	X				X			
H 3a. Social support is associated with greater recovery								
Blacks & Whites			X			X		
Mexican Americans		X				X		
H 3b. Social support mediates the association between race and recovery								
Blacks at Lower Risk of Recovery than Whites		X				X		
Mediation		X				X		

Notes:

S=Supported, NS=Not Supported, PS=Partially Supported, RH=Reverse of Hypothesis

Table 8.1 summarizes the results that were found for the hypotheses that referred to social support from the Duke EPESE and the Hispanic EPESE. Hypothesis 1a which states, **greater social support will be associated with lower rates of disability in whites, blacks, and Mexican Americans** was supported among blacks and whites in the Duke EPESE. However, in the Hispanic EPESE, results showed that initially, social support was not associated with disability. When health variables were included in the model, particularly depressive symptoms, the reverse of the expected results was found. Social support was associated with increased disability across time which is different from the results that were found in the Duke EPESE data. The difference in the results between the studies could be due to cultural differences or socioeconomic differences between the two groups. Cultural differences could play a role in how and when social support is called upon in times of need compared to times when it is not needed. In addition, cultural values may dictate who, such as family or friends, is asked for support when it is needed, or under what circumstances it is asked for. For example, Hispanics tend to rely upon family more for support, and feel more comfortable asking for tangible, emotional, and financial support than blacks and whites in the United States, even under circumstances where there are no emergencies that are being experienced (Kaniasty & Norris, 2000).

A theory that indicates mobilization of social support occurs after the disability process begins is one possible reason that the results in the Hispanic EPESE are reverse of what was expected (Thoits, 1995). Once a stressor or a buildup of various stressful situations is faced, one way of coping is to mobilize the social support offered by the social support network (Thoits, 1995). Here, the stressor would be disability experienced

across time. So in the case of Mexican Americans, it is possible that social support is not perceived as being available until disability becomes apparent, and social support is more actively sought by the disabled adult. There is evidence that social support is actively sought by Hispanics during emergency situations, the same as blacks and whites, but after an emergency has ended, social support is reduced among all groups, but the reduction occurs more dramatically among Hispanics (Kaniasty & Norris, 2000).

Mobilization of social support would become apparent after the development of a disability, and would appear in the model as if increased social support increases disability, when in fact social support is increasingly perceived as it is mobilized after disability is experienced and worsens. In the literature, Hispanics have been shown to seek support after an emergency event, and reported receiving more support (Kaniasty & Norris, 2000). However, before the event and after the emergency was over, Hispanics reported receiving less support than blacks or whites (Kaniasty & Norris, 2000). Due to the lack of data in between data collection periods, the tendency of older Mexican Americans to seek support after they begin to become disabled would resemble a positive association between social support and disability, as it does in this study. That is because disability would occur sometime between the data collection periods, and social support would also be sought at that time, and it would appear that social support is associated with increased disability.

Other explanations for the differences in the association between the two studies should not be ignored, however. The two studies are different studies, collected at different times with no overlapping waves. It is possible that the social support questions

that were asked may have a different meaning to Mexican Americans from this cohort compared to older blacks and whites from North Carolina.

Hypothesis 1b states, **blacks will have higher rates of disability than whites and social support will mediate the association between race and disability among respondents from the Duke EPESE**. Blacks did have higher levels of disability across time in the model that was unadjusted for sociodemographics and health variables. Once sociodemographics were included in the model, race was no longer significantly associated with disability levels. However, to test mediation effects, the most basic model that did not adjust for other covariates was used. It was found that social support did partially mediate the association between race and disability, although the reduction due to social support was moderate.

The next hypothesis that examines social support and the effect it has on disability is hypothesis 3a. Hypothesis 3a states, **greater social support will be associated with a decreased risk of developing disability and increased risk of recovery from disability in whites, blacks, and Mexican Americans**. Among older blacks and whites, this hypothesis was found to be partially true. Social support was significantly associated with the risk of development of disability in the unadjusted model and in the model that adjusted for sociodemographics. When health variables were included in the model, however, the effect of social support on the development of disability was fully attenuated. This is likely due to social support having a greater effect on the development of disability among older blacks and whites who have chronic illness, depression, or lower cognitive function. The Disablement Process Models, developed by Verbrugge and Jette (1994), shows that pathology-which would include the health variables that were

included in the model-leading to impairments that then may cause functional limitations are directly affected by intra-individual factors, such as psychosocial attributes and coping, which would include social resources such as social support and social networks. This would indicate that those intra-individual factors would intervene in the process. Therefore, among individuals with more pathology, social support and social networks may make a bigger difference in the pathway to functional limitations. Therefore, when health is included in a model where social support and social networks are significantly associated with reduced functional limitation, the association would be reduced greatly.

Among Mexican Americans, the reverse of what the hypothesis stated was observed, and social support was associated with an increased risk of developing disability among older Mexican Americans. Again, this may be due to the mobilization of social support after disability has been experienced, again potentially reflecting possible cultural differences among Mexican Americans compared to blacks and whites.

Recent research that was conducted in Europe found that there were differences between a sample of older adults from Mediterranean and non-Mediterranean countries in how they perceived their interactions with their social networks (Litwin, 2010). Respondents from Mediterranean countries reported feeling more loneliness than their non-Mediterranean counterparts despite having larger families and reporting that they maintained more contact with their families (Litwin, 2010). Litwin (2010) reported that this was likely because of the cultural context to which it applied. The social norm among Mediterranean families is to maintain more contact, thus increasing pressure on individual within those societies to maintain more contact with their families, which may have increased the levels of loneliness (Litwin, 2010). Another study illustrated that

during an emergency, blacks, whites, and Hispanics all sought social support, but before emergency and after emergency was over, Hispanics reported lower levels of social support than blacks or whites (Kaniasty & Norris, 2000). These examples of cultural differences in how, from whom, and when social support is solicited helps to understand why there may be differences in how social support affects different groups of older adults. The results from this study may also provide a caution to future researchers in the area of social support-social support should be considered within its cultural context, because there are likely to be differences in how various ties in the social network are viewed, depending on how an individual from a culture is conditioned to view that social tie. Different cultures may also emphasize that there are certain conditions that support may be sought, and depending on the condition, from whom the support may come from.

The second part of hypothesis 3a that refers to recovery was met with mixed results as well. Social support did not increase recovery from IADL disability among blacks and whites, and social support did not increase recovery from ADL or IADL disability among Mexican Americans. One reason why social support may not appear to affect recovery in Mexican Americans and recovery from IADL disability among blacks and whites in this study may be because the type of social support that was examined, which is referred to in the literature as “perceived emotional support” may not be the “right” kind of social support to promote recovery from disability. Cutrona and Russel (1990) argue that different types of social support are more effective at preventing negative outcomes, depending on the type of stressor. It is possible that perceived social support may not be the right fit when measuring the association between social support and recovery from disability, and therefore has no association with recovery. There might

be another type of support that would be more effective in increasing recovery that was not measured by the Duke EPESE or the Hispanic EPESE.

Other types of social support may be more effective in predicting recovery. For example, instrumental support might be of more help because there would be a tangible exchange of help between the receiver and the giver. These exchanges might include monetary loans to cover rehabilitation bills, or even transportation to the grocery.

Hypothesis 3b states, **blacks will have a higher risk of developing disability and a decreased risk of recovering from disability. Social support will mediate the association of race with developing disability and with recovery from disability.** In relation to this hypothesis, it was very interesting was that while older blacks were at higher risk of developing disability and had a higher level of disability across time, they had a similar risk as older whites of recovering from disability. These results may be due to a higher rate of mortality among older blacks after developing disability. Because older blacks had a similar risk of recovery compared to older whites, the mediation effect of social support on the association between race and recovery from disability could not be tested. However, social support was found to mediate the association between race and the risk of developing disability.

These results are important because they show that social support plays a role in the disparity in disability between older blacks and whites. This study also shows that social support may be more important in lowering the level of disability across time and preventing onset of disability than supporting the recovery process, except for recovery from ADL disability among blacks and whites before health is accounted for. Although there was some evidence that social support was important to the recovery of ADL

disability among less healthy adults, perceived social support overall appeared to be more important in reducing the risk of developing disability and decreasing the level of disability among blacks and whites across time. The results that showed that there was not a significant difference in the risk of recovery from disability between blacks and whites were also an interesting finding. There are many studies that focus on access to health care and other factors related to recovery that were written under the assumption that recovery is less likely for blacks than for whites. However, these results must take into consideration that the population sampled for the Duke EPESE came from a small, mostly rural set of counties in North Carolina, and the participants may have been more similar in regards to their access to health care and rehabilitative services than would be true in a nationally representative sample.

The results among Mexican Americans were also important. The results indicated that a mobilization of social support occurred after the development of disability. This could reveal important cultural differences in how disability in older age is dealt with. These results also indicate that among Mexican Americans, the nature of seeking social support after disability occurs may be one key to reducing disability among this group. Since it seems that social support is more important in the reduction of disability levels and the reduction of the risk of developing disability in the first place, and not as important in the recovery process, it would seem that improving social support among this group before retirement age is reached is especially important. Depression must also be considered when exploring how social support is sought after developing disability among older Mexican Americans. Depression seems to have an important impact on the process of seeking social support once disability had developed, and this could be one

source of disparities since older Mexican Americans may have higher rates of depressive symptoms in old age than the general population of the United States (Kim et al., 2009).

This study fits in with other recent research that focuses on social support and various chronic conditions. Other studies have results that show that both instrumental and emotional social support reduce the development of various chronic conditions either directly or through the support of healthy behavior, such as cardiovascular disease and hypertension (Aggarwal, Liao et al., 2008; Bell et al., 2010). Among older blacks and whites in this study, social support was shown to be associated with reduced disability across time, as well as a decreased risk of developing disability, regardless of whether there were chronic conditions present. This means that there is room for more research in the area of social support and disability, both in the presence and absence of chronic conditions.

The results that examined the association between social support and recovery from disability were also interesting. There were no racial differences in recovery from disability, which is consistent with other research (Mendes de Leon et al., 1997; Mendes de Leon et al., 1999). Also, social support was not associated with recovery except for recovery from ADL disability among blacks and whites before health was adjusted for. This could be because social support is simply more important to the disablement process, and does not affect the recovery process. Or it may be because another type of social support such as instrumental or informational would be more important in the recovery process than perceived emotional support.

Similar to the results from another study that reports that older blacks report less social resources than older whites, this study indicated that older blacks report less social

support than whites across time (Barnes et al., 2004). However, this effect was diminished greatly when sociodemographics were included in the analyses, and the effect was completely attenuated when health variables were also included. The mediation effect of social support on the association between race and disability is an interesting result that has not yet been tested in the social support literature.

In all, this study reveals that there is not enough known about the role that social support plays in the disability process among older adults, especially among minority groups. This study, along with some other recent research, indicates that social support should be considered in its cultural context when considering how it affects health.

Suppression Effect in the Association between Social Support and Disability among Mexican Americans

In the Hispanic EPESE, results showed that depressive symptoms suppress the effect of social support on disability. When depressive symptoms are included in the model, social support is associated with an increase in disability. It was interesting that among Mexican Americans, social support was likely perceived after the development of disability. While these results are concurrent with a mobilization of social support hypothesis, the reason why depression would affect the results should be taken into careful consideration in regards to the population that was studied (Thoits, 1995). Among this sample of Mexican Americans, it was found that there is a higher level of depressive symptoms and greater rates of clinical depression than respondents from the New Haven EPESE (Kim et al., 2009). The high levels of depression in this group may inhibit the perception of receiving emotional social support, or prevent an individual from seeking social support when it is needed. Therefore, when depressive symptoms are controlled for

in the model, the true association between social support and disability becomes clear with the effect of mobilization of social support after the disability process begins becoming more apparent. It is also possible that older Mexican Americans who do not experience higher levels of depressive symptoms perceive that there is more social support as they become more disabled. However, the evidence from the literature indicates that Hispanics may have less social support before an event occurs, seek and receive social support during an event, and then report less social support once an emergency event has ended compared to whites and blacks (Kaniasty & Norris, 2000).

The positive association between perceived social support and disability in this study could be due to a mobilizing of social resources, or possibly an increase in community or family response from the outside as they notice that an older adult in the community is less able to perform normal tasks. One study showed that a higher proportion of Hispanics in the community was associated lower odds of stroke, hip fracture, cancer, and mortality among older Mexican Americans (Eschbach et al., 2004). These results indicate a level of community mobilization that may have beneficial effects on health among older Mexican Americans who live in communities where others may be encouraging better health practices. It is also possible that the results reflect the fact that depressed individuals are less able or less willing to take advantage of any community mobilization that may occur when disability begins to develop.

Among disabled older adults, Hispanics represent a high risk group in developing depression (Brown, Mason et al., 2009). Depression decreases the risk of recovering from conditions that are disabling, such as hip fractures, and increase the risk of mortality (Blazer, Hybels et al., 2001; Givens, Sanft et al., 2008). Considering how depression affects social support and disability is important because there is evidence that Mexican Americans seek social support and other social resources after disablement occurs

(Angel, Angel et al., 2000; Kaniasty & Norris, 2000). For example, research by Angel, Angel, and Markides (2000) shows that older Mexican Americans, especially late-life immigrants, often move in with other relatives after disablement occurs. In a population with limited resources, this arrangement likely places greater stress on the family and can cause increased hardship on the family of the disabled adult (Angel et al., 2000). Older Mexican Americans who are experiencing depression may not be as likely or as able to mobilize social support resources when disability becomes apparent, or possibly may be less willing to tax the slim resources of their family members and try to remain independent.

SOCIAL NETWORK SIZE AND SOCIAL NETWORK CHARACTERISTICS RESULTS

Social network size is associated with less disability among blacks, whites, and Mexican Americans, and is associated with recovery among blacks and whites, similar to findings in other studies (Giles et al., 2004; Mendes de Leon et al., 1999; Mendes de Leon et al., 2001; Walter-Ginzburg et al., 2004). When health variables are included in the model that predicts the level of disability across time, the effect of social network size on disability is attenuated, and social network size has minimal or no effect on disability. Likely, larger social network size is mostly beneficial to older adults when they face increasing health issues related to aging. It can be concluded that larger social network size is more beneficial to older adults who are facing chronic disease, depression, and reduced cognitive abilities than relatively healthy older blacks, whites, and Mexican Americans.

Table 8.2: Summary of Hypotheses that Examine Relationships between Social Networks, Disability, Development of Disability, and Recovery and whether Hypotheses were Supported, Not Supported, Partially Supported, or the Reverse of the Hypotheses was True

	ADL Disabilities				IADL Disabilities			
	S	NS	PS	RH	S	NS	PS	RH
H 2a. Larger networks associated with less disability across time								
Blacks & Whites			X				X	
Mexican Americans			X				X	
H 2b. More friends associated with less disability across time								
Blacks & Whites				X	X			
Mexican Americans			X				X	
H 2c. Network size and proportion friends mediate association between race and disability								
Blacks Have Greater Disability Level than Whites	X				X			
Mediation-Social Network Size		X				X		
Mediation-Proportion Friends in Social Network		X				X		
H 4a. Network size reduces risk of disability								
Blacks & Whites	X						X	
Mexican Americans				X		X		
H 4b. More friends reduce risk of disability								
Blacks & Whites		X			X			
Mexican Americans			X			X		
H 4c. Network Size and more friends mediate association of race with risk of developing disability								
Blacks at Higher Risk of Developing Disability than Whites	X				X			
Mediation-Social Network Size		X				X		
Mediation-Proportion Friends in Social Network		X				X		
H 4a. Network size increases recovery								
Blacks & Whites	X						X	
Mexican Americans		X				X		
H 4b. More friends increase recovery								
Blacks & Whites				X		X		
Mexican Americans			X			X		
H 4c. Network size and more friends mediate association of race with recovery								
Blacks at Lower Risk of Recovery than Whites		X				X		
Mediation-Social Network Size		X				X		
Mediation-Proportion Friends in Social Network		X				X		

Notes:

S=Supported, NS=Not Supported, PS=Partially Supported, RH=Reverse of Hypothesis

In the association between the proportion of friends in the social network and disability the results of this study were mixed, similar to the results found in the literature (Giles et al., 2004; Mendes de Leon et al., 1999; Mendes de Leon et al., 2001; Walter-Ginzburg et al., 2004). A higher proportion of friends among blacks and whites were associated with increased ADL disability before controlling for health variables, indicating that a higher proportion of friends in the social network is negative for older, less healthy blacks and whites in terms of their level of ADL disability across time. However, an increased proportion of friends in the social network were associated with less IADL disability, even after health variables were included in the model. This means that among older blacks and whites, an increased proportion of friends in the social network is beneficial to the level of abilities that enable them to complete day-to-day tasks, such as taking medication, shopping, or being able to use transportation to get around. These results indicate that perhaps, similar to social support, the support received from different types of contacts is contextually important, with different contacts playing important roles in disability depending on the type of disability experienced. The negative findings for ADL disability could also be a reflection of the mobilization of friends in the network as the disabled adult begins to search for more resources to depend on outside of children and relatives.

Different results were found among the Mexican American sample, perhaps indicating cultural differences. It must be kept in mind, however, that all social network information was collected in the Mexican American sample only during the fifth and sixth waves of data collection. This means that the sample represents older Mexican Americans who were 75+ years across only two waves. Keeping this in mind, a higher

proportion of friends in the social network was beneficial for Mexican Americans and was associated with a reduced level of disability across time. When health variables were included in the model, the association was attenuated, which indicates that a higher proportion of friends in the social network may be more important in protecting against disability among older Mexican Americans who have chronic illnesses, depression, or lower cognitive ability.

This study supports research that shows that friends in the social network is associated with less disability, although it contrasts with other work that shows that family matters and friends do not matter as much (Giles et al., 2004; Mendes de Leon et al., 1999; Mendes de Leon et al., 2001; Walter-Ginzburg et al., 2004). The inconsistencies in the literature about the importance of the role of family versus friends as part of the social network may have some basis in sociocultural differences in how various relationships are perceived in groups from different ethnic backgrounds. It has been suggested that friendship matters because it may be a marker of the ability to form relationships that are the most important kinds of relationships that make up social capital, which in turn gives the older adult access to better resources, and mitigates the effects of stress more effectively (Mendes de Leon, 2005).

These results are important because they illustrate the complex nature of social networks and how they affect disability among diverse populations. It can be expected that any future work on social networks among diverse groups of people will remain complex, as social networks can influence health both positively and negatively, and the sociocultural context of the social network influences how different social networks affect health.

STRENGTHS AND LIMITATIONS

Study Strengths

The Duke EPESE and the Hispanic EPESE data provided an opportunity to examine how social support and social networks affect the disability process across time. Both studies offer several waves of data that were consistently measured and offered a selection of variables that were of interest in this study. Both studies had similar goals, and similar variables that allowed some comparisons to be made between the groups measured in the two studies. This allowed a limited comparison of the results between the two studies.

Also, both data sets were large data sets that had data available for large samples across several waves of data collection. The sample from the Hispanic EPESE represents a large proportion of Mexican Americans in the United States who live in areas with higher concentrations of Mexican Americans. This means that the study has strong results on the effect of social support and social networks on disability among older Mexican Americans from the Southwest United States, and older blacks and whites from North Carolina.

Study Limitations

There were several limitations of this study. First of all, some of the key variables measured in the Duke EPESE were not included in all of the waves of the study. These included: IADL disability, BMI, social support variables, social network variables, depressive symptoms, and cognitive status. These six variables were measured during the

first, fourth, and seventh waves of data collection. This meant that there would have been some loss of information that could have changed the results, especially in the analyses that assessed the risk of developing and recovering from IADL disability. However, it is expected that the loss of information made the results more conservative.

It was also difficult to compare the Mexican Americans with the respondents from the Duke EPESE. The data could not be pooled together, due to the fact that the dates that the two studies were conducted did not overlap, and because of geographical differences in the populations studied. However, this study was a first look at how social support and social networks affect disability among ethnically diverse populations, and supports the idea that different sociocultural norms may affect the association between social support and disability as well as social networks and disability.

One other limitation was that there were only two waves of data from the Hispanic EPESE that had information available about the social network variable. Given the results, further waves of this study should continue to yield important information about social networks and disability among Mexican Americans, particularly the oldest old.

One potential limitation was that the social support variable was examined as a categorical variable in the analyses, as well as a continuous variable. When applied in the analysis as a categorical variable, the highest level of social support did not differ significantly in the analyses from the lowest category. However, a similar measure of perceived social support has been used in the literature as a continuous variable (Mendes de Leon et al., 2001).

Another limitation occurred in the analyses among Mexican Americans. When it was noted that there was an unusually large increase in ADL disability incidence in chapter 6 between the fourth wave (2000-2001) and the fifth wave (2004-2005) of data collection, the analyses that examined the association between social support and the risk of developing ADL disability were run again, this time using the first four waves of data (1993-2001). In that analysis, it was found that the results did not stay consistent with the results that were found across all six waves (1993-2007). After adding health variables into the third model, social support was not associated with the risk of developing ADL disability, whereas in the analyses that examined all six waves of data, social support was associated with a higher risk of developing ADL disability when health variables were included in the third model.

DIRECTIONS FOR FUTURE RESEARCH

There is much room for future research on social networks and social support and how they affect the association between race/ ethnicity and disability. It is important that the sociocultural context of social variables be emphasized in future studies. This study shows that there are differences in how and when social resources are accessed and how it affects disability. This study also suggests that older blacks and whites depend on social support and social networks to reduce risk of disability, while Mexican Americans may tend to mobilize social resources after disablement occurs.

The mobilization of social resources among Mexican Americans could be tested among the sample of older Mexican Americans that were used in this study. This would

help to validate the results, and to lend more strength to the conclusions that were gained from this study.

More research should focus on how social support affects disability by gender. Research shows that women are more likely to report disablement than men. Exploring how social support affects this association among women of different ethnic backgrounds could help to explain some differences that are seen in disability.

Another area of potential interest is how the internet will affect social resources among older adults as the population ages. It is not well known how electronic resources and social networking through the use of a computer will affect aging adults and their ability to cope with disability and disease. One question that would be interesting would be, “how effective are electronic social contacts compared to face-to-face contacts in the reduction of disease and disability? How will this affect minority groups, who are less likely to have regular access to a computer?” These questions will become of greater relevance as the older population becomes more technically savvy and as the older population is able to maintain contact with social network members who would otherwise be less accessible. In fact, the number of older users who access the internet in order to network through web applications developed for that purpose has increased rapidly in recent years (Gregory, 2010; Rozental, George et al., 2010). This would be an area that would benefit from social network and social support research. It is crucial that this area be considered as soon as possible, because as more technically adept adults reach retirement age, the ways that they use the internet to network and how it affects health could be better understood if research begins early.

CONCLUSION

Social support is very important in the disablement process among older blacks, whites, and Mexican Americans. Social support also mediated the association between race and disability which means that social support reduced some of the disability gap between whites and blacks. While social support reduces disability among older blacks and whites, it appears that Mexican Americans mobilize social support after developing disability. In addition, depressive symptoms among older Mexican Americans suppress the effect of social support on disability.

Social network size was also important in the disablement process. It was less clear what role friends provided in the disablement process, but in general, friends were more beneficial to Mexican Americans in the disablement process.

Bibliography

- Adkins, D. E., Wang, V., Dupre, M. E., Van den Oord, E. J. C. G., & Eider Jr, G. H. (2009). Structure and Stress: Trajectories of Depressive Symptoms across Adolescence and Young Adulthood. *Social Forces*, 88(1), 31-60.
- Adler, N. E., & Rehkopf, D. H. (2008). U.S. Disparities in Health: Discriptions, Causes, and Mechanisms. *Annual Review of Public Health*, 29, 235-252.
- Aggarwal, B. A. F., Liao, M., & Mosca, L. (2008). Physical Activity as a Potential Mechanism Through Which Social Support May Reduce Cardiovascular Disease Risk. *Journal of Cardiovascular Nursing*, 23(2), 90-96.
- Ahmad, L. A., & Crandall, J. P. (2010). Type 2 Diabetes Prevention: A Review. *Clinical Diabetes*, 28(2), 53-59.
- Ajrouch, K. J., Antonucci, T. C., & Janevic, M. R. (2001). Social Networks Among Blacks and Whites: The Interaction Between Race and Age. *Journal of Gerontology: Social Sciences*, 56(2), S112-S118.
- Al Snih, S., Fisher, M. N., Raji, M. A., Markides, K. S., Ostir, G. V., & Goodwin, J. S. (2005). Diabetes Mellitus and Incidence of Lower Body Disability Among Older Mexican Americans. *Journal of Gerontology: Medical Sciences*, 60A(9), 1152-1156.
- Allen, S. M., Ciambrone, D., & Welch, L. C. (2000). Stage of Life Course and Social Support as a Mediator of Mood State among Persons with Disability. *Journal of Aging and Health*, 12(3), 318-341.
- Allison, M. A., Cushman, M., Solomon, C., Aboyans, V., McDermott, M. M., Goff, D. C., & Criqui, M. H. (2009). Ethnicity and risk factors for change in the ankle-brachial index: The Multi-Ethnic Study of Atherosclerosis. *Journal of Vascular Surgery*, 50(5), 1049-1056.
- Almeida, J., Molnar, B. E., Kawachi, I., & Subramanian, S. V. (2009). Ethnicity and nativity status as determinants of perceived social support: Testing the concept of familism. *Social Science & Medicine*, 68(10), 1852-1858.
- Andrade, F. C. D. (2010). Measuring the Impact of Diabetes on Life Expectancy and Disability-Free Life Expectancy Among Older Adults in Mexico. *Journal of Gerontology: Social Sciences*, 65B(3), 381-389.
- Angel, J. L., Angel, R. J., & Markides, K. S. (2000). Late-Life Immigration, Changes in Living Arrangements, and Headship Status among Older Mexican-Origin Individuals. *Social Science Quarterly*, 81(1), 389-403.
- Ashida, S., & Heaney, C. A. (2008). Differential Associations of Social Support and Social Connectedness With Structural Features of Social Networks and the Health Status of Older Adults. *Journal of Aging and Health*, 20(7), 872-893.
- Barnes, L. L., Mendes de Leon, C., Bienias, J. L., & Evans, D. A. (2004). A Longitudinal Study of Black-White Differences in Social Resources. *Journal of Gerontology: Social Sciences*, 59B(3), S146-S153.
- Baron, R. M., & Kenny, D. A. (1986). The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-1182.

- Bash, L. D., Selvin, E., Steffes, M., Coresh, J., & Astor, B. C. (2008). Poor Glycemic Control in Diabetes and the Risk of Incident Chronic Kidney Disease Even in the Absence of Albuminuria and Retinopathy. *Archives of Internal Medicine*, 168(22), 2440-2447.
- Beard, H. A., Gerst, K., Al Ghatrif, M., Markides, K. S., & Samper-Ternent, R. (2009). Trends in Diabetes Prevalence and Diabetes-Related Complications in Older Mexican Americans From 1993-1994 to 2004-2005. *Diabetes Care*, 32(12), 2212-2217.
- Bell, C. N., Thorpe, R. J., & LaVeist, T. A. (2010). Race/Ethnicity and Hypertension: The Role of Social Support. *American Journal of Hypertension*, 23(5), 534-540.
- Berkman, L. F., & Syme, S. L. (1979). Social Networks, Host Resistance, and Mortality: A Nine-Year Follow-Up Study of Alameda County Residents. *American Journal of Epidemiology*, 109(2), 186-204.
- Bhattacharya, J., Choudry, K., & Lakdawalla, D. (2008). Chronic Disease and Severe Disability Among Working-Age Populations. *Medical Care*, 46(1), 92-100.
- Blazer, D., Hughes, D. C., & George, L. K. (1987). The Epidemiology of Depression in an Elderly Community Population. *The Gerontologist*, 16, 118-124.
- Blazer, D. G., Hybels, C. F., & Pieper, C. F. (2001). The Association of Depression and Mortality in Elderly Persons A Case for Multiple, Independent Pathways. *Journal of Gerontology: A Biological Sciences and Medical Sciences*, 56(8), M505-M509.
- Brown, R. L., & Turner, R. J. (2010). Physical Disability and Depression: Clarifying Racial/Ethnic Contrasts. *Journal of Aging and Health*, 1-24.
- Brown, S. C., Mason, C. A., Spokane, A. R., Cruza-Guet, M. C., Lopez, B., & Szapocznik, J. (2009). The Relationship of Neighborhood Climate to Perceived Social Support and Mental health in Older Hispanic Immigrants in Miami, Florida. *Journal of Aging and Health*, 21(3), 431-459.
- Carranza, S. N., & LeBaron, S. (2004). Adherence among Mexican Americans with type 2 diabetes: behavioral attribution, social support, and poverty. *Family Medicine*, 36(8), 539-540.
- Carrasquillo, O., Lantigua, R. A., & Shea, S. (2000). Differences in Functional Status of Hispanic Versus Non-Hispanic White Elders: Data From the Medical Expenditure Panel Survey. *Journal of Aging and Health*, 12(3), 342-361.
- Caskie, G. I. L., Sutton, M. C., & Margrett, J. A. (2010). The Relation of Hypertension to Changes in ADL/ IADL Limitations of Mexican American Older Adults. *Journal of Gerontology: Psychological Sciences*, 65B(3), 296-305.
- Choi, N. G., & Schlichting-Ray, L. (2001). Predictors of Transitions in Disease and Disability in Pre- and Early-Retirement Populations. *Journal of Aging and Health*, 13(3), 379-409.
- Ciol, M. A., Shumway-Cook, A., Hoffman, J. M., Yorkston, K. M., Dudgeon, B. J., & Chan, L. (2008). Minority Disparities in Disability Between Medicare Beneficiaries *Journal of the American Geriatrics Society*, 56(3), 444-453.
- Cobb, S. (1976). Social Support as a Moderator of Life Stress. *Psychosomatic Medicine*, 38(5), 300-314.
- Cornoni-Huntley, J., Ostfeld, A. M., Taylor, J. O., Wallace, R. B., Blazer, D. G., Berkman, L. F., Evans, D. A., Kohout, F. J., Lemke, J. H., Scherr, P. A., &

- Korper, S. P. (1993). Established populations for epidemiologic studies in the elderly: Study design and methodology. *Aging Clinical and Experimental Research*, 5, 27-37.
- Coyle, J. T. (2003). Use It or Lose It-Do Effortful Mental Activities Protect Against Dementia. *New England Journal of Medicine*, 348, 2489-2490.
- Crooks, V. C., Lubben, J., Petitti, D. B., Little, D., & Chiu, V. (2008). Social Network, Cognitive Function, and Dementia Incidence Among Elderly Women. *American Journal of Public Health*, 98(7), 1221-1227.
- Cutler, J. A., Sorlie, P. D., Wolz, M., Thom, T., Fields, L. E., & Roccella, E. J. (2008). Trends in Hypertension Prevalence, Awareness, Treatment and Control Rates in United States Adults Between 1988-1994 and 1999-2004. *Hypertension*, 52, 818-827.
- Cutrona, C. E., & Russel, D. W. (1990). Type of Social Support and Specific Stress: Toward a Theory of Optimal Matching. In B. R. Sarason, I. G. Sarason & G. R. Pierce (Eds.), *Social Support: An Interactional View*. New York: John Wiley & Sons.
- Dunlop, D. D., Song, J., Manheim, L. M., Davigius, M. L., & Chang, R. W. (2007). Racial/Ethnic Differences in the Development of Disability Among Older Adults. *American Journal of Public Health*, 97(12).
- Erickson, W., & Lee, C. (2008). *2007 Disability Status Report: United States*. Unpublished manuscript, Ithaca, NY.
- Eschbach, K., Ostir, G. V., Patel, K. V., Markides, K. S., & Goodwin, J. S. (2004). Neighborhood Context and Mortality Among Older Mexican Americans: Is there a Barrio Advantage? *American Journal of Public Health*, 94(10), 1807-1812.
- Evers, A. W. M., Kraaimaat, F. W., Geenen, R., Jacobs, J. W. G., & Bijlsma, J. W. J. (2003). Pain coping and social support as predictors of long-term functional disability and pain in early rheumatoid arthritis. *Behaviour Research and Therapy*, 41, 1295-1310.
- Fillenbaum, G. G., Leiss, J. K., Pieper, C. F., & Cohen, H. (1998). Developing a Summary Measure of Medical Status. *Aging*, 10, 385-401.
- Finch, B. K., & Vega, W. A. (2003). Acculturation Stress, Social Support, and Self-Rated Health Among Latinos in California. *Journal of Immigrant Health*, 5(3), 109-117.
- Fiori, K. L., Smith, J., & Antonucci, T. C. (2007). Social Network Types Among Older Adults: A Multidimensional Approach. *Journal of Gerontology: Psychological Sciences*, 62B(6), 322-330.
- Fitzpatrick, R., Newman, S., Archer, R., & Shipley, M. (1991). Social Support, Disability and Depression: A Longitudinal Study of Rheumatoid Arthritis. *Social Sciences & Medicine*, 33(5), 605-611.
- Fitzpatrick, R., Newman, S., Lamb, R., & Shipley, M. (1988). Social Relationships and Psychological Well-Being in Rheumatoid Arthritis. *Social Sciences & Medicine*, 27(4), 399-401.
- Franklin, S. S. (2006). Hypertension in Older People: Part 1. *Journal of Clinical Hypertension*, 8(6), 444-449.

- Fraser, S. N., & Spink, K. S. (2002). Examining the Role of Social Support and Group Cohesion in Exercise Compliance. *Journal of Behavioral Medicine*, 25(3), 233-249.
- Giles, L. C., Metcalf, P. A., Glonek, G. F. V., Luszcz, M. A., & Andrews, G. R. (2004). The Effects of Social Networks on Disability in Older Australians. *Journal of Aging and Health*, 16(4), 517-538.
- Givens, J. L., Sanft, T. B., & Marcantonio, E. R. (2008). Functional Recovery After Hip Fracture: The Combined Effects of Depressive Symptoms, Cognitive Impairment, and Delirium. *J Am Geriatr Soc*, 56(6), 1075-1079.
- Goulding, M. R., Rogers, M. E., & Smith, S. M. (2003). Public Health and Aging: Trends in Aging-United States and Worldwide [Electronic Version]. *Morbidity and Mortality Weekly*, 52, 101-106 from <http://www.cdc.gov/mmwr/>.
- Gregory, T. (2010). Grampy Down with 'The Face' [Electronic Version]. *Media Mention: Seniors, Social Networking*. Retrieved September 6, 2010 from <http://www.pewinternet.org/topics/Social-Networking.aspx>.
- Gruenewald, T. L., Karlamangla, A. S., Greendale, G. A., Singer, B. H., & Seeman, T. E. (2007). Feelings of Usefulness to Others, Disability, and Mortality in Older Adults: The MacArthur Study of Successful Aging. *Journal of Gerontology: Social Sciences*, 62B, P28-P37.
- Hajat, A., Lucas, J. B., & Kington, R. (2000). Health Outcomes Among Hispanic Subgroups: Data from the National Health Interview Survey, 1992-95. *Advance Data*, 310, 1-16.
- Hardy, S. E., & Gill, T. M. (2005). Factors Associated With Recovery of Independence Among Newly Disabled Older Persons. *Archives of Internal Medicine*, 165(1), 106-112.
- Hertz, R. P., Unger, A. N., Cornell, J. A., & Saunders, E. (2005). Racial Disparities in Hypertension Prevalence, Awareness, and Management. *Archives of Internal Medicine*, 165, 2098-2104.
- Himmelfarb, S., & Murrell, S. A. (1983). Reliability and Validity of Five Mental Health Scales in Older Persons. *Journal of Gerontology*, 38, 333-339.
- House, J. S. (1987). Social Support and Social Structure. *Sociological Forum*, 2(1), 135-146.
- House, J. S., Umberson, D., & Landis, K. R. (1988). Structures and Processes of Social Support. *Annual Review of Sociology*, 14, 293-318.
- Jang, Y., Chiriboga, D. A., Borenstein, A. R., Small, B. J., & Mortimer, J. A. (2009). Health-Related Quality of Life in Community-Dwelling Older Whites and African Americans. *Journal of Aging and Health*, 21(2), 336-349.
- Kagawa-Singer, M., Dadia, A. V., Yu, M. C., & Surbone, A. (2010). Cancer, Culture, and Health Disparities: Time to Chart a New Course? *CA: A Cancer Journal for Clinicians*, 60, 12-39.
- Kaniasty, K., & Norris, F. H. (2000). Help-Seeking Comfort and Receiving Social Support: The Role of Ethnicity and Context of Need. *American Journal of Community Psychology*, 28(4), 545-581.
- Kawachi, I., & Berkman, L. F. (2001). Social Ties and Mental Health. *Journal of Urban Health*, 78(3), 458-467.

- Keeler, E., Guralnik, J. M., Tian, H., Wallace, R. B., & Reuben, D. B. (2010). The Impact of Functional Status on Life Expectancy in Older Persons. *Journal of Gerontology: A Biological Sciences and Medical Sciences*, 65 (7), 727-733.
- Kempen, G. I. J. M., Scaf-Klomp, W., Ranchor, A. V., Sanderman, R., & Ormel, J. (2001). Social Predictors of Recovery in Late Middle-Aged and Older Persons After Injury to the Extremities: A Prospective Study. *Journal of Gerontology: Social Sciences*, 56B(4), S229-S236.
- Kim, G., Chiriboga, D. A., & Jang, Y. (2009). Cultural Equivalence in Depressive Symptoms in Older White, Black, and Mexican-American Adults. *Journal of the American Geriatrics Society*, 57(5), 790-796.
- Kubzansky, L. D., Berkman, L. F., & Seeman, T. E. (2000). Social Conditions and Distress in Elderly Persons: Findings From the MacArthur Studies of Successful Aging. *Journal of Gerontology: Psychological Sciences*, 55B(4), P238-P246.
- LaVeist, T. A., Thorpe, R. J., Galarraga, J. E., Bower, K. M., & Gary-Webb, T. L. (2009). Environmental and Socio-Economic Factors as Contributors to Racial Disparities in Diabetes Prevalence. *Journal of General Internal Medicine*, 24(10), 1144-1148.
- Lin, N., Woelfel, M. W., & Light, S. C. (1985). The Buffering Effect of Social Support Subsequent to an Important Life Event. *Journal of Health and Social Behavior*, 26(3), 247-263.
- Link, B. G., & Phelan, J. (1995). Social Conditions as Fundamental Causes of Disease. *Journal of Health and Social Behavior*, 35 (Extra Issue), 80-94.
- Litwin, H. (2003). The Association of Disability, Sociodemographic Background, and Social Network Type in Later Life. *Journal of Aging and Health*, 15(2), 391-408.
- Litwin, H. (2010). Social Networks and Well-being: A Comparison of Older People in Mediterranean and Non-Mediterranean Countries. *Journal of Gerontology: Social Sciences*, 65B(5), 599-608.
- Lynch, E. B., Butt, Z., Heinemann, A., Victorson, D., Nowinski, C. J., Perez, L., & Cella, D. (2008). A Qualitative Study of Quality of Life After Stroke: The Importance of Social Relationships. *Journal of Rehabilitative Medicine*, 40, 518-523.
- Manton, K. G. (2008a). Disability in the Elderly U.S. Population: Risk Factors and Future Dynamics. *Annual Reviews: Public Health*, 29(1), 91-113.
- Manton, K. G. (2008b). Recent Declines in Chronic Disability in the Elderly US Population: Risk Factors and Future Dynamics. *Annual Reviews: Public Health*, 29, 91-113.
- Marengoni, A., von Strauss, E., Rizzuto, D., Winblad, B., & Fratiglioni, L. (2009). The impact of chronic multimorbidity and disability on functional decline and survival in elderly persons. A community-based longitudinal study. *Journal of Internal Medicine*, 265(2), 288-295.
- Markides, K. S., Eschbach, K., Ray, L. A., & Peek, M. K. (2007). Census Disability Rates Among Older People by Race/Ethnicity and Type of Hispanic Origin. In J. L. Angel & K. E. Whitfield (Eds.), *The Health of Aging Hispanics: The Mexican-Origin Population* (pp. 27-39). New York, NY: Springer.

- Masel, M. C., Raji, M., & Peek, M. K. (2010). Education and Physical Activity Mediate the Relationship Between Ethnicity and Cognitive Function in Late Middle-Aged Adults. *Ethnicity & Health, 15*(3), 283-302.
- Mendes de Leon, C. (2005). Why do friendships matter for survival? *Journal of Epidemiology and Community Health, 59*, 538-539.
- Mendes de Leon, C. F., Barnes, L. L., Bienias, J. L., Skarupski, K. A., & Evans, D. A. (2005). Racial Disparities in Disability: Recent Evidence From Self-Reported and Performance-Based Disability Measures in a Population-Based Study of Older Adults. *Journal of Gerontology: Social Sciences, 60B*(5), S263-S271.
- Mendes de Leon, C. F., Beckett, L. A., Fillenbaum, G. G., Brock, D. B., Branch, L. G., Evans, D. A., & Berkman, L. F. (1997). Black-White Differences in Risk of Becoming Disabled and Recovering from Disability in Old Age: A Longitudinal Analysis of Two EPESE Populations. *American Journal of Epidemiology, 145*(6), 488-497.
- Mendes de Leon, C. F., Glass, T. A., Beckett, L. A., Seeman, T. E., Evans, D. A., & Berkman, L. F. (1999). Social Networks and Disability Transitions Across Eight Intervals of Yearly Data in the New Haven EPESE. *Journal of Gerontology: Social Sciences, 54B*(3), S162-S172.
- Mendes de Leon, C. F., Gold, D. T., Glass, T. A., Kaplan, L., & George, L. K. (2001). Disability as a Function of Social Networks and Support in Elderly African Americans and Whites: The Duke EPESE 1986-1992. *Journal of Gerontology: Social Sciences, 56B*(3), S179-S190.
- Mitchell, P. H., Teri, L., Veith, R., Buzaitis, A., Tirschwell, D., Becker, K., Fruin, M., Kohen, R., & Cain, K. C. (2008). Living Well with Stroke: Design and Methods for a Randomized-Controlled Trial of a Psychosocial-Behavioral Intervention for Post-Stroke Depression. *Journal of Stroke and Cerebrovascular Disease, 17*(3), 109-115.
- Molloy, G. J., Perkins-Porras, L., Bhattacharyya, M. R., Strike, P. C., & Steptoe, A. (2008). Practical support predicts medication adherence and attendance at cardiac rehabilitation following acute coronary syndrome. *Journal of Psychosomatic Research, 65*, 581-586.
- Molloy, G. J., Perkins-Porras, L., Strike, P. C., & Steptoe, A. (2008). Social Networks and Partner Stress as Predictors of Adherence to Medication, Rehabilitation Attendance, and Quality of Life Following Acute Coronary Syndrome. *Health Psychology, 27*(1), 52-58.
- Ogden, C. L., Carroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence of Overweight and Obesity in the United States, 1999-2004. *American Medical Association, 295*(13), 1549-1555.
- Oramasionwu, C. U., Brown, C. M., Ryan, L., Lawson, K. A., Hunter, J. M., & Frei, C. R. (2009). HIV/AIDS Disparities: The Mounting Epidemic Plaguing US Blacks. *Journal of the National Medical Association, 101*(12), 1196-1204.
- Pabon-Nau, L. P., Cohen, A., Meigs, J. B., & Grant, R. W. (2010). Hypertension and Diabetes Prevalence Among U. S. Hispanics by Country of Origin: The National Health Interview Survey 2000-2005. *Journal of General Internal Medicine, 25*(8), 847-852.

- Pandey, D. K., & Gorelick, P. B. (2005). Epidemiology of Stroke in African Americans and Hispanic Americans. *Medical Clinics of North America*, 89, 739-752.
- Pérès, K., Jagger, C., & Matthews, F. E. (2007). Impact of late-life self-reported emotional problems on Disability-Free Life Expectancy: results from the MRC Cognitive Function and Ageing Study. *Geriatric Psychiatry*, 23(6), 643-649.
- Pfeiffer, E. A. (1975). A Short Portable Mental Status Questionnaire. *Journal of the American Geriatric Society*, 23, 433-441.
- Radloff, L. S. (1977). The CES-D Scale: A Self Report Depression Scale for Research in the General Population. *Applied Psychological Measurement*, 1, 385-401.
- Roberts, R. E., & Vernon, S. W. (1983). The Center for Epidemiologic Studies Depression Scale: Its Use in a Community Sample. *American Journal of Psychiatry*, 140, 41-46.
- Rozental, T. D., George, T. M., & Chacko, A. T. (2010). Social Networking Among Upper Extremity Patients. *Journal of Hand Surgery*, 35A, 819-823.
- Schaefer, C., Coyne, J. C., & Lazarus, R. S. (1981). The Health-Related Functions of Social Support. *Journal of Behavioral Medicine*, 4(4), 381-406.
- Schoeni, R. F., Martin, L. G., Andreski, P. M., & Freedman, V. A. (2005). Persistent and Growing Socioeconomic Disparities in Disability Among the Elderly: 1982-2002. *American Journal of Public Health*, 95(11), 2065-2070.
- Schulberg, H. C., McClelland, M., & Burns, B. J. (1987). Depression and Physical Illness: The Prevalence, Causation, and Diagnosis of Comorbidity. *Clinical Psychology Review*, 7, 145-167.
- Seeman, T. E. (1996). Social Ties and Health: The Benefits of Social Integration. *Annals of Epidemiology*, 6, 442-451.
- Seeman, T. E., Bruce, M. L., & McAvay, G. J. (1996). Social Network Characteristics and Onset of ADL Disability: MacArthur Studies of Successful Aging. *Journal of Gerontology: Social Sciences*, 51B(4), S191-S200.
- Seeman, T. E., Merkin, S. S., Crimmins, E. M., & Karlamangla, A. S. (2010). Disability Trends Among Older Americans: National Health and Nutrition Examination Surveys, 1988-1994 and 1999-2004. *American Journal of Public Health*, 100(1), 100-107.
- Sloan, F. A., & Wang, J. (2005). Disparities Among Older Adults in Measures of Cognitive Function by Race or Ethnicity. *Gerontology Society of America*, 60(5), P242-250.
- Song, J., Chang, H. J., Tiroidkar, M. A., Chang, R. W., Manheim, L. M., & Dunlop, D. D. (2007). Racial/Ethnic Differences in Activities of Daily Living Disability in Older Adults With Arthritis: A Longitudinal Study. *Arthritis and Rheumatism*, 57(6), 1058-1066.
- Strogatz, D. S., & James, S. A. (1986). Social support and hypertension among blacks and whites in a rural, southern community. *American Journal of Epidemiology*, 124, 949-956.
- Sturm, R., Ringel, J. S., & Andreyeva, T. (2004). Increasing Obesity Rates And Disability Trends. *Health Affairs*, 23(2), 199-205.

- Taylor, M. G., & Lynch, S. M. (2004). Trajectories of Impairment, Social Support, and Depressive Symptoms in Later Life. *Journal of Gerontology: Social Sciences*, 59B(4), S238-S246.
- The Emerging Risk Factors Collaboration. (2010). Diabetes Mellitus, Fasting Blood Glucose Concentration, and Risk of Vascular Disease: A Collaborative Meta-Analysis of 102 Prospective Studies. *Lancet*, 375(9733), 2215-2222.
- Thoits, P. A. (1995). Stress, Coping, and Social Support Processes: Where Are We? What Next? *Journal of Health and Social Behavior*, 35(Extra Issue), 53-79.
- Tirodkar, M. A., Song, J., Chang, R. W., Dunlop, D. D., & Chang, H. J. (2008). Racial and Ethnic Differences in Activities of Daily Living Disability Among the Elderly: The Case of Spanish Speakers. *Archives of Physical and Medical Rehabilitation*, 89(7), 1262-1266.
- Turner, R. J., Wheaton, B., & Lloyd, D. A. (1995). The Epidemiology of Social Stress. *American Sociological Review*, 60, 104-125.
- Uchino, B. N. (2004). *Social Support & Physical Health: Understanding the Health Consequences of Relationships* (1 ed.). New Haven and London: Yale University Press.
- Van Damme, H., & Limet, R. (2007). Amputation in Diabetic Patients. *Clinics in Podiatric Medicine and Surgery*, 24(3), 569-582.
- Verbrugge, L. M., & Jette, A. M. (1994). The Disablement Process. *Social Science & Medicine*, 38(1), 1-14.
- Walter-Ginzburg, A., Blumstein, T., & Guralnik, J. M. (2004). The Israeli Kibbutz as a venue for reduced disability in old age: lessons from the Cross-sectional And Longitudinal Aging Study (CALAS). *Social Sciences & Medicine*, 59, 389-403.
- Weinberger, M., Hiner, S. L., & Tierney, W. M. (1986). Improving Functional Status in Arthritis: The Effect of Social Support. *Soc Sci Med*, 23(9), 899-904.
- Wen, L. K., Shepherd, M. D., & Parchman, M. L. (2004). Family Support, Diet and Exercise Among Older Mexican Americans with Type 2 Diabetes. *The Diabetes Educator*, 30(6), 980-993.
- White, R. H., & Keenan, C. R. (2009). Effects of race and ethnicity on the incidence of venous thromboembolism. *Thrombosis Research*, 123(Suppl. 4), S11-S17.
- Wolf, D. A., Mendes de Leon, C. F., & Glass, T. A. (2007). Trends in Rates of Onset of and Recovery From Disability at Older Ages: 1982-1994. *Journal of Gerontology: Social Sciences*, 62B(1), S3-S10.
- Zhang, X., Saaddine, J. B., Chou, C.-F., Cotch, M. F., Cheng, Y. J., Geiss, L. S., Gregg, E. W., Albright, A. L., Klein, B. E. K., & Klein, R. (2010). Prevalence of Diabetic Retinopathy in the United States, 2005-2008. *Journal of the American Medical Association*, 304(6), 649-656.
- Zsembik, B. A., Peek, M. K., & Peek, C. W. (2000). Race and Ethnic Variation in the Disablement Process. *Journal of Aging and Health*, 12 (2), 229-249.

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