RACIAL/ETHNIC DIFFERENCES IN HOSPITAL UTILIZATION FOR CARDIOVASCULAR-RELATED EVENTS: EVIDENCE OF A SURVIVAL AND RECOVERY ADVANTAGE FOR LATINOS?

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Evidence continues to demonstrate that racial/ethnic minority groups experience a disproportionate burden of disease and mortality in cardiovascular-related diseases (CVDs). However, emerging evidence suggests a health advantage for Latinos despite a high risk profile. The current study explored the hospital utilization trends of Latino and non-Latino patients and examined the possibility of an advantage for Latinos within the context of CVD-related events with retrospective data collected over a 12-month period from a local safety-net hospital. Contrary to my hypotheses, there was no advantage for in-hospital mortality, length of stay or re-admission in Latinos compared to non-Latinos; rather, Latinos hospitalized for a CVD-related event had a significantly longer length of stay and had greater odds for re-admission when compared to non-Latinos. Despite data suggesting a general health advantage, Latinos may experience a relative disparity within the context of hospital utilization for CVD-related events. Findings have implications for understanding the hospital utilization trends of Latinos following a CVD-related event and suggest a call for action to advance understanding of Latino cardiovascular health.
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“Simple solutions to complex problems are dangerous. Complexity is your friend.” (“Soluciones simples a problemas complejos son peligrosas. La complejidad es tu amigo.”)
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CHAPTER 1
INTRODUCTION

1.1 Introduction

Although there are improvements in overall health and longevity for most of the U.S. population, evidence continues to demonstrate that racial/ethnic minority groups experience a disproportional burden of disease and mortality in cardiovascular diseases (CVDs). This has contributed to a national call to reduce and eliminate health disparities as part of the national health agenda and legislation of Healthy People 2010 (US Department of Health and Human Services [DHHS], 2000) and the Affordable Care Act (ACA; DHHS, 2010).

1.2 Racial/Ethnic Health Disparities

Despite the robust data supporting a disproportionate burden of disease and mortality among racial/ethnic minorities, there are important exceptions. For example, Latinos in the U.S. live longer than their non-Hispanic Latino counterparts despite a lower socioeconomic status profile; a phenomenon coined the Latino mortality paradox (Franzini, 2001; Markides & Eschbach, 2011). This mortality advantage is evident in all-cause and disease-specific mortality. For example, a recent meta-analysis documented a 25% mortality advantage for Latinos relative to non-Latinos in the context of CVDs (Ruiz, Smith, & Steffen, 2013). These findings do not indicate reduced likelihood of health disparities in Latinos, but instead suggest that the disease course and longevity trends of minorities may not be as generalizable as is sometimes believed. With respect to Latinos, the reduced mortality risk of CVDs may reflect a number of possibilities including a survival and recovery advantage following hospitalization for an acute cardiac event, such as a heart attack. However, there is little published data on this possibility.
1.3 Current Study Hypotheses

The current study aims to compare Latinos and non-Latino differences in survival and recovery following hospital admission for an acute cardiac event. I plan to examine retrospective data, collected over a 12-month period, from a local safety-net hospital. The sample of interest will be adults from 3 major racial/ethnic groups (non-Hispanic White, non-Hispanic black, and Latino) who have a primary admission code (ICD-9-CM) for CVD-related events. I hypothesize that Latinos admitted for a cardiac issue will: 1) experience lower odds of in-hospital mortality, 2) lower lengths of stay during the initial hospitalization and aggregated over the 12-month study period, and 3) have lower odds of re-admissions over that time compared to non-Latinos. The implications of this work include: 1) comparative evidence for racial/ethnic differences in CVD-related hospitalization use, 2) replicating and extending the conceptualization of a recovery and a survival advantage to disease-specific acute clinical events (i.e., cardiac-related events) for Latinos and 3) enhancing the Latinos mortality paradox literature by providing evidence for a recovery and survival advantage for Latinos within the context of CVD-related diseases.
CHAPTER 2
CARDIOVASCULAR DISEASES

2.1 Description of Cardiovascular Diseases

Cardiovascular diseases (CVDs) are a collection of medical conditions that affect the heart and circulatory systems, account for 30% of deaths globally, and are projected to result in mortality for 23.3 million people worldwide by 2030 (Mathers & Loncar, 2006). Prevalence rates suggest 82 million people in the United States (U.S.) have a cardiovascular-related disease (National Heart Lung and Blood Institute [NHLBI], 2012). Incidence cases estimate over one million new occurrences of heart attacks, 795,000 stroke-related events, and 670,000 cases of heart failure among the U.S. population (NHLBI, 2012). In 2009, the age-adjusted mortality from CVDs was estimated at 237.1 per 100,000 people in the U.S, which decreased 6% from 2007 (NHLBI, 2012); a finding in line with the impact goals of the American Heart Association (AHA) to reduce cardiovascular-related mortality to 20% by the year 2020 (Lloyd-Jones et al., 2010). Given the pervasiveness of CVDs as the leading cause of death in the U.S. (Heron, 2012), examining these diseases becomes important in order to the address and improve the cardiovascular health of the U.S. nation.

2.2 Classification of CVDs

There are a variety of diseases covered under the term cardiovascular diseases. For example, overall (total) CVD is an umbrella term typically used to capture all diseases of the circulatory system according to the ninth edition of the International Classification of Diseases Ninth Edition (ICD-9) which contains codes 390-459 (NCHS, 2002) and is adopted by the American Heart Association (AHA). Alternatively, the term disease of the heart denotes specific
heart-related diseases (i.e., hypertensive heart disease, coronary heart disease, and heart failure), contains conditions with ICD codes 100-178, and is frequently used as a classification system by the National Center for Health Statistics (NCHS). Given the differences in classification systems used by major health organizations, it becomes important to identify the most common cardiovascular-related condition. As seen in figure 1, the most common type of cardiovascular disease is Coronary heart disease, accounting for an estimated 49.9% of deaths (NHLBI, 2012). Taken together, the term cardiovascular diseases are used as an umbrella term to describe a variety of disease processes that affect the heart.
CHAPTER 3
CORONARY HEART DISEASE

3.1 What is Coronary Heart Disease?

Coronary heart disease (CHD) refers to the accumulation of waxy and fatty plaques within the coronary arteries that disrupt the flow and supply of oxygen-rich blood to the heart muscle and brain (NHLBI, 2012). Typically, the accumulation of plaques, the associated wear-and-tear of the interior arteries, and inflammation of the walls of the coronary arteries are part of a process referred to as atherosclerosis (NHLBI, 2012). Any blockages in the coronary arteries due to atherosclerosis reduce the flow of oxygen-rich blood to the heart and may produce chest discomfort (i.e., angina pectoris), result in deterioration of the heart muscle, create poor circulation to the heart leading to a heart attack (myocardial infarction or MI), and/or may affect circulation to the brain by creating a blockage and resulting in a stroke (NHLBI, 2012). CHD overtime may cause the heart muscle to weaken and result in heart failure (not pumping enough blood to meet bodily demands) and/or abnormal heartbeat rate/rhythms or arrhythmias (NHLBI, 2012). As a result, CHD affects several structures such as the heart muscle, brain, and creates systemic problems that affect circulation of oxygen-rich blood throughout the body.

The pervasiveness of CHD in the U.S. population is pronounced. CHD comprises about half of all cardiovascular-related events experienced by both men and women below age 75 (Go et al., 2013) and is the leading cause of death for men and women in the U.S (NHLBI, 2012). Epidemiological data from the National Health and Nutrition Examination Survey from 2007-2010 estimate about 15.4 million adults above age 21 have CHD (Go et al., 2013). Incidence rates for new coronary attacks (i.e., first hospitalization due to myocardial infarction or CHD death) are estimated at 635,000, according to data collected by the Atherosclerosis Risk in
Communities Study (ARIC) of the NHLBI (Go et al., 2013). Collectively, these estimates shed light on the pervasiveness of CHD as a major type of cardiovascular disease afflicting the U.S population.

3.2 CHD Risk Factors

The advent of the biopsychosocial model proposed biological, psychological, and social factors that promote risk for several disease processes (Engle, 1977). This paradigm shift in the field of biomedicine challenged the notion of the patient and illness as two distinct and independent entities. Engle advocated for an evaluation of all factors that contribute to illness, specifically biological, psychological and social factors. Using a biopsychosocial approach, the subsequent sections will focus on a discussion of biological, behavioral, psychological, and social risk factors (RFs) for CHD. Some of these factors are potentially modifiable risk factors (i.e., biological and behavioral/lifestyle), while others are psychosocial influences on CHD.

3.2.1 Biological Risk Factors

There are several biologically-based factors that account for variance in explaining the development of CHD-related events. The traditional biological risk factors assessed by studies that predict future CHD-related events include dyslipidemia (i.e., high triglycerides, dysregulation of low and high density lipoprotein cholesterol) as a risk factor for atherosclerosis (McBride, 2007; Sharrett et al., 2001; Talayero & Sacks, 2011), hemodynamic responses such as high systolic/diastolic blood pressure and hypertension (blood pressure greater than or equal to 130/85) in community (Wilson, D’Agostino, Levy, Belanger, Silbershatz, & Kannel, 1998) and population samples (Stamler, Stamler, & Neaton, 1993), metabolic syndrome (i.e., collection of...
risk factors including: abdominal waist circumference, atherogenic dyslipidemia, hypertriglyceremia, low and high density lipoprotein, high blood pressure, pro-inflammatory state, pro-thrombotic state and high fasting glucose; Ford, Giles, Dietz, 2002; Grundy, Brewer, Cleeman, Smith, & Lenfant, 2004) and a family history of myocardial infarctions (Friedlander et al., 1998). In clinical practice, the prevalence of one of these traditional risk factors is estimated at 85% in established CHD samples (Khot et al., 2003). These finding sheds light on the importance of risk assessment in medical settings, which tend to be the primary points of contact for patients who seek medical care for CHD.

Other evidence suggests the inflammatory response of atherosclerosis produces several inflammatory risk markers that circulate in the bloodstream and indicate the diseased state of CHD. Of the inflammatory markers proposed, evidence suggests C-reactive protein (Pai et al., 2004; Rifai & Ridker, 2001; Rifai & Ridker, 2002; Buckley, Freeman, Rogers, & Helfand, 2009) interleukin-6 (Cesari et al., 2003; Pai et al., 2004), homocysteine (Wilson, 2004; Arnesen, Refsum, Bonaa, Ueland, Forde, & Nordrehuag, 1995; De Bree, Verschuren, Kromhout, Kluitjmans, & Blom, 2002; with current smokers Troughton et al., 2007; Humphrey et al., 2008), liproprotein associated phospholipase (Lp-PLA2) (Wilson, 2004; Koenig, Khuseyinova, Lowel, Trischler, & Meisinger, 2004), tumor necrosis factor-α (TNF-α; Cesari et al., 2003) and apolipoproteins B and A1 (apoB and apoA1; Yusuf et al., 2004) shed light on risk for CHD. However, some researchers debate the predictive power of these inflammatory markers when compared to traditional risk factors (Danesh et al., 2004), resulting in a statement released by the AHA suggesting insufficient evidence to support the use of inflammatory markers for assessment and prediction above and beyond the use of traditional risk factors for CHD-related events (Pearson, Mensah, Hong, & Smith, 2004; Wilson, 2004). Nonetheless, recent guidelines from
the American Association of Clinical Endocrinologists (AACE) suggest the use of certain inflammatory markers in clinical settings in order to stratify the risk for coronary heart disease in some patients (Jellinger et al., 2012). Taken together, inflammatory markers present a novel approach to the study of CHD-related events.

3.2.2 Behavioral Risk Factors

Behavioral choices play a role in the development of CHD as potentially modifiable risk factors. These factors are collectively referred to as health behaviors and include: body mass index (BMI), physical activity, smoking, nutrition, and alcohol consumption. The AHA has identified and monitored several of these potentially modifiable risk factors to identify and target areas of improvement for the cardiovascular health of the U.S. population (Go et al., 2013). As such, behavioral factors contribute to risk for CHD-related events.

3.2.2.1 Body Mass Index

BMI is typically calculated using a person’s height and weight—information that is relatively fast to collect and easy to categorize as underweight (below 18.5), normal (18.5-24.9), overweight (25.0-29.9), and obese (30+) (NHLBI, 2013). This indicator is used in the social sciences as a measure of obesity (Cawley & Burkhauser, 2008), although this composite tends to overestimate risk in some individuals by not taking into consideration body composition (i.e., those that are muscular). Despite this limitation, BMI remains the metric used by social science researchers to conceptualize obesity, given the efficiency in collecting these parameters (Cawley & Burkhauser, 2008). Related to CHD, high BMI throughout childhood increases the likelihood of developing CHD as an adult (Owen, Whincup, & Cook, 2009). Findings from the
Framingham Offspring Study suggest high BMI is related to higher risk for CHD risk factors (Lamon-Fava, Wilson, & Schaefer, 1996). Results from a study of 1.2 million women found higher BMI is associated with CHD incidence (Canoy et al., 2013) and CHD-related mortality (Logue et al., 2011). Taken together, BMI plays a role as a potentially modifiable risk factor and as a proxy to health behavior (i.e., obesity) in the development and progression of CHD.

3.2.2.2 Physical Activity

Physical activity (PA) refers to exercise and the energy costs of work/physical activities, or energy consumption, as a ratio to resting metabolic rate (Ainsworth et al., 2011). Established guidelines set by the U.S. Department of Health and Human Services (USDHHS) suggest frequent moderate-intensity exercises provide optimal health benefits for adults (USDHHS, 2008). Typically, PA is measured by calculating the frequency and duration of activities and converting that information to metabolic equivalent value (METs) with the use of the Compendium of Physical Activities (Ainsworth et al., 2011). These MET values represent the expenditure associated with the frequency and intensity of physical activity in order to reap health benefits (Lee, Sesso, Oguma, & Paffenbarger, 2003; Blair, LaMonte, & Nichaman, 2004). In the infamous Whitehall II studies, higher physical activity demonstrated an inverse relationship with CHD mortality in British civil servants (Smith, Shipley, Batty, Norris, & Marmot, 2000). Increased PA was implicated in lower CHD incidence in a sample of over 5,000 men and women in the Swedish Annual Level-of-Living Survey who were followed for 12 years (Sundquist, Qvist, Johansson, & Sundquist, 2005). Moreover, increased physical activity was associated with lower CHD morbidity and mortality in participants followed for 23 years as part of the Honolulu Heart Program (Rodriguez, Curb, Burchfield, Abbott, Petrovich, & Masaki,
Evidence examining the mechanisms associated with PA and risk for CHD suggests this relationship is mediated by inflammatory biomarkers (explaining 32.6% of variance) and blood pressure (explaining 27.1% of variance) (Mora, Cook, Buring, Ridker, & Lee, 2007). It is worthy to note that some evidence suggests that vigorous and intense frequency exercise does not provide any additional health or mortality advantages (Lee & Skerrett, 2001). Together, this evidence suggests that engaging in physical activity offers a protective effect against CHD.

3.2.2.3 Smoking

Smoking is an established, preventable, and modifiable behavioral risk factor for CHD (Parish et al., 1995). Evidence from data collected by the Framingham Study suggests those who smoke a pack a day (20 cigarettes) have twice the risk for CHD-related events (Castelli, 1990). Additionally, second hand smoke exposure (i.e., passive smoke), as measured by the biomarker serum cotinine, is associated with increased CHD-related risk (Whincup et al., 2004). Moreover, findings from a randomized controlled intervention suggest those who engage in a smoking cessation intervention demonstrate reduced CHD-related mortality, which sheds light on the modifiable properties of this behavioral risk factor (Critchley & Capewell, 2003). Examining the above evidence suggests that smoking plays a role in the development and progression of CHD-related events.

3.2.2.4 Nutrition

Food consumption (i.e., nutrition), plays a role as a potentially modifiable behavioral risk factor for CHD (Hankey & Leslie, 2001). A review of the literature suggests diets rich in non-hydrogenated unsaturated fats (dietary fats), whole grains (carbohydrates), plenty of fruits and
vegetables, and omega-3 fatty acids buffer against developing CHD (Hu & Willett, 2002). Additionally, some researchers suggest there are nutritional patterns associated with the inflammatory response of atherosclerosis, which contributes to the development of CHD-related events. For example, results from a factor analysis of dietary patterns from the NHLBI Multi-Ethnic Study of Atherosclerosis (MESA) suggest fats and processed meats pattern are positively associated with CRP, IL-6 and homocysteine; refined grains pattern are positively associated with the endothelial adhesion molecule; whole grains and fruit pattern are negatively related to CRP, IL-6 and homocysteine; vegetables and fish pattern are inversely related to IL-6, CRP, and homocysteine (Nettleton et al., 2007). Thus, nutrition plays a role via the inflammatory response of CHD-related events.

3.2.2.5 Alcohol

An abundance of literature exists on alcohol consumption as a risk factor for CHD. Typically, those who drink one or two drinks a day have the lowest CHD mortality risk, occasional drinkers have an increased mortality risk compared to the low risk group, those who consume three or more drinks per day have the highest mortality among; in essence, total mortality “climbs” as a function of number of drinks per day (Corrao, Rubbiati, Bagnardi, Zambon, & Poikolainen, 2000). Moreover, meta-analytic evidence suggest a protective effect of alcohol consumption, regardless of the type (i.e., beer versus wine, etc.) up to a certain point: namely less than one drink a day for women and two drinks per day for men, and an upper limit at which it is harmful and places individuals at risk for CHD (i.e., 52 grams/day for women and 114 grams/day for men) (Corrao, Rubbiati, Bagnardi, Zambon, Poikolainen, 2000, p. 1518). However, these results await corroboration from randomized controlled trials (Freiberg & Samet,
2005) and have warranted medical statements from the AHA regarding responsible alcohol consumption (Pearson & Terry, 1994). Together, these data suggest alcohol consumption is a behavioral risk factor that plays a role in the development and progression of CHD-related events.

3.2.3 The Impact of Traditional Risk Factors

Although numerous biological and behavioral factors are associated with risk, the degree to which they collectively account for variance in CHD-related events (i.e., AMIs) is not always clear. A recent study termed INTER-HEART attempts to inform on the degree of variance accounted for by different classes of risk factors. This study involves an examination of over 15,000 participants from 52 countries who participated in a standardized case-control study to examine the risk factors of acute myocardial infarction (AMIs; Yusuf et al., 2004). Results from INTER-HEART indicate that traditional risk factors (i.e., smoking, alcohol, nutrition, physical activity, obesity, and hypertension) explain about 50-60% of population attributable risk for AMIs, a CHD-related event. This information helps to not only understand the degree to which traditional risk factors account for AMI risk but also highlights that nearly half the variance in risk for CHD-related events remains unexplained, which raises the need to explore the remaining variance unaccounted for by non-traditional risk factors such as psychological and social variables.

3.3 Non-Traditional Risk Factors

3.3.1 Psychological Factors

An examination of psychosocial variables (i.e., stress at work and home, financial stress,
generalized locus of control, and depression) from the INTER-HEART study found that these factors account for about 33% of population attributable risk for AMIs (Rosengren et al., 2004). This finding adds explanation for risk not accounted for by traditional biological risk factors in explaining risk for AMIs, a clinical endpoint of CHD. More importantly, findings from the INTER-HEART study illustrate that interventions targeting psychosocial stress are needed in order to reduce risk for CHD-related events.

The psychological experience of stress may contribute to increased risk for CHD-related events. For example, a review by Steptoe and Kivimäki (2012) suggest chronic and day-to-day stress (i.e., external stressors including excessive work demands, marital problems, financial difficulties, strain from caregiving, and social isolation) increase risk for CHD. These findings are corroborated by findings from the infamous civil servant Whitehall II studies (Stansfeld, Furhrer, Shipley, & Marmot, 2002). A review by Steptoe and Kivimäki (2012) also suggest short-lived stressful events play a role in the risk of CHD-related events, namely psychologically dramatic experiences (i.e., short-lived work-related stress, acute effects of bereavement) and intense experiences created by extraordinary events such as natural disasters (i.e., acute sadness, acute mental distress). These findings are in line with findings from the psychosocial findings of the INTER-HEART study (Rosengren et al., 2004). Stress may also increase propensity to negative affectivity, resulting in an increase reporting and experiencing psychological symptoms (i.e., negative emotions), which increases risk for CHD (Suls & Bunde, 2005).

The most widely studied negative emotions as risk factors for CHD are depression, anxiety and anger-hostility (Kubzansky, 2007; Kubzansky & Kawachi, 2000; Everson-Rose & Lewis, 2005; Suls & Bunde, 2005). First, depression has received overwhelming attention as a risk factor for CHD (Kubzansky, 2007 p. 68; Hemingway & Marmot, 1999) among initially
healthy samples (Goldston & Baillie, 2008, p. 290) and in established CHD patients (Sirois & Berg, 2003). Typically, depression is conceptualized as a trait, including 1) diagnosed major depressive episodes, 2) current depressive symptoms, or 3) prior history of depression (Everson-Rose & Lewis, 2005). Moreover, depression is most commonly assessed by self-report surveys of depressive symptoms, including the Center for Epidemiological Studies Depression scale (CES-D) as well as assessing for hopelessness as a cognitive symptom of depression (Everson-Rose & Lewis, 2005). Second, anxiety has received meta-analytic support as a risk factor, accounting for a 26% risk in incidence of CHD and 48% risk of cardiac mortality (Roest, Martens, de Jonge, & Denollet, 2010) among healthy and established CHD patients (Hemingway & Marmot, 1999). Generally, anxiety is conceptualized as a trait, including 1) anxiety disorders, 2) panic, 3) phobia, 4) post-traumatic stress disorder or 5) worry as a cognitive symptom of anxiety (Roest, Martens, de Jonge, & Denollet, 2010; Kawachi, Sparrow, Vokonas, & Weiss, 1994). Relatedly, some researchers suggest anxiety may play a role as a risk factor for CHD independent of depression, given the high co-morbidity of these two disorders (Barger, & Sydeman, 2005). Third, anger is conceptualized as negative emotions that include irritation to rage, with varied intensity (Miller, Smith, Turner, Guijarro, & Hallet, 1996, p. 322). Population-based studies suggest anger expression, as a transient state or trait, is associated with 10-year incidence of CHD (Davidson & Mostofsky, 2010). Relatedly, hostility as a trait or transient state is typically defined as negative beliefs, intentions, and attitudes of others that create mistrust and cynicism (Miller, Smith, Turner, Guijarro, & Hallet, 1996, p. 323). Hostility has demonstrated increased CHD incidence among initially healthy populations as well as increased progression of the disease in CHD patients (Hemingway & Marmot, 1999). However, some researchers suggest anger and hostility combined are associated with higher risk for CHD-related outcomes in
healthy participants and in CHD samples (Chida & Steptoe, 2010; Seigman, Townsend, Civelek, & Blumenthal, 2000). As such, negative emotions play a role in CHD incidence and in the progression of CHD-related events.

3.3.2 Social Factors

3.3.2.1 Social Support

Several decades of research on social support suggest a robust and consistent effect on health outcomes, with pronounced effects found for cardiovascular diseases. Social support is typically defined as containing two domains: structural and functional. Structural support concerns the size of one’s network, the frequency of contact with people from one’s social network, membership and community activities, as well as marital status (Barth, Schneider, von Kanel, 2010). In contrast, functional support represents the instrumental, appraisal, informational and emotional aid from one’s social network. These two domains are assessed either by single-item questions that are used as proxies to social support or as a group of questions that are combined into a composite score representing social integration, which refers to the multiple identities/ties that individuals hold with other members of their social network (Cohen, Kaplan, & Manuck, 1994). However, there is substantial heterogeneity in the assessment and a ‘persistent vagueness’ of social support, which make it difficult to identify what domains of social support confer protective effects on health outcomes (Lett et al., 2005). Nonetheless, evidence from experimental (Kamarck, Manuck, & Jennings, 1990) and etiologic/prognostic studies (Lett et al., 2005; Barth, Schneider, & von Kanel, 2010; Cohen, Kaplan, & Manuck, 1994) suggest that supportive social ties provide a protective effect on CHD-related outcomes.
3.3.2.2 Socioeconomic Position

Ruiz, Steffen and Prather (2012) suggest SES is composed of an amalgamation of several resources, including income (Marmot, 2002), education status (Ross & Wu, 1995; Culter & Lleras-Muney, 2006) occupation (Marmot et al., 1991; Kuper, Singh-Manoux, Siegrist, & Marmot, 2002) subjective social status (Adler, Singh-Manoux, Schwartz, Stewart, Matthews & Marmot, 2008), and neighborhood characteristics (Diez-Roux, 2001). These resources tend to have a gradient effect on health outcomes—in essence, more wealth (in terms of socioeconomic resources) tends to be associated with better health outcomes (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010). Therefore, those who are not SES wealthy tend to experience poorer physical health outcomes. To highlight the powerful impact of SES on cardiovascular health, Cohen, Janicki-Deverts, Chen, and Matthews (2010) found individuals with adverse childhood experiences (i.e., low SES, including home, neighborhood, and school variables) strongly predicted poorer CVD-related health outcomes later in life (for a graphic illustration see Cohen, Janicki-Deverts, Chen & Matthews, 2010, p. 48). In spite of the robust evidence on the SES-health link, some researchers suggest improvements in methodology, such as well-defined assessments to measure the amalgamated construct of SES (Adler & Ostrove, 1999) in order to quantify the strongest components that influence health outcomes, as one size does not fit all (Braveman et al., 2005). Relevant to CHD, evidence implicates low SES (i.e., poorest income quintiles, lowest occupations, and lower education attainment) as a risk factor for CHD (Fiscella & Tancredi, 2008; Luepker et al., 1993) regardless of CHD risk at baseline (Hemingway, Shipley, Macfarlane, & Marmot, 2000). Hence, evidence suggests that SES has a robust and gradient effect on physical health outcomes, such that those who are at the poorest quintiles of SES have the most pronounced risk for CHD-related processes.
3.3.2.3 Work Characteristics

Evidence demonstrates that characteristics of the work place environment confer risk for CHD. For example, Kuper and Marmot (2003) suggest that job strain, or increasingly high job demands and low decision making abilities, predict incidence and future occurrence of fatal/non-fatal myocardial infarctions particularly for young workers at 11-year follow as part of the Whitehall II study. Similarly, Kuper, Singh-Manoux, Seigrist, and Marmot (2002) suggest that a work environment with a high effort-reward imbalance predicts incidence of CHD in participants from the Whitehall II Study. However, it is worthy to note that although Whitehall II studies contain non-industrial workers employed by the civil service; these studies provide valuable insight into the effects of work characteristics on CHD-related processes.

3.3.2.4 Disadvantaged Neighborhoods

Neighborhood-level variables have shown a consistent effect on health outcomes. First identified through a process called geocoding, or geographically mapping census tracts/blocks via zip codes, several neighborhood-level factors have been identified and linked to adverse health outcomes. For example, the physical, or built, environment include factors such as the physical layout of the land (commercial versus residential), accessibility of the walking environment via sidewalks, the quality and availability of parks for recreational activities, the accessibility to healthy and fast-food options (chain grocery stores versus fast-food restaurants), and air pollution (Diez-Roux, Kershaw, & Lisabeth, 2008; Diez-Roux & Mair 2010). Additionally, several factors in the social environment of a neighborhood such as social norms involving health behaviors, neighborhood sources of prolonged stress (i.e., vandalism, traffic, drug use, breakdown of social order, safety, violence, noise, crowding, poor housing, proximity
to environmental toxins and poverty), as well as social cohesion and collective self-efficacy have an effect on individual-level health outcomes (Diez-Roux, Kershaw, & Lisabeth, 2008; Diez Roux & Mair 2010). Evidence from over 15,000 non-Hispanic White and Black participants in the Atherosclerosis in Communities Study (ARIC) found that living in a disadvantaged neighborhood (defined with indicators such as median household income, median house values, educational attainment, and occupation) was associated with higher incidence of CHD (Borrell, Diez-Roux, Rose, Catellier, & Clark, 2004). Moreover, a disadvantaged neighborhood (defined as neighborhood deprivation and lower safety), was associated with higher risk for certain inflammatory markers involved in the atherogenic process, such as IL-6 and fibrinogen (Nazmi, Diez-Roux, Ranjit, Seeman, & Jenny 2010). Lastly, evidence from the Worcester Heart Attack Study in Massachusetts found that those who reside in a disadvantaged neighborhood environment (defined as low median income, poverty, low educational attainment, and crowding) had lower survival rates following an acute myocardial infarction, a CHD-related event (Tonne, Schwartz, Mittleman, Melly, Suh, & Goldberg, 2005), findings that are similar to those found in the ARIC study (Rose et al., 2009). However, it is worthy to note that one of the limitations of this body of research involves the vast number of operational definitions of what constitute neighborhood effects. Nonetheless, this evidence demonstrates that neighborhood-level variables have an effect on individual-health outcomes, particularly CHD-related processes.

3.3.2.5 Racial/Ethnic Discrimination

One psychosocial stressor that is specific to the experiences of racial/ethnic groups is racial/ethnic discrimination (Kessler, Mickelson & Williams, 1999; Finch, Kolody, & Vega, 2000; Mays, Cochran, & Barnes, 2007). Racial/ethnic discrimination, or more globally racism,
takes on many forms. For example, racism can occur at the institutional level, such as in public policies and regulations that disadvantage individuals via differential access to social, political, and economical resources (Jones, 2000). These institutional practices may result in differential access to housing (i.e. redlining), access to predominantly poor quality health care (Burgess, Ding, Hargreaves, & van Ryn, 2008) and may result in minority-serving hospitals diverting ambulances carrying racial/ethnic minority patients (Hsia et al., 2012). Discrimination at the individual level may result in differential or unfair treatment, social exclusion, and harassment of out-group members due to the target person’s racial/ethnic affiliation and group identification (Brondolo et al., 2011). Although not commonplace in the U.S, blatant and overt forms of discrimination may include a refusal to sit, associate, or interact with racial/ethnic minorities because of the target person’s race/ethnicity. These overt forms of discrimination, often termed “old-fashioned” or blatant racism, are seen as undesirable and have become less common in the U.S. (Pearson, Dovidio, & Gaertner, 2009; Utsey, Ponterotto, & Porter, 2008). Some evidence suggests that contemporary racism and discrimination have taken on subtle, covert forms and are insidious in nature- these subtle interpersonal slights are conceptualized as microaggressions and aversive racism (Pearson, Dovidio, & Gaertner, 2009; Sue, et al., 2007; Sue, 2010). In relation to cardiovascular health outcomes, experiences with discrimination may act as a unique psychosocial stressor for racial/ethnic minority groups via an acute cardiovascular reactivity pathway that increases risk for CVDs (Ahmed, Mohammed, & Williams, 2007; Brondolo, Gallo, & Myers, 2009; Brondolo, Love, Pencille, Shoenthaler, & Ogedegbe, 2011; Clark, Anderson, Clark, & Williams, 1999; Guyll, Matthews, & Bromberger, 2001; Mays, Cochran, & Barnes, 2007; Myers, 2009; Krieger, 1990; Williams & Mohammed, 2009; Wyatt, Williams, Calvin, Henderson, Walker, & Winters, 2003). Collectively, chronic and prolonged exposure to
experiences of racial/ethnic discrimination may be a pathway contributing to CHD-related processes in racial/ethnic minorities.
CHAPTER 4
CVD HOSPITALIZATIONS

4.1 CVD and Hospitalizations

CVDs are one of the leading medical conditions requiring extensive hospitalization and rank first in hospital discharges (Go et al., 2013). Although death rates due to CVDs have steadily declined over the past decades, due to advances in medical technology, cardiac procedures and pharmaceutical agents (van Domburg, Kappetein, & Bogers, 2009; Weisfeldt & Zieman, 2007), approximately one out of every 6 hospital stays (representing about 6 million of the annual hospitalizations in the U.S) result from heart disease (Go et al., 2013). Findings from the Healthcare Cost and Utilization Project (HCUP) suggest congestive heart failure, coronary atherosclerosis, and acute myocardial infarctions rank as the leading principal diagnosis and most frequent medical condition requiring extensive inpatient hospital stays (HCUP, 2009; Mensah & Brown, 2007; NHLBI, 2012). Moreover, these data extend to the emergency room, such that 61% of patients who present to the emergency room have a CVD-related condition (Go et al., 2013). These findings shed light on the pervasiveness and the impact CVDs have on hospitalizations across the U.S.

4.2 Financial Costs of CVD-related Hospitalizations

Annually, the financial burden of cardiovascular-related diseases is costly to the individual and society. At the personal level, those with established CVDs pay expensive medical bills, medication, and experience a decreased in quality of life (physical, psychological, social) due to the disabling nature of these disease processes. Evidence from over 12,000 patients enrolled in a health maintenance organization (Kaiser Permanente) followed for seven
years suggests the individual-level associated costs (inpatient stays, outpatient visits and pharmaceutical-related expenses) are about $19,000, with a higher cost differential (~ $50,000) in patients who experience a second CVD-related hospitalization (Nichols, Bell, Pedula & O’Keeffe-Rosetti, 2010). At the societal level, evidence estimate the current annual indirect costs of CVDs at $273 billion and project indirect and direct costs to rise between $818.8 billion and $1.48 trillion by 2030 (Go et al., 2013; Heidenreich et al., 2011). This astonishing evidence provides insight into the costly nature and shed light on a pressing need to monitor and reduce hospital utilization and the associated costs for patients with CVDs.

4.3 Survival of CVD-Related Hospitalizations

There is poor prognosis after survival of a CVD-related event. Evidence from the multinational WHO MONItoring of Trends and determinants of CArdiovascular diseases study (MONICA) offers evidence for this assertion, suggesting that about 50% of people who have their first acute myocardial infarction (AMI) survive (Chambless et al., 1997). In addition, patients who have their first CVD-related attack, such as first hospitalization for AMI, will have a recurrent acute myocardial infarction that will require hospitalization (Go et al., 2013). To illustrate survival rates of CVD-related hospitalizations, in a study of over 117,000 men and women followed after their first AMI, women had lower survival rates at 30-days and 1-year compared to men (MacIntyre et al., 2001). In patients with congestive heart failure from the Framingham Heart Study, median years of survival after the onset of heart failure were two to three years (Ho, Anderson, Kannel, Grossman, & Levy, 1993). Other evidence suggests lower survival within the first weeks after congestive heart failure diagnosis (Cowie, Wood, Coats,
Suresh, Poole-Wilson & Sutton, 2000). As a whole, these findings demonstrate the poor prognosis and subsequent survival after initial diagnosis of CVD-related events.

4.4 Length of Stay and Discharge for CVD-Related Hospitalizations

Length of stay (LOS) represents the interval (in days) of hospitalization, a measurement calculated by examining the interval from date of admission to the discharge date. The National Center for Health Statistics (NCHS) found that the average LOS from all heart diseases in short-stay hospitals was 4.6 days, with the lowest LOS in patients with ischemic-related heart disease (average 3 days) and the highest LOS for AMI patients (average 5.4 days) (NCHS, 2013). Discharge rates from the National Hospital Discharge Survey suggest about 1,054 per 10,000 people with heart disease were discharged in 2009-2010, with the highest discharge rate in heart failure patients (451.7/10,000) and the lowest rate for AMI patients (161/10,000) (NCHS, 2013). Both LOS and discharge data suggest a longer LOS interval and lower discharge rate for AMI patients, which highlights the need to monitor the hospital utilization trend for this CVD-related event. However, there is also variation in LOS depending on the site of care (i.e., minority v. non-minority serving hospital). For example, Medicare patient data from 2007-2009 demonstrated AMI patients in minority-servings hospitals stay a full day longer compared to AMI patients in non-minority serving hospitals (Joynt, Orav, & Jha, 2011). As a whole, these findings highlight the importance of monitoring hospital LOS and discharges to improve CVD-related hospitalization outcomes and reduce the associated costs.

4.5 Re-Admission for CVD-Related Events

Hospital re-admissions have received considerable attention from Congress, more
specifically from the Centers for Medicare and Medicaid Services (CMS), as an indicator of accountability and quality of health care (Axon & Williams, 2011; Benbassat & Taragin, 2000; Hasan et al., 2009). The legislation of the Affordable Care Act (ACA), more specifically the Hospital Re-admission Reduction Program, aims to reduce preventable hospital re-admission rates in AMI and congestive heart failure (CHF) by: 1) reducing Medicare reimbursements for hospitals who provide inpatients services for these medical conditions, 2) imposing hefty payment penalties for hospitals with sub-optimal and under-performance in re-admissions, 3) requiring all hospitals to publicly report re-admission rates, and 4) establishing quality improvement programs in order to assess the clinical care provided to AMI and CHF patients to prevent re-admissions (Kocher & Adashi, 2011). However, hospital re-admissions for CVD-related processes are common due to the pervasive and recurrent nature of CVDs. For example, data from Medicare patients demonstrate that CVD patients are generally re-admitted within 10-12 days of their previous hospitalization (Dharmarajan et al., 2013), the majority of CVD patients (~87-97%) are re-admitted at least once more following an initial hospitalization (Dharmarajan et al., 2013), and approximately 25% of all re-admissions are due to congestive heart failure and 20% are due to acute myocardial infarction (Dharmarajan et al., 2013). In aggregate, these data shed light on the nature of re-admission for CVD-related conditions and illustrates the importance of identifying risk factors for CVD-related hospitalization. This is imperative given the legislation of the ACA to reduce hospital re-admissions.

4.6 Risk Factors for Re-Admission

There are several risk factors that increase re-admission for a CVD-related process. For example, clinical characteristic such as the severity of the illness (SOI) represent the burden of
cardiac illness on patients, risk of adverse clinical outcomes due to treatment choices; combined, these factors increase risk for hospitalization. Evidence suggests that patients with heart failure with a high SOI score (Schwarz & Elman, 2003) and left-ventricular dysfunctions at admission are more likely to be re-admitted (Babayan et al., 2003). Findings from the Acute Decompensated Heart Failure National Registry (ADHERE) suggest those who have heart failure tend to have other systemic co-morbidities, such as hypertension, coronary artery disease, and diabetes, had a greater risk for re-admission compared to those with no co-morbidities (Adams et al., 2005). Patient-level characteristics such as Black ethnicity (Joynt, Orav, & Jha, 2011), insurance coverage such as Medicaid/Medicare (Joynt, Orav, & Jha, 2011; Philbin & Disalvo, 1999) and lower socioeconomic status (Philbin, Dec, Jenkins, & DiSalvo, 2001) are also associated with higher risk for hospital re-admission. Lastly, some evidence suggests poor self-rated physical and functional health predicts hospitalization for CVD-related processes (Mommersteeg, Denollet, Spertus, & Pedersen, 2009; Schwarz & Elman, 2003). Thus, these findings suggest there are several factors that affect re-admissions for CVD-related events.

4.7 Summary of CVDs

Cardiovascular diseases are a collection of medical conditions that affect the heart and circulatory system. In the U.S., CVD prevalence, incidence and mortality are public health concerns. Although advances in treatment have decreased mortality rate for CVDs, hospitalization utilization for CVDs remain high, as evidenced by costly length of stays and the high likelihood of re-admission due to the recurrent nature of these diseases. The projected increase in direct and indirect costs for CVD-related hospitalizations place these medical conditions as a national priority. Additionally, evidence from Medicare patient data for
hospitalization of CVDs sheds light on the importance of identifying and reducing racial/ethnic health disparities.
CHAPTER 5

RACIAL/ETHNIC HEALTH DISPARITIES

5.1 Racial/Ethnic Health Disparities

The Centers for Disease Control (CDC) suggests racial/ethnic minority groups share disproportionately higher morbidity and mortality of physical health conditions such as hypertension, obesity, pre-term births, diabetes, HIV/AIDS, and cardiovascular diseases in comparison to their White counterparts (CDC Health Disparities and Inequalities Report [CHDIR], 2011; Kurian & Cardarelli, 2007; Winkleby, Kraemer, Ahn, & Varady, 1998). In a comprehensive review of operational definitions of health disparities, Braveman (2006) concluded that health disparities are the consistent health differences of socially disadvantaged groups which tend to be worse than their advantaged counterparts. In this section, I will specifically focus on and review the racial/ethnic health disparities literature and propose the need for comparative health research in the hospitalization utilization patterns of Latinos and their non-Latino counterparts.

5.2 Black-White Differences in Health

Despite initiatives aimed at reducing health disparities (i.e., Institute of Medicine’s Report on Unequal Treatment [IOM]; Smedley, Smith, & Nelson, 2009) evidence continues to demonstrate racial/ethnic differences in mortality in the U.S. For example, data from the National Vital Statistics System Mortality suggest that Blacks have a shorter life expectancy, living about 75.1 years compared to the 78.9 year average for Whites (CHDIR, 2011; National Center for Health Statistics [NCHS], 2013). Evidence from the NCHS suggests this Black-White mortality gap has changed very little since 1960, proposing that if this gap were closed,
83,000 deaths of Blacks would be eliminated (Satcher, Fyer, McCann, Troutman, Woolf, & Rust, 2005). In the National Longitudinal Mortality Study, an examination of over 530,000 participants, Blacks had higher age-adjusted mortality rates compared to their White counterpart (Sorlie, Backlund, Keller, 1995; Ng-Mak, Dohrenwend, Abraido-Lanza, & Turner, 1999). Additionally, evidence from the NCHS corroborates this, as Blacks also showed a disproportionate burden of mortality compared to their White counterparts (Levine et al., 2001). Together, these findings shed light on an all-cause mortality difference between Black and White individuals.

Black-White differences also exist for specific diseases, particularly CVDs. For example, age-adjusted rates demonstrate higher prevalence of CVD-related conditions in Blacks compared to Whites (Go et al., 2013). In addition, compared to Whites, Blacks experience high rates of CVD incidence (Go et al., 2013), greater subclinical disease assessed via carotid intima-media thickness (D’Agostino et al., 1996), higher incidence of high blood pressure and hypertension (Go et al., 2013) with greater likelihood of poor control (Go et al., 2013), higher risk of myocardial infarction and stroke (NHLBI, 2012), longer lengths of stay and greater likelihood of re-admission following a prior admission for a cardiac event (Joynt, Orav, Jha, 2011), lower rates of tertiary interventions such as coronary artery bypass graft (CABG) and percutaneous transluminal coronary angioplasty (Jha et al., 2005; Ford, Newman, & Deosaraningh, 2000, Kressin & Petersen, 2001; Peterson et al., 1997), and higher rates of complications from those tertiary interventions (Lucas, Stukel, Morris, Siewers, & Birkmeyer, 2006; Osborne, Upchurch, Mathur, & Dimick, 2009). Finally, Blacks are at greater risk of cardiovascular and all-cause mortality relative to Whites (Barnett & Halverson, 2000; CHDIR, 2011; Corti et al., 1999).
These findings demonstrate significant racial/ethnic disparities in cardiovascular disease, which contribute to the broader observed racial/ethnic differences in health outcomes.

5.3 What about Latinos?

Although much is known about Black-White differences in health, particularly cardiovascular health, far less is known about the comparative cardiovascular health profile of Latinos (Davidson et al., 2007). Latinos comprise 50.7 million people, have become the largest racial/ethnic group in the U.S. (Pew Hispanic Research Center [PHRC], 2011) and accounted for over half of the nation’s population growth (~56%) from 2000 to 2010 (PHRC, 2011). Given the size of the Latino community, the scope and cost of their health and care could have a significant impact on the U.S. nation.

5.3.1 Who Are Latinos?

The demographic profile of Latinos tends to be different than other racial/ethnic minority groups. For example, Latinos tend to be younger than non-Latinos (median age = 27; PHRC, 2011), fall within prime child-bearing years (PHRC, 2011), and contribute to a substantial number of new births in the U.S., such that one in every four newborn children in the U.S. is Latino (PHRC, 2011). In terms of immigration status, most Latinos are U.S-born, 13% are foreign-born; only 5.8% of foreign-born Latinos achieve citizenship (PHRC, 2011). A variety of terms exist to identify this racial/ethnic group as a whole, such as Hispanic, Chicano, and Latino. For this paper, we used the term Latino to describe members of this racial/ethnic group (Hayes-Bautista & Chapa, 1987). Although useful, this categorization does not capture the diversity and heterogeneity of distinct cultures and dialects of this racial/ethnic group. For example, amongst
Latinos, those who are of Mexican and Puerto-Rican origin are the largest groups (64.6% and 9.5%, respectively; PHRC, 2011). As illustrated, Latinos represent a fairly young, mostly U.S.-born, and heterogeneous group of people.

5.3.2 Psychosocial Experiences of Latinos.

Latinos face a disproportionate number of psychosocial experiences that are hypothesized to have a gradient effect on health outcomes. For example, educational attainment affects health, such that those with the highest levels of education have fewer disease morbidity and greater life expectancy (Culter & Lleras-Muney, 2012; Culter & Lleras-Muney, 2007). Latinos generally have the lowest educational attainment rates (as measured by high school completion rates and college enrollment) compared to Blacks and Whites (PHRC, 2011). Socioeconomic position, an amalgamation of several social and economic resources, is positively associated with better health outcomes (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010). In relation to this experience, Latinos generally have comparable household median incomes to Blacks (PHRC, 2011), similar poverty rates to non-Hispanic Blacks, and tend to be over-represented in high-risk/low social status occupations, such as construction and fast-food services (PHRC, 2011). In addition to these experiences, experiences of perceived discrimination are associated with adverse health outcomes, a finding demonstrated among Blacks (Williams & Mohammed, 2009). Although the literature has primarily focused on discrimination within the context of Black-White relations, it is important to note that experiences of perceived discrimination are also salient for Latinos, such that 60% of Latinos and 25% of the nation report that discrimination is an issue for Latinos (PHRC, 2011). Dovidio and colleagues (2010) propose that distinct experiences, such as foreignness/legal status, deviations from the prototypical White culture, and
non-native accents, shape the discriminatory experience faced by some Latinos. Together, these data highlight the disproportionate psychosocial experiences faced by some Latinos and hypothesize that these challenges typically have a gradient effect on health outcomes.

Members of this racial/ethnic group also generally face a number of challenges that influence their ability to optimally interact with the healthcare system, such as insurance coverage, difficulties with maintaining a usual place of care, health literacy and distrust toward healthcare systems. For example, Latinos have the highest uninsured rates of all racial/ethnic groups, a healthcare coverage disparity that plays a role in access to quality and affordable health care (Rutledge & McLaughlin, 2008; CDC, 2011). Second, Latinos as a group have difficulties with maintaining a usual place of care, as evidenced by high rates (25% compared to 8% of the total population) of community health clinic usage (Doty & Ives, 2002). Within the context of health literacy, some Latinos have difficulties with understanding health information (i.e., health literacy). This may be the result of a language barrier as they interact and receive health information from healthcare systems. This is demonstrated by findings suggesting that predominantly English-speaking Latinos have a 35% inadequate health literacy rate compared to the 61.7% inadequate health literacy rate of Spanish-speaking patients (Williams et al., 1995). Regarding distrust, evidence from the Community Tracking Study, an examination of over 32,000 participants, found that Latinos as a group reported high levels of distrust towards healthcare systems, such as perceiving denial of referrals to a specialist and unfair treatment by healthcare systems because of their race/ethnicity (Armstrong, Ravenell, McMurphy, & Putt, 2007). Thus, there are a number of challenges faced by Latinos as a group that impact their ability to optimally utilize and interact with healthcare systems, which may contribute to adverse health outcomes.
5.3.3 Cardiovascular Health of Latinos

Evidence suggests Latinos generally have a health risk profile comparable to Blacks, such that they experience a disproportionate burden of risk factors that contribute to CVD-related morbidity (CHDIR, 2011; Kurian & Cardarelli, 2007; Winkleby, Kraemer, Ahn, & Varady, 1998). More specifically, Latinos as a group have higher lipid abnormalities (i.e., higher mean LDL cholesterol level and fasting triglyceride levels) compared to Blacks and Whites, a 66% risk of being diagnosed with diabetes compared to their White counterpart, have the highest rates of being unaware of hypertension, are under-treated for this condition, and have the poorest rates of control for high blood pressure compared to Blacks and Whites (Go et al., 2013). Given the risk factors, subclinical risk markers of disease (e.g., carotid intima-media thickness [cIMT]) may shed light on early evidence of subclinical disease in Latinos. However, findings from the Insulin Resistance Atherosclerosis Study (D’Agostino et al., 1996) and the Northern Manhattan Study (Sacco et al., 1997) demonstrate that Latinos have the lowest cIMT compared to Blacks and Whites and suggest that Latinos have lower risk markers of subclinical disease. As such, it appears that although Latinos have a similar risk profile to Blacks, the data on risk markers do not indicate that there is development of subclinical cardiovascular-related disease in Latinos.

Despite having some of the traditional major risk factors, higher prevalence, incidence, surgical interventions, and mortality for CVD-related events are not demonstrated among Latinos as a group. For example, age-adjusted rates do not demonstrate a higher prevalence of CVD-related events for Latinos compared to Blacks or Whites (Go et al., 2013). Concerning incidence, some evidence suggests that Latinos have a greater incidence for AMIs compared to Whites (Goff et al., 1997), whereas other data demonstrate lower incidence for MI and stroke in Latinos (Ninomiya, L’Italien, Criqui, Whyte, Gamst, & Chen, 2004; Howard, Anderson, Sorlie,
Andrews, Backlund, & Burke, 1994). Regarding cardiac procedures, Latinos (regardless of insurance type; Carlisle, Leake, & Shapiro, 1997) are less likely to receive coronary bypass grafting (CABG), percutaneous transluminal coronary angioplasty (PTCA) or catheterization compared to Whites (Kressin & Petersen, 2001; Ford, Newman, & Deosaraningh, 2000; Peterson et al., 1997; Ramsey, Goff, Wear, Labarthe, & Nichaman, 1997). In relation to mortality, the CDC Health Inequalities Report highlights that Latinos have the lowest rates of CVD-related mortality (CHDIR, 2011). Hence, evidence demonstrates that the risk factor profile of Latinos tends to approximate that of Blacks; however, the mixed data on prevalence and incidence of CVD-related events, cardiac interventions and CVD-related mortality outcomes appear paradoxical given the health risk profile of Latinos.

5.3.4 Latino Mortality Paradox

As illustrated above, the paradoxical findings suggests Latinos experience a mortality advantage compared to their non-Latino counterparts. Cross-sectional examinations corroborate this assertion by focusing on the prevalence of risk factors in Latino samples at one point in time, describing the characteristics they observe retrospectively and typically demonstrate a health advantage for Latinos compared to Whites (Brown, Chireau, Jallah, & Howard, 2007; Jerant, Arellanes, & Franks, 2008; Abraido-Lanza, Dohrenwend, Ng-Mak, & Turner, 1999; Eschbach, Ostir, Patel, Markides, & Goodwin, 2004; Patel, Eschbach, Ray, & Markides, 2004). Similarly, longitudinal data from several representative national sample surveys (i.e., National Health Interview Survey, National Center for Health Statistics) reliably demonstrate a mortality advantage for Latinos overtime (Markides & Eschbach, 2005; Liao et al., 1997). However, systematic and meta-analytic findings provide the most convincing evidence of a mortality
advantage. For example, Ruiz, Steffen, and Smith (2013) reviewed the literature from 1990-2010 and focused on studies that examined Latino health comparatively (i.e., Latinos-Whites-Blacks). They identified and examined 58 longitudinal studies, totaling over four million participants, with mortality (both all-cause and disease-specific) as the primary outcome variable. Results demonstrated Latinos have a 17.5% all-cause mortality advantage and a 25% mortality advantage from CVD-related events compared to Whites. The authors posited this advantage reflects differences in recovery from acute clinical events (e.g., heart attacks) and survival from these events. Together, these meta-analytic and systematic findings challenge the generalizability of the disease course and longevity trends across all racial/ethnic groups (Braveman, Cubbin, Egerter, Williams & Pamuk, 2010).

5.3.5 Latinos and Hospital Utilization

In order to examine these paradoxical findings, hospital utilization trends may shed light on this issue. However, there are mixed findings that comparatively examine the utilization trends of Latinos, Blacks, and Whites. For example, evidence demonstrates Latinos have all-cause admission rates comparable to Whites and Blacks as demonstrated by the 1997 U.S. Medical Expenditure Survey (Laditka, Laditka, & Mastanduno, 2003), longer length of stay (compared to Whites and Blacks) in emergency departments as suggested by the National Hospital Ambulatory Medical Care Survey from 2001-2005 (Herring et al., 2009), and are more likely to be re-admitted (compared to Whites and Blacks) due to diabetes-related conditions as found by the Healthcare Cost and Utilization Project of 1999 (Jiang et al., 2005). Conversely, data also exist demonstrating that Latinos have better in-hospital survival rates for heart failure (Yarzebski, Bujor, Lessard, Gore, & Goldberg, 2004), are less likely to need revascularization
procedures for acute myocardial infarctions (Barnhart, Fang, & Alderman, 2003), and have shorter length of stay and lower re-admission rates (Cook et al., 2006; Dávalos, Hlaing, Kim, & de la Rosa, 2010) compared to Whites. These findings are corroborated by Ruiz, Hamman, Lewis, Prather, Garcia, and Santini (2014) who found Latinos had better odds of survival for in-hospital mortality, a lower length of stay, but were more likely to be re-admitted compared to non-Hispanic Whites and Blacks for all-cause clinical events. As such, the mechanisms of the Latino mortality paradox may be reflected via hospital utilization trends and may shed light on a survival and a recovery advantage from acute clinical events. However, further research is needed to clarify general hospitalization trends as well as trends within specific disease contexts, such as CVD (Davidson et al., 2007). This is vital to improve understanding and inform intervention efforts for the salud cardiovascular (cardiovascular health) of Latinos.

5.4 Current Study Hypotheses

The overall aim of this study is to examine racial/ethnic differences in CVD-related hospital utilization trends with a specific focus on three hospital utilization variables: LOS (in days), re-admission rates, and in-hospital mortality. The sample was drawn from a larger, retrospective study of racial/ethnic differences in hospital utilization from a community safety-net hospital. The parent study involved electronic medical records with for the period of January 1, 2008 through December 31, 2008 with individual patient utilization tracked with medical records numbers (MRN). Patients were identified for inclusion in this study through the use of ICD-9 codes for cardiovascular diseases. The specific aim of this investigation is to compare survival and recovery among Latino, non-Hispanic White, and non-Hispanic Black adults admitted for a cardiac-related event. I hypothesize that Latinos admitted for a cardiac issue will:
1) experience lower rates of in-hospital mortality and 2) lower lengths of stay during the initial hospitalization and aggregated over the 12-month study period, and 3) have lower odds of re-admissions over that time compared to non-Latinos. The implications of this work include: 1) comparative evidence for racial/ethnic differences in CVD-related hospitalization use, 2) replicating and extending the conceptualization of a recovery and a survival advantage to disease-specific acute clinical events (i.e., cardiac-related events) for Latinos and 3) enhancing the Latinos mortality paradox literature by providing evidence for a recovery and survival advantage for Latinos within the context of CVD-related diseases.
CHAPTER 6

METHOD

6.1 Method

The current investigation was approved by the Institutional Review Boards of the University of North Texas, University of Texas Southwestern Medical Center, and Parkland Health & Hospital System (Parkland/PHHS).

6.2 Setting

Parkland is one of two regional Level 1 trauma facilities, houses of the nation’s largest burn centers, and is the only public academic hospital with a commitment “to furnish medical aid and hospital care to indigent and needy persons” residing in the Dallas-Fort Worth metroplex regardless of ability to pay. In 2012, Parkland had 36,000 inpatient discharges, helped with the delivery of about 10,000 births, and provided outpatient care to over 1 million individuals. PHHS accomplishes this high volume clinical care with its rather large infrastructure of 744 adult beds, 65 NNICU beds and 10 centers of excellence, including (but not limited to) cancer, cardiology, and endocrinology. These numbers are impressive considering that in 2012, PHHS received most of its payments in the form of charity (37%) and government reimbursements (44%). Moreover, patients who seek services from Parkland are predominantly of low socioeconomic status, with 45% having Medicaid as their only source of health insurance, 30% having individual health insurance, and less than 28% of patients having no health insurance. In addition to providing clinical care to a high volume of patients, Parkland also aims to reduce community-level health disparities by improving access to health care for its residents via nine satellite care facilities located throughout Dallas County. Given the large catchment area and
insurance profile of patients, those who seek services from PHHS are likely to stay within PHHS for their future medical needs.

6.3 Procedure

As previously mentioned, the current study draws from a larger parent study that identified 24,119 patients admitted to PHHS between January 1 and December 31, 2008 for all-cause (not disease-specific) hospitalization (Ruiz, Hamman, Lewis, Prather, Garcia, & Santini, 2014). However, the current study focuses on a disease-specific subsample of patients from the larger parent study, namely those admitted to PHHS for CVD-related events. Detailed procedures for the data collection of the parent study are reviewed elsewhere (Ruiz, Hamman, Lewis, Prather, Garcia, & Santini, 2014). Briefly, the current CVD subsample was retrospectively examined by identifying and extracting hospital data from electronic medical records for all adult (>17 years of age) who had an initial admission for a CVD-related event as coded by ICD-9 codes 390–459, as classified by AHA statistical reports (Go and et al., 2013), between January 1 and December 31, 2008 from PHHS. Patients who had an initial admission with a CVD-related event were then tracked over the 12 month study period with the use of their medical record numbers (MRN) on subsequent in-hospital mortality, length of stay, and re-admission to PHHS.

6.4 Sample

For the current investigation, there were a total of 2,272 CVD-related admissions to PHHS, comprised of 1269 (59%) men, 1003 (44.1%) women, 705 (31%) non-Hispanic White, 1059 (46.6%) non-Hispanic Black, and 508 (22.4%) Latino patients aged 17-99 (mean = 57
years). Regarding diagnoses at admission, the subsample contained a variety of CVD-related events, ranging from diseases of the tricuspid valve, acute myocardial infarction, to unspecified hypotension.

6.5 Independent and Outcome Variables

The primary independent variable was dummy coded to reflect combined ethnicity and race. Ethnicity was assessed with the item: “Are you of Hispanic or Latino origin or descent” (Office of Management and Budget, 1997). Moreover, race was self-reported by the patient from a standard list that included Black, White, and Asian. For the purposes of the current study, we focused on three specific groups: non-Hispanic Whites, non-Hispanic Blacks, and Latinos. There were three primary hospital utilization outcomes of interest in the current investigation. First, we examined CVD-related in-hospital mortality during initial 2008 hospitalization as well as over the course of the study period. Second, we examined differences in the length of stay (LOS) of CVD-related conditions at first admission and differences in total LOS during the study period. In order to estimate LOS, we subtracted the admission date from the discharge date to obtain a LOS interval. Lastly, we examined differences in CVD-related re-admission statistics, including time (days) to first admission and total re-admissions during the study period.

6.6 Statistical Analyses

Two separate one-way analysis of covariance (ANCOVA), controlling for age, were used to examine racial/ethnic differences in LOS during initial 2008 hospitalization and aggregated LOS across the 12 month study period. Three separate hierarchical logistic regression analyses were used to examine racial/ethnic differences in dichotomized mortality and re-admission
variables, controlling for age. The first two hierarchical logistic regression analyses focused on examining the risk of in-hospital mortality at admission and at the end of the study period, whereas the third logistic regression analysis focused on the risk of re-admission as a function of race/ethnicity. The control covariate, (i.e., age), was entered in the first step of the all the regression analyses, followed by the three level race/ethnicity variable (NH White, NH Black, Latino) in the second step. Categorical variables were coded using Latino ethnicity as the reference group of greatest interest. Latinos were used as the reference group, as it is hypothesized they have better cardiac-related outcomes compared to non-Hispanic Whites and Blacks. This is in line with the methodological recommendations proposed by the National Center for Health Statistics for researchers who examine health disparities (Keppel, et al., 2005).
CHAPTER 7

RESULTS

There were a total of 2,272 CVD-related admissions to PHHS. Heart Failure (14%), occlusion of the cerebral arteries (11%), acute myocardial infarction (6%), unspecified essential hypertension (6%), and intermediate coronary syndrome (5%) comprised the top five CVD-related conditions (ICD-9 coded) for patients at initial admission in the study period.

7.1 Initial In-Hospital Mortality

Hypothesis 1: Latinos admitted for a cardiac issue would experience lower rates of in-hospital mortality during the initial hospitalization and aggregated over the 12-month study period.

To test this hypothesis I used a hierarchical binary logistic regression analysis, with Latinos as the reference group. For the current sample, approximately two percent of the sample died at first admission to PHHS (see Table 1 for a racial/ethnic breakdown). In block one, the covariate age was entered in order to control for the effect of age on in-hospital mortality. Block two contained the race/ethnicities non-Hispanic White and non-Hispanic Black, dummy coded. Concerning block one, a chi square goodness-of-fit test demonstrated that age reliably distinguished those who died versus those who survived, $\chi^2 (2, 2272) = 23.24, p < .001$. For patients in this CVD-related subsample, every one year increase in age significantly increased the odds of in-hospital mortality by three percent, (OR = 1.05, 95% CI: 1.03-1.05, Wald (1) = 22.67, $p < .001$, Nagelkerke $R^2$= 0.05). Compared to Latinos, non-Hispanic Whites and Blacks had lower odds of in-hospital mortality during the initial 2008 hospitalization (OR = 0.85, 95% CI: 0.33-1.23; OR = 0.63, 95% CI: 0.43-1.65, respectively), though these effects were not
7.2 Twelve Month In-Hospital Mortality

To test for a 12-month in-hospital mortality advantage, I used a hierarchical logistic regression. Descriptive results suggest 1.5% of CVD patients died during the study period ($N = 91$). Results for block one were similar to those found previously for age $\chi^2 (2, 2272) = 21.107, p < .001$: every one year increase in age significantly increased the odds of in-hospital mortality by 3% (OR = 1.03, 95% CI: 1.02-1.05, $Wald (1) = 22.67, p < .001$, Nagelkerke $R^2 = 0.03$).

Similar to the initial in-hospital mortality findings, compared to Latinos, non-Hispanic Whites and Blacks had lower odds of mortality, though this effect was not statistically significant, ($Wald_{NHW} (1) = .244, p = .21$ and $Wald_{NHB} (1) = 1.816, p = .14$, Nagelkerke $R^2 = 0.03$, see Table 3). Together, these results do not demonstrate an in-hospital mortality advantage for Latinos during the 12-month study period.

7.3 Initial Length of Stay

Hypothesis 2: Latinos will have lower lengths of stay during the initial hospitalization and aggregated 12-month study period.

To test this hypothesis, I used an analysis of covariance (ANCOVA) with age as a covariate. Descriptive results suggest the average LOS at admission was about seven days for all patients admitted for CVD-related condition in this sample, with variation by race/ethnicity (see Table 1). As shown in Table 4, controlling for age, results of the ANCOVA demonstrated no
racial/ethnic differences in LOS at initial hospitalization, $F (2, 2268) = 1.49$, $p = .226$, partial $\eta^2 = .001$. Thus, results do not indicate a lower length of stay for Latinos at initial hospitalization.

7.4 Twelve Month Length of Stay

A separate ANCOVA, with age as a covariate, tested the hypothesis of lower length of stay for Latinos during the 12-month study period. Descriptive results suggest the average length of stay for patients with CVD-related conditions was 13 days with racial/ethnic variation (see Table 1). As shown in table 4, controlling for age, results of the ANCOVA demonstrated significant racial/ethnic differences across the 2008-2009 study period, $F (2, 2268) = 4.206$, $p = .015$, partial $\eta^2 = .004$, with simple contrast comparisons indicating that non-Hispanic Whites and Blacks had significantly lower hospital length of stay across all admissions (3.044 and 1.939, days respectively) compared to Latinos. These results suggest Latino patients admitted to PHHS with CVD-related conditions stayed longer in the hospital during the study period.

7.5 Re-admission

Hypothesis 3: Latinos will have lower odds of re-admissions over the 12-month study period compared to non-Latinos

To test this hypothesis, I used a hierarchical logistic regression. Descriptive results indicated a total of 931 patients with CVD-related conditions were re-admitted during the study period, with variations by race/ethnicity (see Table 1). In block one, the covariate age was entered in order to control for the effect of age on re-admission, whereas block two contained the dummy coded race/ethnicities non-Hispanic White and non-Hispanic Black. Regarding block one, a chi square goodness-of-fit test demonstrated that age reliably distinguished those who
were re-admitted or not, $\chi^2 (2, 2272) = 8.989, p = .003$. Results from block two demonstrated that compared to Latinos, the odds of re-admission were significantly lower for non-Hispanic White (OR = 0.73, 95% CI: 0.995-0.997, $Wald_{NHW} (1) = 6.994, p = .008$), but not for non-Hispanic Black CVD patients (OR = 1.035, 95% CI: 0.84-1.28, $Wald_{NHB} (1) = .102, p = .750$, see Table 5). Thus, results do not indicate an advantage for hospital re-admission for Latinos; rather, Latinos were more likely to be re-admitted to PHHS during the study period.
CHAPTER 8
DISCUSSION

The current study explored the hospital utilization trends of Latino and non-Latino patients and examined the possibility of an advantage for Latinos within the context of CVD-related events. Contrary to our hypotheses, there was no advantage for in-hospital mortality, length of stay or re-admissions in Latinos compared to non-Latinos. Instead, Latinos hospitalized for a CVD-related event had a significantly longer length of stay and had greater odds for re-admission when compared to non-Latinos. Together, the findings of the current investigation suggest a different hospital utilization pattern for Latinos following admission for a CVD-related event and suggest a disparity in hospital utilization that may result in worse recovery outcomes for this racial/ethnic group.

8.1 Poor Cardiac-Related Recovery

Although there are inconsistent findings in the literature regarding the hospital utilization for Latinos, my findings are in line with data suggesting poor cardiac-related recovery. For example, evidence suggests that once Latinos are admitted into the hospital, they have greater odds for a longer LOS compared to non-Hispanic Whites (Schwamm et al., 2010). Relatedly, poor recovery has been documented in Latinos with heart failure (Vivo, Krim, Cevik, & Witteles, 2009), demonstrating higher rates of hospitalization (Alexander, Grumbach, Remy, Rowell, & Massie, 1999) and higher odds for re-admission (Brown, Haldeman, Croft, Giles, & Mensah, 2005; Jiang et al., 2005) compared to non-Hispanic Whites. Together, these findings suggest that once Latinos develop CVDs, they experience a decrease in cardiac-related recovery.
Evidence from the current study does not demonstrate an advantage for in-hospital mortality within the context of all-cause CVD admissions for Latinos. These null findings are in line with the Corpus Christi Heart Project (Pandey, Labarthe, Goff, Chan, & Nichaman, 2002), San Antonio Heart Study (Hunt, Resendez, Williams, Haffner, Stern, & Hazuda, 2003) and with data collected by the National Registry of Myocardial Infarctions (Canto, Taylor, Rogers, Sanderson, Hilbe, & Barron, 1998); however, the abovementioned cardiac findings are largely based on post-MI samples whereas my data were for all-cause cardiovascular admissions. It is important to note that my findings are inconsistent with the limited evidence regarding Latinos and hospitalization (Ruiz, Hamman, Lewis, Prather, Garcia, & Santini, 2014); however, results from this study shed light on the trends of Latinos hospitalized following a cardiac event.

8.2 Worse Recovery from CVD Hospitalizations

Although the literature depicts the cardiovascular health profile of Latinos as having lower risk for developing CVDs (Go et al., 2013), lower age-adjusted mortality within the context of diagnosed CVDs (Cortes-Bergodieri et al., 2013; Ruiz, Steffen & Smith, 2013), findings of the current study suggest worse recovery from a CVD hospitalization. It may be possible that once Latinos develop CVDs, they experience a decrease in cardiac-related recovery resulting from the burden of co-morbid major CVD risk factors, such as hypertension, hypercholesteremia, diabetes, and obesity (as suggested by the Hispanic Community Health Study/Study of Latinos; Daviglus et al., 2012), which lead to a disease trajectory requiring and involving frequent contact with healthcare systems (i.e., longer lengths of stay and more re-admissions as found in the “Get with the Guidelines- Coronary Artery Disease Registry”; Krim et al., 2011) but not mortality; the former is supported by findings from the current study,
whereas the latter point is extensively documented in meta-analytic and systematic evidence (Cortes-Bergoderi et al., 2013; Ruiz, Steffen & Smith, 2013). Furthermore, it may be that the Latino advantage is present only for initial risk of developing CVDs (despite a significant comorbidity in CVD risk factors) and in CVD-related mortality; thus, this may suggest that Latinos have an advantage at different points throughout the disease course of CVDs. Together, my findings have implications for understanding the cardiovascular health Latinos post-hospitalization.

8.3 Limitations

There are several limitations in the current study. For example, data were collected from only one hospital site, which limits the generalizability of the current findings; thus, a multi-site investigation is warranted. Relatedly, the current study followed patients hospitalized for only one year; perhaps following patients for more than one may elucidate the reliability of these trends overtime. Moreover, the current study relied on medical records, not individual patients; this does not account for mortality outside the hospital setting nor disease severity markers that may have contributed to the null findings. Also, the current study classified CVDs consistent with AHA standards but conflated all CVD-related conditions; however, given that CVDs have substantial variance in disease course/progression, it may be possible that the groups differed in survival and LOS within specific conditions such as recovery from a myocardial infarction but that such differences were lost when the data was viewed in the aggregate. Additionally, perhaps re-admission may be a marker of illness sensitivity which may vary by group, such that some groups may and return to the hospital not because their condition have worsened and/or require medical attention, but rather returning to the hospital due to an increased adherence to medical
treatment. Lastly, LOS may vary as a function of recovery but may also reflect lack of trust towards health system (Armstrong, Ravenell, McMurphy, & Putt, 2007) or perceived discrimination (Dovidio et al., 2008; Smedley, Stith, & Nelson, 2009).

8.4 Summary

In summary, our findings suggest that although the incidence and prevalence for CVDs is low for some Latino groups, once Latinos ultimately develop a CVD-related condition (reflecting a progression in the disease course), they may require significantly more hospitalizations and days in the hospital to recover from the burden of established CVDs. Given the costly impact of hospital length of stays and re-admissions at the individual and societal level, findings from the current study suggest a pressing need to monitor Latinos who develop CVD-related conditions, as the disease course for this racial/ethnic group indicate greater use of hospital resources to address their CVD-related medical needs. Furthermore, research efforts are encouraged to test the reliability of my findings in order to help clarify these hospital use patterns in Latinos with CVDs. This becomes imperative, given the mandate to reduce hospital re-admission as part of the Affordable Care Act, as hospitals that provide clinical care to racial/ethnic minority communities may be disproportionately penalized (McHugh, Carthon, & Kang, 2010)
Percentage of Deaths from CVDs

- Coronary Heart Disease: 50%
- Stroke: 17%
- Other CVD: 16%
- Hypertensive Diseases: 7%
- Heart Failure (underlying cause): 7%
- Diseases of Arteries: 3%

*Figure 8.1.* Percentage of deaths from overall CVD as reported by the Vital Statistics of the National Center for Health Statistics in 2008 (National Heart Lung and Blood Institute, 2012).

*Figure 1.*
Table 8.1
Demographic Characteristics By Race/Ethnicity

<table>
<thead>
<tr>
<th>Variable</th>
<th>Latino</th>
<th>non-Hispanic Black</th>
<th>non-Hispanic White</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>508</td>
<td>1059</td>
<td>705</td>
<td>2272</td>
</tr>
<tr>
<td><strong>Age in years (M)</strong></td>
<td>56.01***</td>
<td>56.26***</td>
<td>59.03abc***</td>
<td>57.06</td>
</tr>
<tr>
<td><strong>Sex (N)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Male</em></td>
<td>298</td>
<td>560</td>
<td>411</td>
<td>1269</td>
</tr>
<tr>
<td><em>Female</em></td>
<td>210</td>
<td>499</td>
<td>294</td>
<td>1003</td>
</tr>
<tr>
<td><strong>Marital Status (N)d</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Single</em></td>
<td>163</td>
<td>505</td>
<td>261</td>
<td>929</td>
</tr>
<tr>
<td><em>Married</em></td>
<td>197</td>
<td>201</td>
<td>244</td>
<td>642</td>
</tr>
<tr>
<td><em>Common law</em></td>
<td>11</td>
<td>9</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td><em>Legally separated</em></td>
<td>36</td>
<td>90</td>
<td>22</td>
<td>148</td>
</tr>
<tr>
<td><em>Significant relationship</em></td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td><em>Divorced</em></td>
<td>29</td>
<td>130</td>
<td>94</td>
<td>253</td>
</tr>
<tr>
<td><em>Widowed</em></td>
<td>58</td>
<td>119</td>
<td>67</td>
<td>244</td>
</tr>
<tr>
<td><em>Other</em></td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><strong>Mortality at first admission (%)</strong></td>
<td>3%</td>
<td>2%</td>
<td>3%</td>
<td>2.5%</td>
</tr>
<tr>
<td><strong>Mean initial LOS in days (SD)</strong></td>
<td>7.28 (9.59)ns</td>
<td>6.46 (11.03)ns</td>
<td>7.12 (8.80)ns</td>
<td>6.85 (10.07)</td>
</tr>
<tr>
<td><strong>First Re-admission (N)</strong></td>
<td>21%</td>
<td>24%</td>
<td>21%</td>
<td>22%</td>
</tr>
<tr>
<td><strong>Mean interval (days) to first re-admission (SD)</strong></td>
<td>34.11 (76.86)c</td>
<td>36.40 (76.45)c**</td>
<td>25.47 (66.43)a,b**</td>
<td>32.50 (73.71)</td>
</tr>
<tr>
<td><strong>Mean 12-month LOS in days (SD)</strong></td>
<td>14.72 (21.24)c,abc***</td>
<td>12.76 (17.82)d,*</td>
<td>11.46 (15.79)d,**</td>
<td>12.79 (18.09)</td>
</tr>
<tr>
<td><strong>Total 12-month Mortality (N)</strong></td>
<td>26</td>
<td>37</td>
<td>28</td>
<td>91</td>
</tr>
<tr>
<td><strong>Total 12-month Re-admission (N)</strong></td>
<td>219</td>
<td>465</td>
<td>247</td>
<td>931</td>
</tr>
</tbody>
</table>

**Note:** ***p < .001, **p < .01, *p < .05. LOS = length of stay. a significant simple contrast differences compared to Latinos, b significant simple contrast differences compared to Blacks, c significant simple contrast differences compared to Whites. d missing data = 23. ns = not significant.
Table 8.2

*Binary Hierarchical Logistic Regression for In-Hospital Mortality at First Admission with Age as a Covariate*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mortality Rate</th>
<th>OR</th>
<th>95% CI</th>
<th>Wald test</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial in-hospital mortality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 1 (covariate: age)</td>
<td>3%</td>
<td>1.05</td>
<td>1.03-1.05</td>
<td>22.67</td>
<td>1</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Block 2 (reference: Latino)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>non-Hispanic Black</td>
<td>2%</td>
<td>0.85</td>
<td>0.33-1.23</td>
<td>1.816</td>
<td>1</td>
<td>0.178</td>
</tr>
<tr>
<td>non-Hispanic White</td>
<td>3%</td>
<td>0.63</td>
<td>0.43-1.65</td>
<td>0.244</td>
<td>1</td>
<td>0.621</td>
</tr>
</tbody>
</table>

Table 8.3

*Binary Hierarchical Logistic Regression for In-Hospital Mortality across the 12-Month Study Period with Age as a Covariate*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mortality Rate</th>
<th>OR</th>
<th>95% CI</th>
<th>Wald test</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>12-month in-hospital mortality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 1 (covariate: age)</td>
<td></td>
<td>1.033</td>
<td>1.018-1.048</td>
<td>22.67</td>
<td>1</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Block 2 (reference: Latino)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>non-Hispanic Black</td>
<td>3%</td>
<td>0.677</td>
<td>0.404-1.134</td>
<td>1.816</td>
<td>1</td>
<td>0.138</td>
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<tr>
<td>non-Hispanic White</td>
<td>4%</td>
<td>0.703</td>
<td>0.405-1.218</td>
<td>0.224</td>
<td>1</td>
<td>0.209</td>
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</tbody>
</table>
Table 8.4

*Analysis of Covariance for Initial and 12-Month Length Of Stay (LOS) with Post-Hoc Comparisons*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>F</th>
<th>df</th>
<th>p</th>
<th>effect size ($\eta^2$)</th>
<th>Contrasts$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS type (covariate: age)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Initial LOS</td>
<td>6.85</td>
<td>10.07</td>
<td>1.49</td>
<td>2</td>
<td>0.226</td>
<td>0.001</td>
<td>none</td>
</tr>
<tr>
<td>12-month LOS</td>
<td>12.79</td>
<td>18.09</td>
<td>4.206</td>
<td>2</td>
<td>0.015</td>
<td>0.015</td>
<td>$A$ $B$</td>
</tr>
</tbody>
</table>

$^a$Significant post-hoc simple contrasts: $A = $ non-Hispanic Whites compared to Latinos; $B = $ non-Hispanic Blacks compared to Latinos

Table 8.5

*Binary Hierarchical Logistic Regression for Re-Admission across the 12-Month Study Period with Age as Covariate*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Re-admit Rate</th>
<th>OR</th>
<th>95% CI</th>
<th>Wald test</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-month Readmission</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 1 (covariate: age)</td>
<td>43%</td>
<td>0.991</td>
<td>0.985-0.997</td>
<td>8.932</td>
<td>1</td>
<td>0.003</td>
</tr>
<tr>
<td>Block 2 (reference: Latino)</td>
<td>non-Hispanic Black</td>
<td>44%</td>
<td>1.035</td>
<td>0.836-1.282</td>
<td>0.102</td>
<td>1</td>
</tr>
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