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# Factors Associated With the Provision of Coronary Heart Disease Preventive CareServices

Patricia Carcaise-Edinboro
*Virginia Commonwealth University*

# Factors Associated With the Provision of Coronary Heart Disease Preventive Care Services

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

By

Patricia Carcaise-Edinboro
Master of Science, Virginia Polytechnic Institute and State University, 1990
Bachelor of Science, Gannon University, 1984

Director: Dolores G. Clement, Dr.P.H.
Professor, Department of Health Administration

Virginia Commonwealth University
Richmond, Virginia
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Dedication

I dedicate this work to my parents, for my mother Emilia who always insisted I could and for my father Michael who showed me the way.

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Abstract

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The Anderson and Aday access framework (1974) is utilized to investigate the association of individual and community level, predisposing, socio-demographic, and enabling factors, on potential and realized access to coronary heart disease (CHD) preventive care. The cross-sectional study is based on a sample of adults age 18-85 from the Medical Expenditure Panel Survey (MEPS) who were identified with CHD risk or who had a CHD diagnosis.

Variables from the MEPS and the Area Resource File (ARF) are used to test logistic regression models for dependent variables measuring primary and secondary CHD preventive care services. The primary preventive care measures include blood cholesterol testing, blood pressure checks, and, diet, exercise and smoking cessation

counseling. The secondary preventive measures include beta-blocker reciept after myocardial infarction (MI) and statin drug use for the treatment of high blood cholesterol.

Being uninsured is associated with a reduced likelihood of receiving primary CHD preventive care. Overall study results indicated gender and race are more consistent predictors of the receipt of CHD preventive care services than individual enabling or community characteristics. Women had a greater likelihood of receiving primary CHD preventive care services than men. Hispanics are less likely than Caucasians to receive primary CHD preventive care services, except for blood cholesterol testing for which they are more likely to receive. Blacks are more likely than Caucasians to have blood cholesterol testing, but are no less likely to receive the other primary CHD preventive care measures. Blacks demonstrate a lower likelihood of receiving secondary CHD preventive care than Caucasians, specifically beta-blocker post myocardial infarction indicating that disparities in secondary CHD preventive care persist for segments of the study population. Persons over 75 years of age are less likely to receive primary CHD preventive care services as well as the secondary preventive measure of statin use for high blood cholesterol.

Community level factors did not improve the logistic regression model for the receipt of CHD preventive care, yet, when predicting potential access for preventive services, persons from a higher percent Hispanic or black community were less likely to have a usual source of care.

# CHAPTER 1: INTRODUCTION

Coronary Heart Disease (CHD) claims more lives than any other disease in America and will incur 393.5 billion dollars in estimated direct and indirect costs for the year 2005 (American Heart Association, 2005). Although CHD has traditionally been viewed as a disease that affects primarily men, half of all CHD deaths occur in women and of all chronic diseases, is the number one killer of women in America. Further, African American males are nearly twice as likely to die from CHD than white males, African American females are 65 percent more likely to die from CHD than white women, and Hispanic Americans, rural populations, and those with lower socioeconomic, (SES) status are considered especially vulnerable to CHD (U.S. Department of Health and Human Services (U.S. Dept. HHS), 2000).

In order to improve the nation's health, it is imperative that CHD be addressed effectively for all populations in the U.S. A key objective of the Healthy People 2010 heart disease and stroke initiative is to "improve cardiovascular health and quality of life through the prevention, detection and treatment of risk factors; early identification and treatment of heart attacks and strokes; and prevention of recurrent cardiovascular events" (Healthy People 2010, 2000). Yet, despite agreement of evidence-based medicine that strongly indicates modification of risk factors can significantly reduce mortality and morbidity associated with CHD (Pearson et al., 2002; Stamler et al., 1999), there is a

considerable divide between what is realized in terms of CHD preventive care and what is recommended (American Heart Association, 2003).

## Development of CHD

The development of CHD can be attributed to environmental hazards and genetics, as well lifestyle behaviors. A persistent unhealthy lifestyle increases the likelihood that most Americans will experience the physical, emotional and financial effects of chronic disease over the course of their lifetime. Unhealthy lifestyles in particular contribute to the development of chronic disease like CHD (Eyre et al., 2004).

Lifestyle behaviors are mutable and therefore are often targeted in preventive care efforts. A significant portion of the American population is overweight (7 out of every 10 adults) and over a third of Americans lives a sedentary lifestyle ( American Heart Association, 2005). Lifestyle behaviors that contribute to obesity also contribute to the rising incidence of diabetes, which in turn is a significant CHD risk factor.

The underlying cause of CHD is arteriosclerosis (US Dept. HHS, National Heart, Lung, and Blood Institute (NHLBI), 2006). Although this process begins in childhood, it can be decades before clinical manifestations are seen. Unlike acute medical episodes, once CHD is initiated it persists in the patient. Nonetheless, if the disease is detected early, prevention of further disease progression is often possible. Therefore, by early identification of CHD risk factors and the implementation of lifestyle changes, CHD risk can be reduced.

## Levels of CHD Prevention

There is a narrow distinction between primary and secondary prevention in the

fight against CHD so that a dual approach is crucial in continuing to reduce CHD mortality. Primary prevention aims to prevent the occurrence of disease by risk factor screening and education. Secondary prevention for the CHD patient aims to reduce the identified risk and slow disease progression in those persons who are symptomatic. Secondary prevention includes cessation of smoking, diet and exercise counseling, and can include effective pharmacological management of hypertension, beta-blocker post myocardial infarction, diabetes control, and the reduction of serum lipid levels (Gotsman and Admon, 1998). Tertiary prevention addresses the care of established disease with the goal of retaining highest function of a patient while attempting to reduce or prevent disease related complications (U.S. Preventative Services Task Force,1996 ).

## Disparities in CHD Preventive Care and Mortality

While there has been progress in reducing mortality from CHD, i.e., a 50 percent reduction in the last 30 years (Sundquist, Winkleby, & Pudaric, 2001), racial and socioeconomic disparities in mortality and health care use persist. Women and minorities are at particular risk of receiving little or inadequate CHD preventive care (Shiefer, Escarce, and Schulman, 1999). Many persons able to benefit from primary preventive care are not receiving the necessary information from their health care providers to modify their lifestyles.

In a report by the Institute of Medicine on unequal treatment (2002), it was reported that even after controlling for health care access, racial and ethnic differences in the provision of cardiovascular health care are still evident. Non-minority, male and better-educated patients who are of higher socioeconomic status and less than 75 years of

age, tend to receive more CHD preventive care services and on a more consistent basis than older, female or minority persons (Baker, Parker, & Williams, 1996; Dornbrook-Lavender, Roth, & Pieper, 2003; Phillips et al., 2000; Pressier, Cohen & Wofford 1998; Rathore et al., 2000; Schulman et al., 2000; Stewart et al., 2004). However, men younger than 70 years old tend to seek out primary preventive care less often than women of the same age group (Tudiver & Talbot, 1999).

Some of the reasons for inadequate provision of preventive care are related to both physician and patient behavior. Physicians are reported to provide less preventive care due to time constraints, limited education on how to promote lifestyle changes in their patient population and a range of reimbursement issues (Amonkar, Madhavan, Rosenbluth, & Simon, 1999; Cheng, DeWitt, Savageau, & O'Connor, 1999). Further, primary preventive care may not be attractive to generations that have come to expect primarily symptomatic or acute medical care. Likewise, investment in a healthier tomorrow may hold little allure to persons with established CHD accustomed to prescriptive healthcare.

Access and equity of access continue to be addressed in the research literature. The factors associated with inequity in access and CHD healthcare are generally known, but how and where in the health care process they manifest themselves is not a certainty. Federal mandates concerning health disparities like Healthy People 2010, (U.S.Dept HHS, 2000) and rigorous challenges from the American Heart Association, the American Cancer Society, and American Dietetic Association (Eyre et al., 2004) are urging researchers to move beyond the identification of factors to actually effecting a change in

policy and practice. Such changes have the potential for significantly impacting CHD disparities. Yet, research efforts to better understand the process of variability in CHD preventive care are still necessary and relevant.

Disparities in health and healthcare are known to be driven in part by socioeconomic, race, and ethnicity, such that these factors of the individual are associated with reduced access to care and the receipt of preventive care services (Betancourt and Maina, 2004). What is less clear as reported by Stryer, Weinick, and Clancy (2002) in an Agency for Healthcare Research and Quality (AHRQ) update on racial and ethnic disparities in healthcare is the mode or pathway by which these factors contribute to inequity in health care. Prior theory-driven research indicates a relationship in varying degrees between enabling (Sambamoorthi and McAlpine, 2003), need and pre-disposing factors of the individual with access to healthcare (Evashwick, Rowe, Diehr, & Branch, 1984). Need factors, or reason for seeking care, have consistently been associated with increased healthcare utilization (Natarajan and Nietert, 2003; Evashwick et al., 1984). However, the presence of different CHD risk factors on the provision of CHD preventive care is relatively unknown. Further, although market factors and health care system characteristics have been investigated in relationship to access, social, political and economic community-level factors in relation to healthcare access are less accounted for in the literature (Putsch and Pololi, 2004). The pathways in which community level factors operate, independently or together, as well as the reason for the 50 percent healthcare disparity not accounted for by these factors requires further investigation.

## Statement of problem

This study helps to define the relationship between a CHD population and realized access to CHD preventive care in the healthcare environment. Particular attention was paid to health disparities in access and delivery for women, minorities and the aged. This study provides a contribution to the body of research literature by including specific information related to variations in care within a coronary heart disease population.

This research contributes to the body of healthcare literature by further exploring the health care access framework of equity in the preventive healthcare environment. According to the Aday and Anderson (1981) framework of healthcare access, access to the healthcare system is judged to be fair if need-based criteria rather than income, insurance and other socio-demographic factors predict access. Over time, the framework has expanded to include social and environmental factors so that the distributive justice components of the health care delivery system, and populations at risk have since guided much of the research on access to care and realized access. The distributive justice conceptual framework as it relates to the Anderson and Aday framework of access (1974), was an appropriate theoretical framework to investigate the association of predisposing, sociodemographic, enabling, and need factors of the individual, external factors of the health service delivery system and external environment on the variability in the provision of coronary heart disease preventive care.

## Research Questions

Given the concerns about the availability of prevention services and access to them in a population of CHD patients, why is there wide variation in the evidence-based guidelines of provision of preventive care?

Further,

(1) What factors are associated with the variation in the potential and realized access to preventive care within a CHD population? Specifically;

(2) Do individual enabling, predisposing or need factors affect potential access and realized access of CHD preventive care?

(3) Do community-level factors impact the provision of CHD preventive care?

Thus, this analysis identifies individual-level factors associated with the progression from potential to realized access of CHD preventive care. Health service and community environmental factors that affect the delivery of CHD preventive care were also addressed.

## Analysis

The Medical Expenditure Panel Survey (MEPS), which is cosponsored by the Agency for Healthcare Research and Quality (AHRQ) and the National Center for Health Statistics (NCHS) was used in combination with the Area Resource File (ARF) to answer the research questions. MEPS is a survey of the civilian population living in

U.S.communities that produces nationally representative statistics on health care expenses, as well as health conditions and health insurance availability and coverage. The nature of the dicotomous dependent variables required logistic regression for analysis.

## Policy Implications

Population-based approaches to health care in the last decade contribute to renewed interest in preventive health care in an attempt to reduce the incidence of chronic disease. Managed care organizations have traditionally advocated preventive health care, and although some of the literature suggests they have fallen short on follow up and provider monitoring for the provision of CHD preventive services, more recent preventive care guidelines and measures instituted by managed care accrediting agencies like the National Center for Quality Assessment (NCQA), have had positive effects on certain CHD preventive care measures (American Heart Association (AHA), 2005). As the health care costs of chronic disease increase along with the aging population, financial benefits of reducing CHD risk will add to the demand from patients for improved access to and utilization of preventive care services. The financial benefits could also serve as an incentive for a provider to make them available. Additionally, physicians who are interested in reducing disparities in CHD preventive care may find the results of this study helpful in identifying potential sources of healthcare bias, and thus provide a point of reference from which to promote change in provider behavior.

Results from this study improve our understanding of the nature of the disparities in the access and utilization of CHD preventive care services in America. By discerning

individual and community factors that impact necessary CHD preventive care, effective policy changes may be implemented that will further the goal set forth by Healthy People 2010, (2000) to reduce the incidence of CHD in the U.S. population.

## Summary

In summary, this study was designed to address the provision of CHD preventive care, a critical component in the fight against one of America's most menacing chronic diseases. CHD exacts a high cost in healthcare dollars spent and American lives lost. Further, a compromised quality of life is not uncommon for those who experience the effects of disparate access and treatment of CHD. When CHD preventive care is provided to patients at risk, the opportunity for a reduction in incidence and progression of CHD ensues. The use of the MEPS and ARF data helped answer the questions of who receives preventive CHD care and what factors most impact the provision of this care.

A review of the literature including a description of coronary heart disease, the risk factors associated with the disease, and associated preventive care follows in Chapter 2. Research on healthcare access and socio-economic determinants of healthcare is also addressed in this section. Chapter 3 presents the theoretical framework that was used in developing the research questions for this study as well as prior research that utilized the theoretical framework. The study design and analytical methods are detailed in Chapter 4.

# CHAPTER 2: LITERATURE REVIEW

## Prevention and Healthcare

Modern medicine primarily treats the individual on an acute basis whereas preventive healthcare is concerned with reducing the risk-bearing lifestyle behaviors that are responsible for many of the disease states treated in a population. The World Health Organizations (1948) definition of health includes a distinction between wellness and medical care that indicates health to be more than just the absence of disease, but rather the state of complete physical, mental and social well being.

In order to achieve an optimal state of health, preventive medicine utilizes a combination of health screenings, lifestyle counseling and immunizations. Prevention can be further defined as primary prevention, referring to the prevention of disease development through health promotion and education, secondary prevention, which is considered screening and early detection, and the halting of potential disease progression with treatment, education and lifestyle behavior changes, and tertiary prevention which addresses the return to maximal function for people with a chronic condition.

Approximately 70 percent of the deaths in the U.S. are attributed to cardiovascular disease, cancer and diabetes (Eyre et al., 2004). Overall, nearly 50 percent

of reported deaths in the U.S. can be partially if not entirely attributed to lifestyle factors, particularly behaviors potentially responsive to prevention intervention (Doll, 1992; McGinnis & Forge, 1993). A consensus concerning the delivery of preventive care services finds that preventive services are offered much less than national recommendations would deem appropriate (How are the Docs doing, 1997; Eyre et al., 2004).

Rising healthcare costs has prompted the concern that prevention services are not cost effective and, therefore, require additional incentives for the provider to comply with the recommended preventive care guidelines (Fields, 1999; Harris, Gordon, White, Stange, and Harper, 1996). Although preventive health care has a cost that may indicate more spent per year for those individuals seeking preventive measures versus those who do not (Marin and Zitter, 2004), there are numerous reports to indicate that prevention is a wise long-term investment in both improved health status of the community and reduced societal costs associated with chronic disease management (U.S. Preventive Services Task Force, 2004; De Parle, 2000; U.S. Dept HHS: Healthy People 2010,2000). Despite the evidence indicating the need and value of preventive healthcare, the national investment in preventive care was estimated at less than 3 percent of the total annual health care expenditures (Eyre et al., 2004).

## Coronary Heart Disease and Evidence-based Medicine

Coronary Heart Disease (CHD) is defined as a narrowing of the coronary arteries that feed blood to the heart. Coronary arteries supply essential nutrients and oxygen via the blood to the heart muscle. When coronary arteries become narrowed or clogged by

fat and cholesterol deposits, less blood and oxygen reaches the heart and CHD ensues. A range of CHD symptoms from angina to myocardial infarction may occur in persons with CHD. Coronary heart disease is the principal cause of death in the U.S., attributing to approximately 38.5 percent of all deaths in 2001(American Heart Association, AHA, 2003). Despite these sobering statistics, many Americans do not understand their level of risk for CHD or receive appropriate CHD preventive care.

The American Heart Association has identified several CHD risk factors of which some can be modified, treated or controlled (AHA, 2003). There is a greater chance of developing CHD as the number of individuals' risk factors increases. Increasing age, being male, family history of heart disease, and being African American are major risk factors for CHD that cannot be altered. Using tobacco, having high blood cholesterol and /or hypertension, being obese, lacking physical activity, and having diabetes are considered *modifiable* risk factors so that lifestyle changes such as dietary modifications, increased exercise and smoking cessation can reduce an individual's CHD risk. More specifically, diabetes increases the risk of CHD such that cardiovascular disease is the number one cause of death in persons with diabetes. Diabetes is a prevalent chronic disease in America that is responsive to lifestyle modification but most patients do not receive the necessary healthcare information to prevent its onset or limit its progression (Egede & Zheng, 2002). Smoking tobacco increases an individuals' risk of developing CHD two to four times over non-smokers. Quitting smoking reduces the risk of death from coronary heart disease by 50 percent after one year as compared to those who continue to smoke (U.S. Dept of Health and Human Services, 1990).

## CHD Risk Factor Screening

Many Americans are unaware of their risk factors for CHD, and remain undiagnosed for hypertension and hyperlipidemia (Ayanian, Zaslavsky, Weissman, Schneider, Ginsburg, 2003). Even within an identified, at-risk population, patients hold inadequate perceptions of their absolute risk of cardiovascular events resulting in either the underestimation or overestimation of their risk for acute CHD events (Frijling et al., 2004). The likelihood is greater for women than men to underestimate their risk for CHD (Lefler, 2004). A report generated from Healthy People 2010, (2000) on understanding and improving health, estimated that one in four adults is hypertensive and that the majority of those diagnosed do not have their condition under control. The same report states that 100 million adults have high serum blood cholesterol with approximately 35 percent requiring aggressive medical intervention. High blood cholesterol, whether dietary-related or genetic, is a risk factor that can be modified by lifestyle and/or pharmacological intervention. Recent estimates of the third National Health and Nutrition Examination Survey (NHANES), indicate that a significant portion of the adult community exhibit CHD symptoms but lack a formal diagnosis (Ayanian et al., 2003). Further, among insured individuals, 28.6 percent of adults were identified with undiagnosed hypertension and 51.2 percent with undiagnosed and untreated high serum blood cholesterol.

Without appropriate screening and risk factor identification, diagnosis of CHD may occur in later stages of the disease progression, thereby compromising the chance for preventive care benefits. In an effort to increase CHD screening in an at-risk population,

the Medicare Prescription Drug Improvement and Modernization Act (MMA) of 2003, expanded Medicare coverage to include new CHD preventive care services as of January 1, 2005 (Center for Medicare and Medicaid Services (CMS), 2004). The CHD preventive health care goals were aligned with the goals set forth by Healthy People 2010 (2000). The CHD preventive services include cardiovascular screening and risk factor assessment for all asymptomatic beneficiaries at enrollment and every 5 years thereafter. Despite the significant progress that has been made in screening for CHD in America, challenges continue to exist for appropriate primary prevention as well as secondary preventive treatment for those at CHD risk (Natarajan & Neitert, 2003).

## Prevention and Coronary Heart Disease

### *Primary Prevention*

Significant reduction in mortality and improvement in quality of life could be realized if the underlying causes of cardiovascular disease were addressed in the U.S. population. Primary preventive care provides an important line of defense in the costly battle against cardiovascular disease that claims two of every three deaths in the U.S. (Eyre et al., 2004). Primary prevention for CHD includes the modification of risk factors or the prevention of their development in an attempt to delay or prevent new-onset CHD (Grundy et al., 1998).

CHD absolute risk, the probability of developing CHD in a finite period of time, increases with age. The majority of new onset CHD cases occur after age 65, particularly in women (Grundy et al., 1998). Secondary prevention is emphasized by current health policies (Kaplan, 2000), providing significant medical and economic benefit to the CHD

population, however prevention is optimized when applied to an asymptomatic population.

Primary preventive efforts aimed at reducing obesity rates, smoking cessation, and improved nutrition and physical activity in children could have significant impact for future generations. Obesity rates in children have dramatically increased in the last two decades (Ogden, Flegal, Carroll, and Johnson, 2002). As Eyre et al., (2003) reports, hypertension, hyperlipidemia, and type-2 diabetes are strongly associated with obesity and are significant independent factors in the development of CHD. Additionally, by preventing children and adolescents from smoking, significant impact could be made in reducing the 20 percent of cardiovascular deaths that are currently attributed to smoking (Centers for Disease Control, 2002).

*Secondary Prevention*

The importance of secondary prevention in the reduction of mortality and further morbidity in patients with overt CHD disease is well documented (Eyre et al., 2004; Gotsman & Admon, 1998; Mosca et al., 2004). Still, the research literature indicates a lack of consistent provision of secondary preventive practices (Holt, Johnson, & de Belder, 2000; O'Connor et. al., 1999; Phillips, Shlipak, et al., 2000; Wang & Stafford, 1998). For individuals diagnosed with CHD, secondary preventive measures may include reductions in serum lipid levels, lifestyle modification, and pharmacological management following an acute cardiac event (Mosca et al., 2004; Eyre et al., 2004).

Changes in lifestyle behavior for the patient who has experienced myocardial infarction (MI), can have significant effects on reduction of mortality and second

myocardial infarction (MI) occurrence (Lee et al., 2000). Several cost effective analyses have been conducted on cardiovascular preventive therapies providing results that indicate CHD preventive strategies including pharmacological intervention and lifestyle counseling are considered economically attractive (Probstfield, 2003).

For persons who have experienced an acute cardiac event, specifically a MI, administration of a beta- blocker, aspirin therapy and angiotensin-converting enzyme (ACE) inhibitors are considered common and generally appropriate approaches to care (Cooper et al., 2000). Yet in a population of post-MI patients, beta-blockers were prescribed to only 40 percent of eligible patients, with a particular deficit noted for women (Phillips, Shlipak, et al., 2000). A lack of consistent use of secondary CHD prevention such as beta-blockers, aspirin, and lipid lowering drugs in the elderly (> 65) has also been reported (Ganz et al., 1999; Krumholz et al., 1998; Rathore et al., 2000;Wang and Stafford, 1998) despite research that indicates the benefit of these treatments is similar to and often greater than that observed in younger patients (Dornbrook-Lavender, Roth, and Pieper, 2003; Krumholz et al.,1998).

*Beta-Blocker use after MI*

The use of beta-blocker for the treatment of post MI patients has provided substantial evidence of reduced mortality and morbidity for patients with heart failure (McDonagh 2005). Yet, overall, effective pharmacological therapy for chronic heart failure (CHF) was reported underutilized despite a broad consensus regarding treatment recommendations (Schmedtje et al., 2003). According to Schmedtje, almost half of the

CHF patients in the study were not receiving appropriate pharmacological therapy, even though it had been proven to reduce morbidity and mortality related to CHF.

There are obvious quality of care issues when beta-blockers are underutilized in a post MI population, but financial and policy consequences exist as well. A study on health and economic benefits of increased beta-blocker use following MI, determined that if all MI patients were treated with beta-blockers, over time it would save a significant amount in medical costs as well as save thousands of individuals from death or recurrent MI (Phillips, Shlipak, et al., 2000). The epidemiological impact and cost effectiveness of increased beta blocker use in post MI patients 35-84 years of age was estimated for the CHD population in the U.S. For all MI survivors without contraindication and with continued treatment for 20 years, it was estimated that beta-blocker use would result in 4,300 fewer CHD deaths, 3,500 MIs prevented, and 45,000 life-years gained compared with current use. Additionally, the use of beta-blockers would save $18 million and result in 72,000 fewer CHD deaths, 62,000 MIs prevented, and 447,000 life-years gained if this increase in beta-blocker use were implemented in all first-MI survivors annually over 20 years.

Several patient-level factors, including socioeconomic status, insurance status, and geography are associated with the variability in the provision of beta-blockers. Lower socioeconomic status (SES) was associated with less overall evidenced-based medical therapy than a higher SES for a population of post MI Medicare beneficiaries (Rao, Schulman, Curtis, Gersh, and Jollis, 2004). Insurance status of the patient can impact the incidence of pharmacological preventive care such that insured versus uninsured post MI

patients tend to experience greater use of beta-blockers (DeVoe et al., 2003; Inciardi et al., 2003; Sial et al., 1994).

The factors of age (being over 75) and race (non-white) are associated with the reduced use of beta-blockers (Everly, Heaton, and Cluxton, 2004; Krumholz et al., 1998). Further, beta-blocker use and effectiveness in elderly post MI patients shows significant variation by geography (Krumholz et al., 1998; O'Connor 1999) and physician specialty (Krumholz et al.,1998).

The Center for Medicaid/Medicare Services (CMS) implementation of a continuous quality improvement approach for Medicare beneficiaries with MI has resulted in increased beta-blocker usage. The majority of beta-blocker recipients are Medicare eligible, therefore Medicare prescription coverage of beta-blockers has a positive impact on increased beta-blocker use (Phillips, Shlipak, et al., 2000).

Some physician's reluctance to prescribe beta-blockers in a population with co-morbidities and contraindications contribute to underutilization (Everly et al., 2004). However considerable research indicates this hesitation in beta-blocker use is unfounded and may be compromising potential patient health benefits. In a randomized controlled trial concerning variations of physician prescribing patterns and beta-blocker use after MI, reductions in mortality were highly significant, but only one fifth of the patients without strong contraindications were found to be taking the medication (Wang & Stafford, 1998).

A study on physicians prescribing patterns found the number of beta-blocker prescriptions have dropped while the number of prescriptions for the less effective

calcium channel blockers has increased despite the recommendations of the Joint National Committee on the Detection, Evaluation, and Treatment of High Blood Pressure (Westfall, 2000). Physicians, in an attempt to aid the low-income patient, may choose an available hypertensive medication that may be provided to physicians by pharmaceutical sales representatives rather than those medicines with greater proven efficacy. Other reasons for underutilization of effective CHD therapies by physicians were examined by Goff, Gu, Cantley, Parker, and Cohen, (2002). In a survey of primary care physicians that reported on attitudes and behavioral intentions regarding aggressive management of CHD, Goff et al. reported that barriers to treatment included that aggressive management of CHD required too much staff time, incurred non-reimbursable costs, and was not warranted in their patient population. Further results of the survey indicated CHD management would require a great deal of patient education and self-management, and was limited by patients who do not adhere to therapy.

A patient's reluctance to use drugs long term due to possible side effects and cost may impact beta-blocker rates of utilization. Policies that attempt to further reduce out of pocket costs for prescriptions, such as federal price discounts and rebates for Medicare programs may aid in improvement of health and reduction of costs.

Evidence-based medicine indicates that in addition to pharmacological care, non-invasive secondary preventive care that would identify potential risk factors such as unchecked blood cholesterol levels, uncontrolled hypertension, and lack of healthy diet and exercise substantially contribute to lowering a patient's risk of MI recurrence (American Heart Association,AHA 2004; Lee et al., 2000). Additionally, lifestyle

modification may provide cardio protection against subsequent intervention techniques like coronary angioplasty (Deedwania et al., 1997).

*Blood Cholesterol Screening and Statin Use*

A national objective for 2010 is to increase the proportion of adults who have been screened for high blood cholesterol (HBC) within the last five years to 80 % (Healthy People 2010, 2000). According to a report on disparities in screening and awareness of HBC, 73 percent of adults have been screened for HBC (Center for Disease Control, 2005) and of those, Mexican Americans, blacks, and younger persons were less likely than others to be screened. The report also indicated that although women were screened more than men for HBC, they were less likely to have their cholesterol levels under control <200mg/dl.

The use of cholesterol lowering drugs is an important tool in the pursuit of effective secondary CHD prevention. However, the American Heart Association in a 2005 update, reports that less than half of those persons at highest risk for CHD are receiving lipid-lowering treatment (AHA, 2005). The National Cholesterol Education Program (NCEP) recommends a clinical goal of reduction of low-density lipoprotein cholesterol (LDL-C) to 100mg/dL or less in persons with CHD (Lee et al., 2000). The newest total cholesterol guidelines (180mg/dl) and the Health Plan Employer Data Information Set (HEDIS) endorsed the practice of including cholesterol lowering therapy in preventive healthcare, and may further encourage managed care to promote cholesterol-lowering therapy in primary prevention patients as well. The Health Plan Employer Data Information Sets utilizes a population performance measure that requires

managed care organizations seeking NCQA accreditation to report the percentage of MI patients who achieve LDL-C levels less than 130mg/dL within a year from discharge (Lee et al., 2000). This performance measure helps to ensure support of managed care for better control of cholesterol in CHD patients (Grundy, 2000). Aggressive cholesterol management may become even more important as a recent study indicates stronger support for the intensive use of statins in reducing the rate of progression of arteriosclerosis (Nissen et al., 2005). For study patients with coronary artery disease, intensive statin use was significantly related to a greater reduced rate of arteriolosclerosis than what was observed for moderate statin use.

*Lifestyle Modification*

Lifestyle choices related to dietary intake, physical activity and smoking habits are strongly associated with CHD risk and continue to be the foundation of primary prevention. Favorable changes in these behaviors by individuals can have significant impact on their current health and future chronic disease risk (Bernadet, 1995; Critchley et al., 2004; Eyre et al., 2004). The impact of a comprehensive lifestyle modification program on dietary, exercise, and smoking habits could contribute to a reduction in the five-year risk for CHD (Vestfold Heartcare Study Group, 2003).

Despite the value of pharmacological therapies for patients with CHD, secondary preventive measures that include lifestyle behavior modification continue to be significant in reducing disease progression and improving patient well being (Hooper et al. 2004). However low physician-counseling rates for lifestyle behavior modification like weight

loss, exercise and diet for CHD prevention, continue to be reported (Anis et al., 2004; Tsui, Dodson, and Jacobson, 2004).

*Smoking Cessation.* Smoking tobacco has been attributed to 20 percent of all CHD deaths and may be an independent predictor of the development of type-2 diabetes, a significant risk factor for CHD (Eyre et al., 2004). Smoking cessation may be the single most effective means to reduce mortality after MI, where a 50 percent reduction in risk is realized at 1-year post cessation (U.S. Dept of Health and Human Services, 1990). Sixty-one large international cohort studies of cardiovascular disease were used to estimate the magnitude of risk-reduction when a patient with CHD stops smoking (Critchley and Capewell, 2004). Regardless of differences between the studies in terms of index cardiac events, age, sex, country, and time period, a 36 percent reduction in crude relative risk (RR) of mortality for those who quit smoking compared with those who continued to smoke was reported. The reported 36 percent risk reduction compares favorably to other secondary preventive therapies such as cholesterol lowering and indicates a reduction in non-fatal myocardial infarctions.

Counseling for smoking cessation is underutilized despite the fact that healthcare providers can have significant impact on a patient's likelihood to change behaviors. Results from a study on the impact of healthcare providers on smoking cessation rates revealed that receiving advice from any health care professional increases quit rates, however, physicians were found to be the most effective (Gorin and Heck, 2004).

*Diet.* Dietary habits play a significant role in the reduction of CHD risk in America (Eyre et al., 2004, Pearson et al., 2002). A review of evidence-based preventive

healthcare measures for CHD provides substantiation that a nutritionally balanced diet limited in animal fats, saturated, trans, and hydrogenated fats, moderate in sodium, mono-unsaturated fat and calories and adequate in fiber, fruits and vegetables can play an important role in achieving and maintaining a healthy body weight, as well as provide a positive impact on blood lipids and blood pressure (Eyre et al., 2004).

In a report on the prevalence of overweight Americans from 1999-2000, it was noted that 65.1 percent of adults were considered overweight with significant evidence for continuing gender and racial BMI disparities (Hedley, Ogden, Johnson, Carroll, Curtin, and Flegel, 2004). Results from a survey study conducted to examine dietary patterns and cardiovascular risk factors in Hispanic adults living in Southwest Detroit indicate that unhealthy eating patterns outnumber heart healthy eating practices in the Hispanic population (Artinian, Schim ,Wal, and Nies, 2004). Most respondents used higher fat salad dressings; ate fried foods, sweets, and high fat snacks; consumed greater than the desired amounts of regular cheese; drank whole milk; and ate few fruits and vegetables. The most prevalent cardiovascular risk factors were associated with being physically inactive, overweight, and being exposed to second-hand smoke suggesting that heart healthy eating can be an effective part of minority community-based heart disease prevention programs.

Dietary interventions were assumed to have equal response in CHD risk reduction but Erlinger, Vollmer, Svetkey, and Appel, (2003) found that by incorporating a lower sodium diet for hypertensive persons and for African Americans, a greater reduction in blood pressure and CHD events could be realized versus whites. Likewise, Hooper et al.,

(2004) report that more lives can be saved by providing evidenced-based dietary counseling to MI patients (including a dietary increase in omega 3 fats) than by focusing on lipid lowering and weight reduction alone.

Overall most patients can benefit by nutritional advice and dietary counseling. Legitimate sources of information can be valuable in both motivation and education of the patient however sources of questionable nutritional information can contribute to a patient's confusion about how to change their diet. Particularly in difficult to manage disease states like diabetes, counseling is crucial for optimal adherence to dietary guidelines. Yet more often than not, limited and broad based information is relayed to CHD patients that serve to frustrate and confuse patients already overwhelmed by their chronic condition. Furthermore, insurance is not consistent in coverage of nutritional counseling so that limited or no dietary counseling may leave many patients at considerable disadvantage for the lifestyle change required to achieve the preventive care benefits of an improved diet. System level changes that would facilitate the provision of physician dietary advice and continued support for lifestyle modification in a CHD population could contribute to increased patient self-efficacy and ultimately the reduction of CHD progression.

*Physical Activity.* Maintaining a healthy body weight is important for reducing the risk of chronic disease because obesity can be a precursor to the development of diabetes and CHD. The Dietary Guidelines for Americans (US Dept. HHS, 2005) recommend a balance of calories from foods and beverages with calories expended, in order to maintain a healthy body weight. Further, to prevent gradual weight gain over time, it is

recommended that individuals make small decreases in food and beverage calories and increase physical activity.

The U.S. Dietary Guidelines published in January 2005 elevated the importance of physical exercise in combating chronic disease by increasing daily recommendations of physical exercise (US Dept HHS, 2005). A key recommendation aimed a reducing the risk of chronic disease in adulthood was to engage in at least 30 minutes of moderate-intensity physical activity, above usual activity, at work or home on most days of the week. For weight loss and prevention of future weight gain, the requirements for physical activity increase to 60 minutes per day while not exceeding calorie intake limits.

Results from the Eyre et al., (2004) review provide consistent evidence for reduced incidence of CHD in individuals who have increased physical activity. Increased physical activity provides CHD risk reduction through the direct impact on weight control and blood pressure. Obesity increases the risk of type-2 diabetes, which is in turn a significant risk factor for CHD. Regular exercise has been found to decrease the incidence of type-2 diabetes, and reduces the risk of MI in women by 50percent (Bedinghaus, Leshan, and Diehr, 2001). Physical activity is an essential part of primary CHD prevention and is a beneficial and necessary part of a secondary preventive risk reduction program. As reported by Bedinghaus et al., (2001) secondary preventive care in the form of rehabilitative exercise also contributes to increased functional capacity in patients with recent MI.

The value of physical activity in reducing CHD risk and CHD disease progression has been demonstrated (Eyre et al., 2004). Still the lack of adequate physical activity by

the American population persists as reported by AHA statistics update (2005); 38.6 percent of Americans report no physical leisure activity. The lack of increased physical activity in America can be in part attributed to individual (Honda, 2004; Gentry et al., 1999), provider based (Cabana and Kim, 2003; Krueter et al., 1997) and system level factors (Anis et al., 2004).

Individual motivation and human behavior for health behavior change is an area that is not entirely understood and continues to be researched. Prior research suggests however that successful health behavior modification requires that gender, cultural, age, and geographical differences be addressed in subgroups of populations (Kuchler, 2002). System level barriers to change for incorporating physical activity as part of preventive care, include a lack of sufficient healthcare reimbursement, and a lack of provider education (Anis et al., 2004; Wee, 2001).

## Health Disparities and CHD Preventive Care

A primary goal of Healthy People 2010 is to eliminate health disparities in the area of cardiovascular disease by 2010. Healthcare disparities are defined as between group differences, as in age, sex or ethnic groups, in the in the incidence, prevalence, mortality, and burden of diseases and other adverse health conditions, (National Institutes of Health, 2006). Healthcare disparities apply to preventive care services as well as medical care.

Results from a study to analyze race and age differences in the distribution of cardiovascular health promotion, screening, and the prevalence of cardiovascular morbidity and mortality in the United States indicate continuing racial disparities in heart

disease despite progress in early detection of cardiac risk factor. Beyond primary prevention, medical therapies that have secondary preventive care benefits are currently underused in the treatment of black, female, and poor patients with myocardial infarction (MI) (Rathore et al., 2000).

Middle-aged blacks, aged 45 to 64 years are still more likely than whites to be hospitalized for hypertension, less likely to receive a cardiac procedure, and almost twice as likely to die of coronary heart disease (Holmes, Arispe, and Moy, 2005). Further, in a report by the Institute of Medicine on unequal treatment (2002), it was reported that even after health care access is established, racial and ethnic differences in the provision of cardiovascular healthcare are still evident. Male, non-minority, and better-educated patients who are of higher socioeconomic status and less than 75 years of age, tend to receive more CHD preventive care services and on a more consistent basis than older, female or minority persons (Baker, Parker, & Williams, 1996; Dornbrook-Lavender, Roth, & Pieper, 2003; Phillips et al., 2000; Pressier, Cohen & Wofford, 1998; Rathore et al., 2000; Schulman et al., 1999; Stewart et al., 2004). Geographic differences in preventive care have also been reported as individuals living in the western portion of the U.S. are more likely to receive preventive care in the form of physician advice than those residing in the northeast or south (Honda, 2004).

### *Racial Minorities*

In a comparison of the black/white mortality gap from 1960-2000 made by Satcher, Fryer, McCann, Troutman, Woolf and Rust (2005), it is suggested over 83,000 deaths each year could be prevented if racial health disparities were eliminated. Yet

despite reported diminishing health disparities between black and white persons (Haas et al., 2002), Hispanics and Asians still receive less preventive care services than non-Hispanic whites. In a summary report of the NHANES survey for 1999-2002, it was determined that racial and ethnic disparities are evident in the identification and treatment of hypertension, a significant risk factor in the development of CHD (Centers for Disease Control, (CDC), 1999). The report noted that despite the fact that Hispanics have a higher prevalence of HBP, they also appear to have lower rates of treatment. In a study to assess the separate and interactive effects of educational status and ethnicity on CHD risk factors, it was reported that Hispanic and white men with lower educational status had higher CHD risk levels but received less health information than Hispanic and white men with higher educational levels (Ribisl, Winkleby, Fortmann, and Flora, 1998).

There are also unexplained differences in CHD mortality between black and white women where black women have greater CHD risk and CHD mortality than white women but receive less CHD preventive services than white women (Jha et al., 2003). Finkelstein, Khavjou, Mobley, Haney, and Will (2004) examined racial disparities in CHD risk factors for women. Black women were found to be at greatest risk of CHD followed by white, Hispanic and Native American women.

Data from the Third National Health and Nutrition Examination Survey (NHANES) were used to examine the disparities in serum cholesterol diagnosis and pharmacological treatment (Nelson, Norris and Mangione, 2002). Results indicate that Mexican Americans and blacks were less likely to report having been screened for high

blood cholesterol than whites. Among those identified, as having high cholesterol, Mexican Americans and Blacks were also less likely to be taking drugs for the condition.

Differences in individual characteristics, such as reports that African Americans and Hispanics are less likely to be insured and less likely to have a regular source of health care than other groups (Park and Buechner, 1997), and differences in community characteristics, such as living in a physically and socially disadvantaged neighborhood, having a low socio-economic status (Finkelstein, Khavjou, Mobley, Haney and Will, 2004; Lynch et al., 1998; Pickett and Pearl, 2001) and the racial or ethnic composition of a community (Benjamins, Kirby, & Huie, 2004; Haas et al., 2004), help to explain some of the racial disparity in CHD preventive healthcare. However access issues, socio-demographic factors, and community factors alone do not explain the reason for the disparity in CHD preventive care. Provider bias may be a contributing factor. Physician bias or institutional bias, based on patient race or ethnicity may contribute to differential treatment practices for the CHD patient (Fincher, Williams, MacLean, Allison, Kiefe, and Canto, 2004). (Community effects will be addressed more fully in the community effects section on page 45.)

*Elderly*

There is reported disparity in CHD preventive care for the elderly CHD population (>75) who, although they have a higher occurrence of CHD and acute coronary events, and would benefit from standard pharmacological therapy (Dornbrook-Lavender et al., 2003) still receive less consistent pharmacological secondary preventive care (Wang and Stafford, 1998; Ganz et al., 1999). In a study that examined physician

prescribing patterns and insurance coverage of hypertensive patients, elderly Medicare patients with CHD who lack drug coverage were reported to use less statins (Huttin, 2002). However, this pattern of using less statin drug therapy also held true in an affluent community of elderly persons with hypertension (Inciardi, McMahom, and Sauer, 2003) indicating that economics may not be the exclusive reason for the disparity of drug use in this elderly population.

Conversely, elderly Medicare patients reported an increase in beta-blocker use if they had employee sponsored coverage in addition to Medicare (Federman, Adams, Ross-Degnan, Soumeral, and Ayanian, 2001) or if they had higher overall income (Rao, Schulman, Curtis, Gersh, and Jollis, 2004). Despite the Medicare entitlement, there remain significant socioeconomic disparities in medical treatment and mortality among elderly patients following acute myocardial infarction.

### *Women*

Although heart disease is the leading killer for both men and women, the death rate from CHD is higher for women in that more die from heart disease than from the next six causes of death collectively (American Heart Association, AHA, 2005). The CHD mortality rate is higher still in black females (AHA, 2004; Johnson and Fulp, 2002).

Women who are older, have lower income, less education, and who lack health insurance as well as some racial and ethnic minorities, have an increased risk of CHD morbidity and mortality (Finkelstein et al., 2004). The prevalence rates of CHD are higher for Mexican American and African American women than for white women even when controlling for socioeconomic status (Winkleby, Kraemer, Ahn, and Varady, 1998).

Disparities in the receipt of preventive care are also reflected within groups of women such that those who are without insurance, lack a usual source of care, and have a lower socioeconomic status, receive less preventive care than those who do not experience these barriers (Sambamoorthi and McAlpine, 2003). Access to and use of preventive care services was found to be less for low-income women with no insurance as opposed to women with public or private insurance (Almeida, Dubay, and Ko, 2001).

Women are more likely to be unaware of their CHD risk as well as less likely to receive CHD preventive care (Hayes, Weisman and Clark, 2003). In a study by Tabenkin, Goodwin, Zyzanski, Stange, and Medalie, (2004), patient gender differences were examined for physician time use and preventive care delivery during outpatient visits. The study utilized direct observation of the receipt of health habit counseling recommended by the U.S. Preventive Services Task Force for eligible patients. It was determined that after controlling for number of visits and patient characteristics, women received less exercise, diet, and substance abuse counseling. Gender difference in informational and preventive care delivery was apparent also in a population of patients with recent acute coronary event. Phillips et al., (2000) reports that in some health plans beta-blockers are prescribed to only 40 percent of eligible patients and that there is a particular deficit noted for women. Stewart, Abbey, Shnek, Irvine, and Grace, (2004) found that although there were differences in patient's information preferences as both men and women reported receiving much less information than they wanted from their health professional, it was especially so for women. Overall, men and women who

received more health information reported less depression, greater self-efficacy and health satisfaction, and improved preventive health behaviors.

The gender differences in CHD preventive and acute care, may be a lack of awareness of the health care provider and patient that CHD is not a gender specific disease. Although men generally have earlier observations of CHD events, women are more likely to have a MI after age 65 (Cabana and Kim, 2003). Women tend to perceive a low risk of heart attack, however women have higher mortality rates from myocardial infarction (MI) than men. Research suggests that women and the elderly delay seeking treatment after signs or symptoms of MI (Lefler, 2004) and are treated less aggressively (Barakat, 2001). A lack of gender-stratified data may contribute to a deficit in understanding about CHD risk and treatment for women and subsequent gender differences in preventive care (Bedinghaus et al., 2001). However, despite the limited gender specific literature, efficacy of primary and secondary preventive care in women is validated by the research literature (Hayes et al., 2003).

There are specific geographic variations in CHD mortality rates among racial and ethnic groups of women (Andrews, Graham-Garcia, and Raines, 2001) such that heart disease mortality for African American women is highest in the south and lower in the northeast, Midwest and mid Atlantic regions of the U.S. For white women the highest CHD death rates are in the eastern region of the U.S. and lowest in the west. Hispanic women experienced more disparity overall but represented less of a definite geographical pattern. Barnett and Halverson, (2000) studied possible CHD mortality disparities by region, race, and whether or not the location was urban or rural. Results of their study

indicate that residents of rural areas in the southern U.S., regardless of race, had the highest mortality due to CHD. Within the group of African Americans, those from smaller metropolitan areas outside of the south had the lowest CHD mortality.

## Access to and Provision of CHD Preventive Care

Through advances in therapy and technology in addressing CHD, a 50 percent reduction in the incidence of CHD has been realized in the past 30 years. Yet disparities in CHD morbidity and mortality within certain subgroups persist (Betancourt and Maina, 2004). Some of the disparity may be attributed to varied access and provision of CHD preventive care for certain sub-groups of the U.S. population.

Rural populations, African-Americans, older Hispanics and individuals of lower socioeconomic status are vulnerable populations to CHD whose access challenges contribute to their increased risk (Zuniga, Anderson, and Alexander, 2003). Barriers to access for these groups include high risk lifestyles of being sedentary, smoking, eating high fat diets, experiencing long travel distances to comprehensive post discharge care for heart failure, variances in available therapy, and limited access to screening services (Zuniga et al., 2003).

CHD mortality and morbidity disparities have in part been attributed to access issues because minorities are more likely to be without a usual source of care or health insurance and thus are at greater risk of reduced healthcare access (Broyles, Narine, and Brandt, 2002). There are also disparities within the gender subgroup of women such that those who are minority or have lower socio-economic status experience even more barriers to healthcare access (Johnson and Fulp, 2002).

Once access is established, however the provision of CHD preventive care is not guaranteed. Healthcare community characteristics including provider type and provider behavior may affect the provision of CHD preventive care. Healthcare community characteristics and their relationship to CHD preventive care are addressed more fully in following sections.

*Usual Source of Care: Potential Access*

Usual source of care refers to a physician's office, hospital, clinic or other place where individuals seek health care and indicates a usual site of care rather than a specific provider. A regular source of care implies continuity of care and can be defined as visiting the same health care provider or health care site. Although use of the terms usual and regular source of care can sometimes be interchangeable or alternatively inferred, this study will consistently use usual source to mean site, and regular to mean who provides the care.

Having a usual source of care, an indicator of access to care, is generally associated with an increase in the receipt of preventive health care (Broyles, Narine, and Brandt, 2002; DeVoe, Fryer, Phillips, and Green, 2003). Insurance is generally associated with having a usual source of care, however being uninsured does not preclude having a usual source of care. A study of the impact of insurance and usual source of care on preventive care services reports that increasing concurrence of both factors rather than one or the other has the best impact on receiving preventive care (DeVoe, Fryer, Phillips, and Green, 2003). Not surprisingly, patients who lack insurance coverage, chronically or temporarily, receive less early detection and preventive care services than those who are

insured (Broyles, Narine, and Brandt, 2002). More than 18 percent of Americans were reported to lack a usual source of care in 2001 (Pancholi, 2005). Gender, race/ethnicity and age were all predictors of having a usual source of care such that men, young adults and Hispanics were found to be the least likely to have a usual source of care.

When controlling for the endogeneity of having a usual source or site of care, having a regular doctor has been reported as having a greater impact on discretionary preventive care services such as blood pressure checks and cholesterol screenings than having a usual site (Xu, 2002). Merzel and Moon-Howard, (2002) concluded that type of health care site was unrelated to utilization and that gaining access to health care was as important as having a continuing relationship with a health care provider, particularly within an urban setting. In another study that looked at the influence of health care site versus patient demographics on utilization of preventive care services, the authors found that patient characteristics were less likely to predict the receipt of preventive services than the site where care was received (Ramsey et al., 2001). Patients using outpatient hospital departments as their usual source of care versus other sites of care reported receiving more diet and exercise advice in a study looking to identify factors associated with the receipt of physician advice on diet and exercise (Honda, 2004). There is an important distinction between using outpatient hospital care versus hospital emergency room care as usual source of care. Emergency room care is not associated with an increase of physician preventive care advice and shows no statistical advantage for preventive care over those individuals with no usual source of care (Honda, 2004).

## Health Service Delivery Characteristics

### *Provider Type*

Having a regular provider of care is a consistent predictor of receipt of preventive care by physicians (Gentry et al., 1999) and is strongly associated with having insurance (Bolin and Gamm, 2003; Powell-Grine et al., 1999). However, beyond having a regular provider of care, the type of provider an individual receives care from may have more impact on specific types of CHD preventive care received. There is evidence to suggest that persons who receive their care from a specialist versus a primary care physician will receive more secondary CHD preventive care (Reschovsky and Kemper, 1999, 2000). In the case of secondary CHD prevention and pharmacological management, Wang and Stafford, (1998) report that specialists, cardiologists in particular, prescribe beta-blockers more than generalists do, even when controlling for patient characteristics.

### *Provider Behavior*

Regardless of gender or experience of the provider (i.e., attending versus resident physicians), low counseling rates for weight loss, exercise and diet for CHD prevention were reported in a recent study on physician attitudes and practice patterns within a hospital setting (Tsui, Dodson, and Jacobson, 2004). In a direct observation of physician counseling on diet and exercise in private medical practice, it was reported that dietary and exercise counseling was provided in only 20-25 percent of patient visits and was not associated with the physicians age, years in practice or numbers of patients seen per week (Anis, Lee, Ellerbeck, Nazir, Greiner, and Ahluwalia, 2004). Anis et al., (2004) found that diet and exercise counseling rates were higher in new patients and older patients over

30 years of age but under age 60. When counseling did occur, the physician initiated it in 61 percent of the cases observed. No difference in the receipt of counseling on diet or exercise was observed by either patient or physician gender. Other studies (Glasgow, Eakin, Fisher, Bacak, and Brownson, 2001; Wee, 2001) using self-report surveys, indicate that women are more likely to receive exercise and diet counseling from their health care provider, and, like the Anis et al., (2004) study, physician exercise advice was reported to be received less often in persons less than 30 years of age. Eaton, Goodwin, and Stange, (2002) observed that the older patient (greater than 60yrs of age), the diabetic patient and those seen during a well care or chronic illness visit were more likely to receive nutritional counseling. However nutritional counseling occurred only between 25 percent-30 percent of the time in visits related to CHD and hypertension.

Wee et al., (2001) examined general financial productivity incentives (not those specifically related to preventive care services) and their effect on the provision of preventive care. Results indicated that as financial productivity incentives for physicians increased, certain preventive care measures, including cholesterol screening, declined. Although it is acknowledged that physician behavior and incentives play a role in the provision of CHD preventive care, the area of research dedicated to physician behavior is vast and will not be further explored within this review.

### *Patient Behavior*

Patients' own pattern of seeking care has an impact on the provision of preventive care. Men tend to seek fewer preventive care services than women (Preisser et al., 1998), and men not only tend to seek more specific information from health care providers than

women, they tend to receive more lifestyle counseling than women (Stewart, Abbey, Shnek, Irvine, and Grace, 2004). Patients may also create their own barriers to care by their lack of willingness to wait to see their physician, difficulty in relinquishing control, and difficulty in honestly communicating with their physician about their own perceived health status (Tudiver and Talbot, 1999). Patient factors can also play a role in reduced access by the lack of language competency of patient and/or provider as well as perceived discrimination by patient (Weinick et al., 2000).

## Geography

Access to quality health care services, including primary preventive care, is compromised in rural areas (Gamm, Castillo, and Pittman, 2003). A companion document to Healthy People 2010 by Bolin and Gamm, (2003) that investigates rural health care access, reports a lack of access to primary care as the top ranking priority and cites provider shortages and the higher proportion of elderly and poor in rural areas as contributing to reduced access to primary preventive care in rural locations.

According to Bolin and Gamm, (2003) in a report on access to quality health services in rural areas, a total of 41.2 million people under the age of 65 are without health insurance. Of the uninsured in rural areas, 57 % are employed full time. Also those living in the rural Southern and Western U.S. have lower rates of private or job-based insurance.

Geographic distribution of providers to patients can generate intentional and unintentional discrimination in the provision of preventive care (Weinick et al., 2000). CHD mortality was observed to be higher among non-metropolitan versus metropolitan

areas for blacks and younger whites (Barnett, Halverson, Elmes, and Braham, 2000) where socioeconomic and medical resources are fewer.

## Health Insurance and Preventive Care

Health insurance is a critical determinant in access to preventive health care particularly for ethnic and racial minorities (Hargraves and Hadley, 2003; Powell-Griner, Bolen, and Bland, 1999). Those persons without insurance are less likely to have access to a regular healthcare provider and subsequently receive less preventive care (Bolin and Gamm, 2003; Powell-Grine et al., 1999). In the case of post MI patients, those that are uninsured versus those with Medicare or private insurance have higher mortality rates and received less specialized procedures as well as preventive care (Shen, Wan, and Perlin, 2001). However, even for those who have coverage, intermittent lapses in health care coverage often results in less use of preventive care services (Bednarek and Schone, 2003; Sudano and Baker, 2003).

The impact of type of insurance on physician preventive care advice and the relationship between having a regular source of care and the receipt of preventive care advice was assessed by Gentry, Longo, Housemann, Loiterstein, and Brownson, (1999). Although having a regular source of care was strongly related to the receipt of preventive care advice, type of insurance provided inconclusive results in respect to the receipt of preventive care. Because regular source of care indicates some measure of continuity of care, and subsequent increased likelihood of receiving preventive care, the findings did suggest that the lack of a relationship between type of insurance and receipt of preventive care may reflect the inability of some insurance plans to ensure continuity of care.

Health related lifestyle counseling is an essential aspect of chronic disease prevention and management that generally requires patients to have access to health care providers. However, assessing healthcare access by accounting for health care coverage only in terms of cost and availability without including preventive care coverage can be misleading. According to a study on health care coverage and chronic disease risk factors (Hagdrup, Simoes, and Browson, 1997), assessing access by availability and cost indicated 22 percent of the total study population lacked health care coverage. Yet it was estimated that 60 percent of the total study population lacked full coverage when access to preventive care was included in the assessment. Health care coverage that includes preventive care services can increase the number of individuals who will undergo preventive health screening and receive health related lifestyle counseling. Further the inclusion or exclusion of prescription drug coverage may compromise the secondary preventive care benefits of early pharmacological treatment of CHD. The lack of prescription drug coverage has been indicated to impact physician prescribing patterns for hypertensive patients (Huttin, 2002) and to be associated with lower statin use in elderly Medicare beneficiaries who lack drug coverage (Federman, Adams, Ross-Degnan, Soumerai, and Ayanian, 2001).

### *Managed Care*

Managed care organizations have been associated with disease prevention and health promotion since the inception of the 1973 HMO Act (Terry, 1998). Preventive health care can reduce disease and disability and provide long term cost savings, however the realization of those savings by any one managed care organization is uncertain in the

transient healthcare market. Therefore health promotion, disease management, and preventive healthcare concepts that have been utilized by the managed care industry to differentiate themselves from other insurers may not be indicative of the managed care organizations operational emphasis. The literature is inconsistent in representing the relationship between managed care insurance and the provision of preventive care. Respondents in a survey assessing type of insurance and physician advice for prevention indicated that HMO-type insurance was associated with receiving less lifestyle counseling, as in diet and exercise, than those insured by non managed care insurers (Gentry et al., 1999)

A significant portion of the Medicaid and Medicare population has moved toward some form of managed care (De Parle, 2000). In a comparison of performance of traditional fee-for-service (FFS) Medicare versus Medicare managed care (MMC), it was reported that MMC was better at delivering preventive services despite the finding that it was inferior to FFS in providing access to care (Landon, Zaslavsky, Bernard, Cioffi, and Cleary, 2004). Medicare beneficiaries with supplemental coverage have been reported to receive more preventive care services in comparison to managed care enrollees, Medicaid recipients, and persons over 65 years of age with no additional insurance (Carrasquillo et al., 2001). Greene, Blustein, and Laflamme, (2001) also observed an increase in preventative care services with Medicare HMO versus FFS. Although a difference in preventive care services was not observed between managed versus non-managed care plans in a literature synthesis by Phillips, Fernyak, Potosky, Schauffler and Egorin, (2000), the authors suggest that the HEDIS performance measures that monitor

the provision of preventive care services within managed care, may play a role in increasing preventive care services for those MC plans that participate.

In a study that addressed the effect of managed care on the receipt of preventive care services for ethnic minorities, it was reported that using managed care insurance increases the likelihood of preventive care use for Hispanic groups and Caucasians, but not necessarily for Black or Asian minorities when compared to fee for service plans (Haas et al., 2002). These results take into consideration prior research that suggests that although managed care addresses some financial barriers to care, the use of preventive care services is also limited by lower rates of insurance coverage, lower socioeconomic status, language barriers, cultural beliefs, and limited health literacy. Haas et al., acknowledges that the increase in preventive care services for Hispanics may be partially due to an increase of a usual source of care for this group.

In a comparison of performance of traditional Medicare versus Medicaid managed care it was reported by Landon, Zaslavsky, Bernard, Cioffi, and Cleary, (2004), that although traditional Medicare was better at providing access to care as well as patient satisfaction, Medicaid managed care was associated with more preventive care services for their covered population. When comparing preventive care services between fee for service versus managed care for minorities who are privately insured, Hispanics realized more preventive care with managed care than FFS, but overall experienced less CHD preventive care than Non-Hispanic whites (DeLaet, 2002). Other research indicates that there is not an advantage to managed care plans (with the exception of Medicaid managed

care) versus non-managed care plans in the receipt of preventive care services (Phillips et al., 2000)

Although it is a common assumption that all older Americans have Medicare health insurance coverage, gaps in coverage for the elderly indicate Medicare is not serving all older Americans thereby leaving a vulnerable segment of the chronic disease population without access to preventive care services (Mold, Fryer, Thomas, 2004). According to Mold et al., it was estimated from the 2000 National Health Interview Survey that 350,000 Americans aged 65 and older were uninsured. The number of persons affected by lack of coverage is significant despite the overall low (1.1 percent) percentage of Americans that are uninsured. Those uninsured were more likely to be foreign born, Hispanic, nonwhite, and unmarried. This population was less likely to receive healthcare despite exhibiting high rates of chronic medical conditions.

Various internal and external factors in the healthcare environment provide effective barriers to the provision of CHD preventive care. The Institute of Medicine (IOM) was commissioned by Congress in 1999 to study the issue of disparities and healthcare and evaluate potential sources of unequal treatment outside of the known effects of access and enabling factors. The resulting Institute of Medicine report on Unequal Treatment (Betancourt and Maina, 2004) acknowledged the existence of racial and ethnic disparities in health status that prior research has indicated is associated with socio-demographic factors and access to care. However the report also points out that disparities in healthcare exist that are not attributed to variations in insurance status, age, income, co-morbidities, and perceived need. These findings are supported by research on

racial and ethnic differences in health access. Weinick, Zuvekas, and Cohen, (2000), report enabling factors of income and insurance status accounts for only about half of the differences in receiving health care for racial and ethnic minorities both in access to and use of services. Variations in health care treatment can in part be attributed to health systems, health care providers, utilization managers and patients.

## Community Level Effects

Beyond or in conjunction with potential access, there are social, market and health delivery system factors that may affect the likelihood of receiving healthcare (Benjamins, Kirby &Bond 2004; Bolin and Gamm 2003;). For the purposes of this inquiry, measures representing these factors are designated community-level factors. Pickett and Pearl, (2001) provide a review of research that is concerned with individual health and health risk and its association with social characteristics of communities in which individuals live. A consensus of studies concerning the effect of local area social characteristics on individual health outcomes indicated a significant association of at least one social environment measure with an individual health outcome for each study reviewed. Moreover the effects were consistent after adjusting for individual socioeconomic factors. Community health effects may affect individual health directly, or indirectly by influencing availability or accessibility of heath services.

### *Health Services Delivery System, Market, and Community Characteristics*

The county of residence of patients may influence an individual's access to care according to Haas et al. (2004) in their study that analyzed whether or not access to care varied for individuals of different race/ethnic groups by the prevalence of minorities in

their county of residence. Their findings suggest that minorities, specifically Blacks and Latinos, perceive less financial and access barriers to healthcare when they resided in a community that had a higher percentage of similar race. However, whites reported more barriers to care if they lived in a high minority-populated area.

Benjamins, Kirby, and Huie, (2004) addressed the role of individual level factors but focused on the association of county-level characteristics of racial and ethnic composition on the receipt of preventive care services. Their study concluded that county racial composition modifies the relationship between individual race and preventive care use such that Hispanics who reside in high percentage black communities receive more preventive care services than they do in more predominant Hispanic communities. Differences in the receipt of certain preventive care services differed between the communities in that residents were more likely to receive cholesterol screening in neighborhoods with a high Hispanic population, and those residing in a higher percentage black neighborhood were more likely to receive regular mammogram. These results indicate that social environments should be considered when investigating predictors of preventive care use.

Access to care is reported to be better in statistical metropolitan areas with higher levels of social capital and higher HMO penetration (Hendryx, Ahern, Lovrich, and McCurdy, 2002). Similar results from a study analyzing community effects on access to behavioral care indicate that access to specialty care is compromised in lower income communities compared to wealthier communities (Gresenz, Stockdale, and Wells, 2000). As well, the authors report greater overall access to behavioral healthcare associated with

greater HMO penetration. Other studies have indicated that greater managed care penetration reduces access to care among the uninsured because of reduced physician profit margins, increased competition and less ability of the physician to provide uncompensated care (Cunningham, 1999; 2001).

In a 2003 study designed to examine the association between insurance status, managed care penetration and individual access to care, Litaker, et al., (2003) reported that independent of insurance status, increased managed care penetration in an area reduces healthcare access. A study on the content, quality and accessibility of care in a Medicare population (Fisher, Wennberg, Stukel, Gottlieb, Lucas, & Pinder, 2003) found that higher spending regions for Medicare although associated with greater use of specialists, were not associated with greater access to or higher quality preventive care. However, according to a study concerning access to healthcare in older adults, Medicare recipients who have access to additional private coverage tend to have a greater chance of having preventive health care needs met (Cohen et al., 1997).

HMOs can reduce the demand for specialists' services. Escarce, Polsky, Wozniak, & Kletke (2000) report that there has been a redistribution of physicians, particularly specialists, from metropolitan areas with high HMO penetration to low-penetration areas. The redistribution of specialists may impact the access to healthcare especially certain kinds of specialty care. More specifically for a CHD population, results from a study on the impact of managed care on treatment and outcomes of post MI patients suggest that a higher HMO penetration market, although associated with a decrease in costly cardiac care as in revascularization and cardiac catheterization, is also associated with an increase

in less costly preventive healthcare like lifestyle counseling (Bundorf, Schulman, Stafford, Gaskin, Jollis, and Escarce, 2004).

## Summary

In summary, evidenced-based medicine deems primary and secondary prevention crucial in the fight against CHD but research indicates a significant portion of the population at risk is not receiving this type of care. Health disparities have been identified on a population level for minorities, women and the elderly. Evidence for disparities in healthcare also exist at the individual level for at-risk groups, including those at-risk for CHD.

Women receive less CHD primary preventive care than men, African Americans less than whites and in some instances, Hispanics less than both white and black. However, middle aged males with more education and an identified need (greater BMI) are more likely to receive more CHD preventive care in the form of diet and exercise counseling than other groups. Disparities also persist in the provision of CHD secondary preventive care. Women and blacks post MI are less likely to receive a beta-blocker prescription, and older Americans overall face a less likelihood of receiving important pharmacological intervention that could significantly reduce mortality and morbidity from CHD.

The geography of residents, (those residing in the Southern part of U.S. receive less preventive care) the number and type of providers in a region, and insurance status and insurance coverage of the patient have all been shown to impact the variability in receipt of CHD preventive care.

Access and equity of access are issues that have been and continue to be addressed in the research literature. The factors associated with inequity in access and CHD healthcare are generally known, but how and where in the health care process they manifest themselves is not a certainty. Although federal mandates concerning health disparities like Healthy People 2010 and rigorous challenges from the AHA, ACS, and ADA are urging researchers to move beyond the identification of factors to actually effecting a change in policy. Research efforts to better understand the process of variability in CHD preventive care are still necessary and relevant.

Community health effects have not yet been sufficiently addressed in the literature as they relate to the receipt of preventive care. And so the question of the impact of the community in which patients live on the likelihood of receipt of CHD preventive care remains to be answered. By utilizing a need-based CHD population in assessing the impact of pre-disposing and enabling factors of the individual, and their relationship to community health effects, this study furthers the understanding of preventive care equity in potential and realized access and ultimately provides a contribution to future program and policy changes aimed at eliminating health care disparities for CHD.

Chapter 3 will detail the analytic framework from which this study has been guided as well as provide the rationale for the study hypotheses.

# CHAPTER 3: THEORETICAL FRAMEWORK

Disparities in health and healthcare are well documented (Eyre et al., 2004; Stryer et al., 2002). Individual factors of race, access, and poverty have been consistently related to health care disparities. Much of the access literature focuses on individual demographic, need and socioeconomic factors that have been established as predictors of healthcare access (Betancourt et al., 2004; Evashwick et al,. 1984;Mensah , 2002; Natarajan and Nietert, 2004). However, environmental and socio-economic characteristics of a community in which an individual lives, are less understood as predictors of individual healthcare (Putsch and Pololi, 2004). In a report on health disparities and policy, McGinnis, Williams-Russo, and Knickman, (2002) reflect that individual health is determined by a myriad of factors from several domains such that genetics and individual health behavior affect health care needs, and social conditions affect both health behavior and the care an individual is likely to receive.

This study aimed to further explore and define individual determinants of access to CHD preventive care as well as investigate the impact that the healthcare delivery system and the environmental, and community economic factors have on health disparities in the realized access of CHD preventive care. Resolving healthcare disparities is a matter of distributive justice.

## Distributive Justice Paradigm

Social theory is the overarching theory of distributive justice as described by Coleman, (1990). According to Coleman, the social system is comprised of effects the system characteristics have on individual constraints and frame of reference as well as the interaction between them. The theory links individual behavior to organizational behavior and further, to society as a whole.

The Anderson and Aday expanded framework of equity of access is based in the distributive justice paradigm that asks the question "What can I justly claim?" (Aday et al. 1998, p175). Distributive justice addresses the goal of equal and fair allocation of resources among all members of a community. According to the distributive justice paradigm, resources are generally distributed by the criteria of need, equity and equality (Buttram, Folger and Sheppard, 1995 p 261). Within this paradigm, equality demands that all resources be distributed equally; equity suggests resources be allocated based on some measure of merit; and need demands that those who need more of a resource will receive more.

In accessing health care, the system is judged to be fair if need-based criteria rather than income, insurance and other socio-demographic factors predicted access. Over time, the Aday and Anderson framework has expanded to include social and environmental factors so that the distributive justice components of the health care delivery system, and populations at risk have since guided much of the research on access to care and realized access. Aday (1993 p.2) applied Coleman's framework of social theory to studying health and healthcare of vulnerable populations using ethical,

community and political community contributions and individual perspectives. Aday suggests that an individual's health related risk varies as a function of available opportunities and resources such as social status, social capital, and human capital. Social status refers to, age, race, sex; social capital pertains to family structure; and human capital can be defined as income, area employment rate, or education opportunity.

Penchansky and Thomas (1981) defined five dimensions that influence access into the health system. These interrelated dimensions are thought to predict the likelihood of health care access and can be defined as follows: accessibility, location of provider and convenience of use; availability, existence of service; accommodation, patients' ability to use healthcare service; affordability, ability to pay for service; and acceptability, cultural and SES differences and patient waiting time. Availability of health care is a factor in equity of health care access and according to Aday (1998, p.2) equity is concerned "with health disparities and the fairness and effectiveness of the procedure for addressing them."

According to the behavioral model of health service utilization, key variables of access are defined as; potential access, which refers to health care system characteristic and enabling resources that influence use of health services; realized access, the actual use of health services; equitable access, the determination of health services use by demographic characteristics and need; inequitable access defined as the inability to use health services determined by social characteristics and enabling resources; effective access, to improve outcomes from health services; and efficient access, minimization of costs of improved health care through use of services (Williams and Torrens, 1999, p.91).

Overall there had not been a significant push towards the development of a comprehensive definition of access to healthcare prior to 1990. Subsequently since that time, researchers have been challenged to make progress in developing access into a useful relevant framework (Gulzar, 1999). Researchers utilizing the Aday and Anderson framework generally define access to care in such a way that is relevant to the specific nature of their research, however it is often not comparable to other access research within the field.

A model to assess the quality of health care was proposed by Donabedian (1966) that uses the constructs of structure, referring to the physical and organizational properties of the care setting; process, that which is done for the patient; and outcome, change in the health of the patient. According to Donabedian, in the assessment of the quality of healthcare, structure is thought to affect process, which in turn affects outcome. The Aday and Anderson (p.179, 1998) expanded conceptual framework of equity for health care utilization can be viewed as analogous to the Donabedian model. The health delivery system, and population at risk are considered structured constructs, which are thought to predict the process of realized access. Access then predicts the intermediate outcomes of effectiveness, equity and efficiency and ultimately the health of individuals or the community.

The distributive justice conceptual framework as it relates to the Anderson and Aday framework of access (1981), will guide this research in an attempt to explain the association of predisposing, socio-demographic, enabling, and need factors of the individual, and external factors of the health service delivery system and external

environment on the variability in the provision of coronary heart disease preventive care. The distributive justice structural and procedural components of the conceptual framework of equity as they relate to the Donabedian constructs of structure and process were utilized in constructing the conceptual model for this study. The conceptual model for the study duplicates the linkage between characteristics of the population as well as health service system characteristics to realized access.

Following is a definition of constructs from the Aday and Anderson (1981) framework and an account of how the constructs were adapted and applied to this study's conceptual model.

## Aday and Anderson Conceptual Framework

### *Population at Risk*

The factors of the population at risk are characterized as pre-disposing, enabling and need based. Pre-disposing characteristics are those defined as affecting the proclivity to use care and include basic demographic characteristics, social structure factors, and individual belief systems. Pre-disposing characteristics can be categorized as mutable or non-mutable. Age, gender, race, religion, education and ethnicity, are considered non-mutable, where as health and lifestyle behaviors are considered mutable. Enabling factors refer to the means by which an individual has to use health care services. These resources, both organizational and individual, include insurance, socio-economic status, regular and usual source of care and personal or median income of a population. Need is defined as the reason for seeking care, self perceived or evaluated, and is a predictor of health service utilization. For this study, CHD risk and CHD diagnosis constituted need.

The conceptual model that guided this research, detailed in Figure 1, includes age, education, race and gender as the pre-disposing factors of interest. Individual factors of insurance status, insurance type, and personal income are considered enabling factors and an individual's CHD risk and/or diagnosis was used to measure need.

*Health Services Delivery System and Community-Level Factors*

The availability of the health delivery system in the Aday model refers to the distribution of providers and relates to equity of access. In the same model, organization refers to the types of facilities, and financing refers to the sources of payments.

Increasing health care access without addressing the social system in which patients reside is not reasonable according to Daniels, Kennedy and Kawachi, (2000). Therefore for this study, the structural community and system effects are incorporated using measures of availability, organization and financing within the social environment of the patient.

Increased mortality for US metropolitan areas has been associated with income inequality and low average income (Lynch et al., 1998). Robert (1998) was one of the first researchers to utilize a nationally representative sample of US adults to investigate the impact of community socio-economic (SES) factors on individual health status. His research indicated that community SES factors are significantly associated with individual health even when controlling for individual SES. Likewise when controlling for individual socio-economic status, community characteristics such as disadvantaged social and physical environments have been reported to negatively affect health

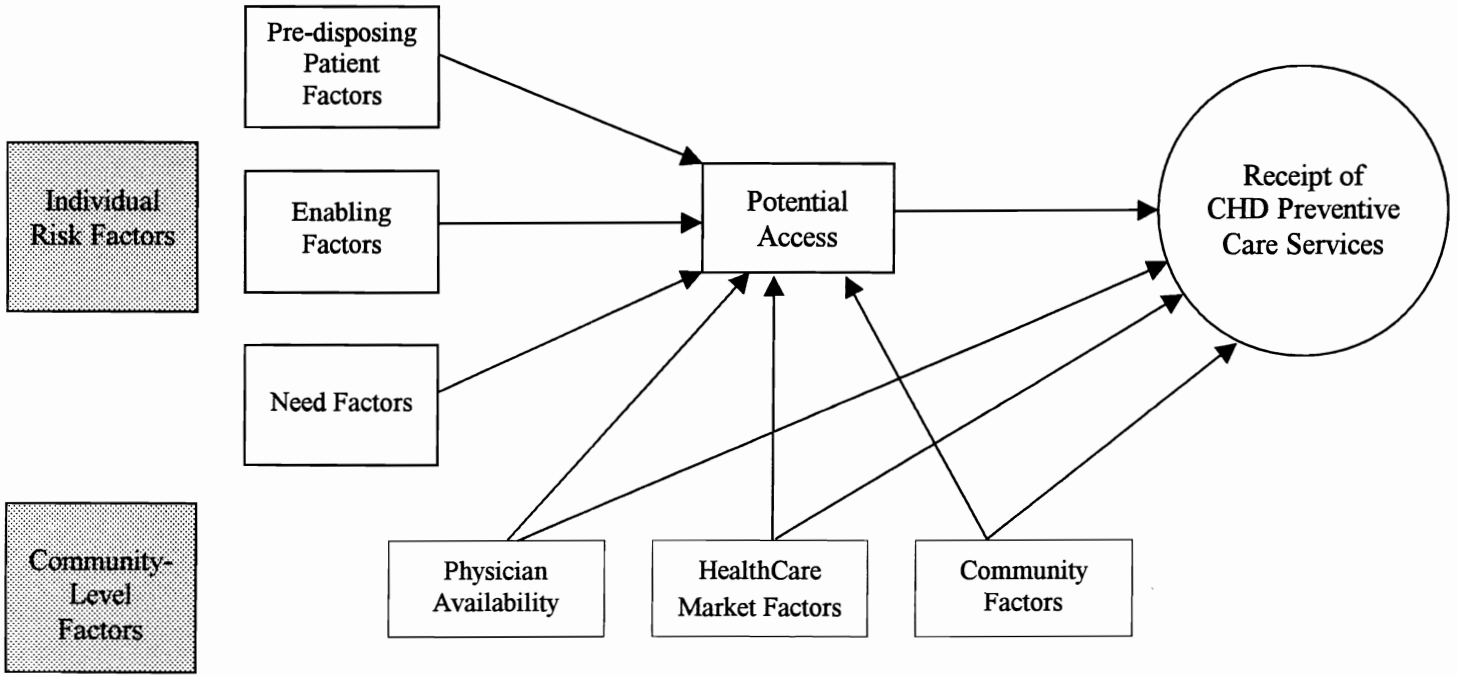


Figure 1. Conceptual Model of Access and Receipt of CHD Preventive Care Services

status, including CHD risk (Wallerstein, 2002). Median income for a community and other community SES factors has been specifically associated with CHD risk and incidence (Diez-Roux, Link, and Northridge, 2000). Additionally, Diez Roux, Borrell, Haan, Jackson, and Schultz, (2004) report that disadvantaged neighborhoods are related to CHD mortality for elderly whites.

In order to assess availability of care in the community, this study used the number of physicians per community as a measure. HMO penetration accounted for the market factor that has been shown to affect healthcare in a community. Median family income, the metropolitan statistical area (MSA), and the percent minority status within the patient's community was used to measure the community SES characteristics.

*Potential Access*

The indicator for potential access in this inquiry, a process indicator, is whether or not the patient has a usual source of care. As the conceptual model indicates, a relationship is hypothesized to exist between the individual characteristics of the population at risk and usual source of care. Further, the community and health system factors may directly affect realized access or may moderate the effects of potential access on the receipt of CHD preventive care services.

*Realized Access*

The ultimate outcome for health utilization is improved health status of the individual or community, however the monitoring of the outcome of prevention in this study would require a prospective long term study that would be cost prohibitive. Although medical research has not provided unequivocal data on causality and disease

states, prior research does provide extensive evidence that preventive care can reduce morbidity and mortality for CHD. Therefore by assuming a causal relationship between preventive health behavior of the individual and positive health outcomes, it is acceptable to use the process measure of realized access to CHD preventive care as a proxy.

Aday and Anderson (1974) spoke of the importance of assessing healthcare utilization as a measure of access. In conjunction, structural indicators like the characteristics of the health care system, and process indicators as in characteristics of the population, and utilization, provide evidence of access. Realized access according to Aday and Anderson (1981) includes utilization and satisfaction. Monitoring provider services through external performance measure databases and patient services can provide some verification of provider actions in the purpose of utilization. Further, Aday and Anderson indicate that utilization is characterized by type, site, purpose or time interval (Gulzar 1999). This study utilized the process variable of realized access as the measure to assess the provision of preventive care for a CHD population. There are several CHD preventive care services that were used to measure realized access including cholesterol screening, high blood pressure screening, and diet and exercise counseling. The provision of smoking cessation and pharmacological care was measured when warranted.

## Application of Theory

Disparities in health and healthcare are known to be interrelated to socioeconomic factors, race, and ethnicity. What is less clear as reported by Stryer, Weinick, and Clancy, (2002) in an AHRQ update on racial and ethnic disparities in healthcare, is the

mode or pathway by which these factors contribute to inequity in health care. Predisposing, need and enabling factors affect potential access to healthcare, but how do these factors affect the receipt of preventive care once the individual has entered the system? How do environmental and system characteristics impact the provision of CHD preventive health care?

In establishing appropriate preventive care monitoring methods it is important that common and reliable measures are utilized for health care providers. Yet, healthcare depends on the actions of many individuals such that the inputs are difficult to monitor when several persons are involved (McLean, 1989). For example, the provision of preventive care may in some cases represent physician or nurse behavior, whereas preventive care utilization is largely dependent on patient behavior.

Research on patient utilization rates for preventive care is essential in the absence of ultimate health outcomes for the individual. Therefore, due to a lack of clear predictors for physician behaviors, research addressing the relationship between provider/physician characteristics and the provision of preventive care is critical.

Although some research suggests that once healthcare access is achieved no racial differences in rates of certain preventive care measures exist (Williams et al., 2001), substantial research indicates that disparities in the receipt of CHD care exist when controlling for access to care and other enabling factors (Betancourt and Maina, 2004; Fincher et al., 2004). Fincher et al indicate that beyond access, physician bias and institutional bias may contribute to differential treatment practices for CHD, based on race, gender and socio-economic status of the patient. The Institute of Medicine Report

on "Unequal Treatment" found that healthcare systems, healthcare providers, patients and utilization managers all contribute to racial and ethnic disparities in health care including treatment for CHD (Institute of Medicine, Washington D.C., National Academy Press, 2002).

*Behavioral Model of Health Services Utilization and Preventive Care Research*

There are differences in expectations for treatment versus delivery of preventive services, based on different study sites, the manner in which research was conducted, and whether or not research was population based or patient based. Much of the work using the behavioral model of health services utilization has been applied to disease care versus preventive care. Research in the last decade includes studies concerning the receipt of physician preventive care advice in relation to social contextual factors such as usual source of care (DeVoe et al., 2003; Mertzel and Moon-Howard, 2002), income, insurance (Haas et al., 2002; Powell-Griner et al., 1999;Reschovsky, Kemper and Tu, 2000; Sudano and Baker, 2003), physician specialty (Krumholz et al., 1999;Wang and Stafford, 1998) and place of residence (Fisher et al., 2003; Krumholz et al., 1999;Wang and Stafford, 1998). However these studies are difficult to assess because of the inconsistent methods, study samples, and variable measurement as well as lack of theoretical foundation.

Honda, (2004) and Gentry et al., (1999), through their research, addressed the receipt of preventive care utilizing the Aday and Anderson access framework (1974). In order to provide more systematic research concerning the predictors of preventive care receipt Honda, (2004) used the Aday and Anderson framework to assess predisposing, enabling and need factors of the individual in identifying predictors of receipt of diet and

exercise counseling in the U.S. population. Utilizing the National Health Interview Survey data, Honda, (2000) suggests that need-based factors of low self-rated health status and high BMI predict receipt of physician diet and exercise counseling, as do the enabling factors of having health insurance and a usual site of care (hospital outpatient more than other sites of care). The pre-disposing factors of age, race, and education were found to be strong independent predictors of the receipt of physician diet and exercise advice. However, persons with co-morbidities were less likely to receive preventive care advice than those without co-morbidities indicating that diet and exercise advice from a physician may have been motivated by preventive, not therapeutic measures. Honda's findings are in contrast to previous studies that find a strong association with the receipt of preventive care advice for individuals diagnosed with diabetes and cardiovascular disease but not for those identified at risk and able to benefit from primary prevention advice (Kreuter, Scharff, Brennan, and Lukwago, 1997; Meigs and Stafford, 2000).

Gentry et al., (1999), also utilized the behavioral model of health services utilization to explore enabling, need, and predisposing factors in relation to physician's preventive care advice. The study results indicate persons who were identified with a family history of CHD were associated with an increased chance of receiving CHD preventive care as in diet, exercise and smoking cessation counseling from their physician. Gentry et al. further investigated the impact of regular source of care and type of insurance on the likelihood of physician mediated lifestyle behavior advice. Those patients with a regular source of care were consistently more likely to report receiving advice to improve their diets, decrease smoking behavior and increase exercise.

Exploring the impact of type of insurance, Gentry et al reports that patients with Medicaid or Medicare received more lifestyle advice from their physician than did those who had commercial insurance. The population from this study had high rates of CHD, but the level of physician advice concerning risky lifestyle behaviors was low relative to the need factors. Middle-aged patients overall received more preventive care advice, leaving the elderly and younger population lacking important health care advice.

## Research Questions

The research question of interest is: In a population of CHD patients, is there variation in the application of the evidence-based guidelines for the provision of CHD preventive care? Further, what individual and community factors are associated with the variation in the potential and realized access of preventive care within a CHD population? This study investigated what enabling and pre-disposing factors affect potential access and realized access in a need based population. More specifically, what factors are associated with disparities in the progression from potential to realized access of CHD preventive care? Additionally, this inquiry helps discern whether community-level factors of physician availability, healthcare market factors and community characteristics are associated with potential and realized access to CHD preventive care.

## Hypotheses Development

### *Pre-disposing Characteristics*

Low SES, lack of insurance, and a lack of usual source of care, are issues associated with minority groups and represent barriers to preventive healthcare (Samboorthi and AcAlpine, 2003). Research on healthcare disparities consistently point

to the elderly, Hispanics, blacks and women, as receiving fewer preventive care services and standard CHD interventions as compared to whites and men (Corbie-Smith, Flagg, Doyle and O'Brien, 2002; Nelson, Norris, & Mangione 2002; Schulman et al., 1999; Sheifer, Escarce, and Schulman, 2000; Rao et al., 2004). Among the elderly, it is the black, female, and poor MI patients who consistently receive lower rates of secondary preventive CHD (Rathore et al., 2000).

**H1: Minorities are less likely to receive CHD preventive care services than non-minority patients.**

There are incidences of increased beta-blocker use in elderly post MI observed for those who are treated in the Northeast (Krumholz, Radford, Wang, Chen, Heiat and Marciniak, 1999; O'Connor, 1999). It has also been found that elderly who are treated by a specialist versus primary care physician (Krumholz et al., 1999), or have Medicare prescription coverage of beta-blocker (Phillips et al., 2000) receive more preventive care services. Yet the majority of research indicates older Americans receive less CHD preventive care than younger Americans, particularly pharmacological care (Ganz et al., 1999; Krumholz et al., 1999; Rathore et al., 2000;Wang and Stafford, 1998). Thus,

**H2: Elderly patients (older than 75 years of age) are less likely to receive CHD preventive care than younger CHD patients.**

Research indicates women receive less overall preventive care than men (Hayes et al., 2003) and less CHD pharmacological care (Phillips et al., 2000) and cardiovascular procedures (Schulman et al., 1999) than their male counterparts. More women are being

tested for cholesterol but less has their high blood cholesterol (HBC) under pharmacological control (Healthy People 2010, US Dept HHS; 2000).

**H-3: Female patients are less likely to receive secondary CHD preventive care than men.**

*Enabling Factors*

Type of provider has been associated with the receipt of preventive care; specifically there is evidence to suggest that persons who receive their care from a specialist versus a primary care physician will receive more secondary CHD preventive care (Reschovsky and Kemper, 1999, 2000; Wang and Stafford, 1998). This hypothesis was not able to be tested as the construction of the variable within the study population limited the number of primary sampling units per stratum and was not able to be included in the analysis.

**H-4: Patients of primary care providers are less likely to receive secondary CHD preventive care advice than those who are cared for by CHD specialists.**

Whereas patients residing in areas with higher HMO penetration may be more likely to receive fewer preventive care measures, those persons who receive their care from within a HMO may be more likely to receive preventive care (Rizzo, 2005).

**H-5: Patients who are enrolled in a HMO are more likely to receive primary preventive care than those who have other forms of health insurance.**

*Potential Access*

Patients with a usual source of care may have more opportunity to reveal their family history, and personal risk factors as well as develop a continuous relationship

with their health care provider . Further, prior research suggests having a usual source of care increases the likelihood of receiving preventive care (Gentry et al., 1999; Glasgow et al., 2001). Therefore,

**H-6: Those patients with a usual source of care are more likely to receive CHD preventive care services than those who do not have a usual source of care.**

When controlling for access factors, women continue to be associated with disparity in the provision of CHD care (Sheifer, Escarce, and Schulman, 2000). Further, the Institute of Medicines report on Unequal Treatment (2002) provides evidence that beyond potential access, disparities in the receipt of preventive care persist for women, minorities and the elderly. Therefore,

**H-7: Controlling for usual source of care, minorities receive less preventive care services than non-minorities.**

**H-8: Controlling for usual source of care, women receive less preventive care than men.**

**H-9: Controlling for usual source of care, the elderly (>75) receive less preventive care than younger patients.**

*Community-Level Factors*

Research indicates that when individual access and socio-economic factors are controlled, disparities in CHD preventive care persist (Pickett and Pearl, 2001). Reseaarch addressing health care disparities in CHD have found that market factors (Haas et al., 2004; Hendryx et al., 2002), health service delivery characteristics (Wang and Stafford, 1998), and other community factors (Diez Roux et al., 2000; Robert, 1998;) have been associated with individual health disparities in CHD preventive care.

There are mixed results from the literature defining the relationship between MC penetration and access. The level of MC penetration in a market area has been associated with reduced potential and realized access (Litaker et al., 2003) and with greater overall access but less specialty care (Gresenz, Stockdale, and Wells, 2000). It is possible that reduced access to specialists (which is associated with more CHD preventive care) may be a result of HMO provider gate keeping. Further, research indicates managed care organizations are driving market–level changes in delivery of health care, specifically, higher MC penetration has been associated with less utilization of costly cardiac procedures and pharmacological care and more low cost preventive care such as certain aspects of lifestyle counseling, i.e. smoking cessation (Bundorf et al. 2004). There is some evidence that suggests HMOs can reduce the demand for physician specialty services (Polsky, Wozniak and Kletke, 2000). Polksy et al., (2000) also indicates that there has been a redistribution of specialist from high HMO penetration markets to low HMO penetration markets. Therefore,

**H-10: Patients who reside in areas with greater HMO penetration are less likely to receive pharmacological secondary CHD preventive care services than those who do not.**

Because there is evidence that there are fewer specialists in high minority areas (Escarce et al., 2000), less minority physicians overall (Betancourt et al., 2004), and more healthcare access issues in high minority areas (Weinick et al., 2000) it is hypothesized that,

**H-11: Patients who reside in an area of high prevalence of minority persons will be less likely to receive CHD secondary preventive care.**

## Summary

In this chapter, the theoretical framework of distributive justice and the framework of equity of access from Aday and Anderson were used in conjunction with the supporting research from the literature review to generate the study hypotheses. The overarching suggestion for the proposed hypothesis is that there are disparities in the receipt of CHD preventive care for minorities, women and the elderly. Further the disparities are thought to persist beyond potential access issues that have been attributed to a reduction in the receipt of care in previous literature.

Chapter 4 will detail the research design, population, data sources, and analytic methods by which this study tested these hypotheses. The analytic approach utilizes community level factors in conjunction with individual level factors to provide a more comprehensive analysis from which to predict the receipt of CHD preventive care.

# CHAPTER 4: METHODOLOGY

## Introduction

Previous studies have analyzed the impact of individual pre-disposing, need and enabling characteristics on the access to preventive healthcare (Gentry et al., 1999; Honda, 2004; Sambamoorthi and McAline, 2003;Shi and Stevens, 2005). Other researchers have included group level health service system characteristics, and community characteristics with individual level factors in assessing individual health status (Diez-Roux, Borrell, Jackson and Schultz, 2004; Pickett and Pearl, 2001; Robert, 1998), person level CHD risk factors (Diez-Roux, Link and Northridge, 2000; Finkelstein et al., 2004) and access to care (Hendryx, Ahern, Lovrich, and McCurdy, 2002). Findings from these studies suggest disparities in healthcare and access can in part be attributed to individual and community socioeconomic factors. There is however, a lack of literature addressing the impact of individual and group level factors on the disparities in potential and realized access of CHD preventive care measures.

This chapter presents the research design, methods and analytic models that will be used to define and study the receipt of CHD preventive care. This study will analyze a CHD population in utilizing individual, environmental and health care system characteristics to further the understanding of access to and receipt of CHD preventive care. By including community, market and health service system characteristics in the

model, the importance of the individual level factors in a community context associated with preventive healthcare disparities can be determined. The Aday and Anderson (1981) framework of health care utilization and expanded conceptual framework of equity was used in modeling the impact of health care delivery system characteristics and community characteristics on the receipt of CHD preventive care. The impact of predisposing and enabling factors of the individual was tested as well, on potential and realized access of preventive care in a CHD population.

## Research Design

This study employed a cross-sectional study design. Although the cross-sectional study design is too limited to allow for causal inferences, it can provide precise information about associations between variables when other variables are taken into account simultaneously.

Within the cross sectional design, there are limits to the data used in this analysis. The Medical Expenditure Patient Survey (MEPS) and Area Resource File (ARF) are secondary data sources that introduce the possibility of measurement inconsistencies and miscoding opportunities that can reduce the reliability of the data. In general survey data are subject to bias of the respondent, instrument and threats to internal validity, selection bias, and unpredictable response rates associated with the possibility of inadequate sample size. The specific sampling methods for MEPS are detailed in the following section.

## Data Sources

This study utilized the 2002 Medical Expenditure Panel Survey (MEPS). MEPS is the third in a series of nationally representative surveys of medical care use and expenditures sponsored by the Agency for Healthcare Research and Quality (AHRQ) that provides nationally representative estimates of health care use, expenditures, sources of payments and insurance coverage for the U.S. civilian non-institutionalized population. The target population for MEPS HC was the 2002 U.S. civilian non-institutionalized population and is a sub sample of the National Health Information Survey (NHIS) of households who were interviewed in two panels, 2000 and 2001. The following sections will provide more detail about the MEPS HC. Additional information can be found at the AHRQ web site following this URL: (http://www.ahrq.gov/data/mepsweb.htm#Medical).

### *MEPS Household Component Survey (HC)*

The Household Component (HC) of MEPS is the core survey that forms the basis for the Medical Provider component and the Insurance Component. Together these components survey households, healthcare providers, inpatient data, and prescription information on household/individual use. The MEPS Household Component Survey (HC) collects medical expenditure data at both the person and household levels. The information collected by the MEPS HC include demographic characteristics, health conditions, health status, use of medical care services, charges and payments, access to care, satisfaction with care, health insurance coverage, income, and employment.

An overlapping panel design is used for the HC of MEPS. Medical expenditure and utilization data including prescription drug use, is collected from each houselhold

over a 2 1/2-year period by a series of five rounds of interviews. This series of data collection rounds is initiated each subsequent year on a new sample of households to provide overlapping panels of survey data. By combining data from ongoing panels, continuous and current estimates of health care expenditures is provided.

*The Household Component Full-Year Files*

This study used the Household Component Full-Year File which is a public use data file that includes full-year information from several rounds of data collection. This information together comprises a complete calendar year's worth of information for a person. There are four different levels of analysis for the various full year data files. Each record in the person level files represents a person and includes characteristics such as age, race, or sex associated with each person. Records from the condition-level files represent a household-reported health condition reported by a particular person. Where as records from job-level files represent a job and include wages and benefits of the job. Event-level files represent a unique household-reported medical event and include characteristics associated with that event such as medical visits and prescriptions.

The MEPS design includes stratification, clustering, multiples stages of selection and disproportionate sampling and is not considered simple random sampling. Therefore when analyzing the MEPS data it is necessary to apply survey weights when producing estimates. One method for estimating standard errors for estimates from complex surveys is the Taylor-series linearization method used in the STATA statistical software packages.

*Prescribed Medicines files and Condition Level Files*

The Prescribed Medicine Events File (HC-067A) was linked to the Medical Conditions File (HC-069). Linking the files was necessary to provide the unique records that match the expected medical condition with a prescription related event. A MEPS provided linking file (CLNK, HC-067I1) was used to accomplish this task. Initially records from HC-069 were selected to match the conditions of interest, i.e. MI. The CLNK file variable CONDIDX was then used to match those selected records that could be linked to the Prescribed Medicine Event File. Finally the variable LINKIDX was used to narrow the selected records from HC-069 to those that had a unique prescribed medicine event associated with the condition. The appropriate variable was then recoded to transform the event-level data to person-level data. The final linked file was then merged back into the main Household Components survey.

*Area Resource File (ARF)*

The 2004 February release ARF was used to collect community socio-economic factors in the area of patient's residence. The ARF is a national county-level health resources information system that collects information on health professions, health training programs, health facilities, measures of resource scarcity, and health status from existing data sources, such as the National Center for Health Statistics, American Hospital Association, and American Medical Association. The ARF also contains specific geographic codes and descriptors and information on economic activity, and socioeconomic and environmental characteristics. The county-specific file is the basis of the system. The data can be aggregated into larger geographic units and files linked to

other geographic level files or data files that have state and county FIPS. The MEPS HC will be matched by FIPS code to county codes. The variables that were accessed from ARF include family income, the percent of minority population and percent of physicians per population. The ARF provided information on the level of managed care penetration in the market.

## IRB

All persons conducting research involving human subjects are required by federal law to file an Internal Review Board (IRB) request. An IRB review from the Virginia Commonwealth University (VCU) was performed that requested and received a category four exemption. An exempt status indicates the researcher is exempt from the requirements set forth in the *Regulations for the Protection of Human Subjects* (Title 45 Part 46 Of the code of Federal Regulations). In order for an exemption to be granted, the data in question must be in existence at the time of IRB review. Exemption category four pertains to research involving the collection or study of data from documents or files, diagnostic tests, pathological samples, public access information, and information that ensures the subject cannot be identified directly or through identifiers linked to the subjects. The MEPS data and ARF are public access files, and therefore elgible for a category four exemption.

For the proposed linkage of ARF and MEPS by FIPS code, a request for access to the FIPs linkage was made to the MEPS data center in Rockville Maryland. The process was perfomed onsite by MEPS staff at the AHRQ data center for confidentiality reasons. Data analysis pertaining to the linkage was also be perfomed on site by the researcher.

To ensure confidentiality, the linkage variables were removed to eliminate future access after the files were merged.

## Sample

This study was based on a population of adults age 18-85. As CHD can manifest symptoms of risk at all ages, the age range selected will increase the likelihood of inclusion of all adults surveyed who may exhibit CHD risk and CHD diagnosis.

## Definition and Measurement of Variables

### *Dependent Variables*

#### *Realized Access*

The construct of realized access was operationalized by seven individual dichotomous dependent variables derived from the MEPS HC that will measure receipt of CHD prevention services. For the purposes of this study, CHD preventive care services was defined as receiving cholesterol screening within five years, high blood pressure screening, smoking cessation information, dietary counseling, exercise counseling, statin use and pharmacological intervention after MI (beta-blocker). Beta-blocker use post MI, statin use, and smoking cessation advice was be tested individually on appropriate populations. Patients that are post MI will be monitored for beta-blocker and those that are current smokers were assessed for receipt of smoking cessation advice. Statin use was assessed for those patients identified as having high blood cholesterol. The other preventive care services were assessed individually for all patients who are at risk for CHD or exhibit at least one of the CHD risk factors. Dependent on the specific hypothesis, selection of CHD preventive care services varied for each hypothesis tested.

The selection of the preventive care services was based on the AHA/ACC Guidelines that address cardiovascular preventive care (Cabana and Kim, 2003, Mosca et al. 2004). The National Cholesterol Education Program recommends periodic cholesterol screening with 5-year intervals for adults 20 years and older (Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP), 2001).

American Heart Association Guidelines for blood pressure screening in adults recommend that blood pressure be taken at every medical care visit for adults age 18 ears and older. However hypertension is not diagnosed until repeated measures are taken and determined to be above normal (University of Texas at Austin, 2002).

The U.S. Preventive Services Task Force (USPSTF) recommends dietary counseling by primary care clinicians or by referral to other specialists, such as nutritionists or dietitians for adult patients with hyperlipidemia and other known risk factors for cardiovascular and diet-related chronic disease. Evidence gathered by the (USPSTF) reports that medium- to high-intensity counseling interventions can produce changes in average daily intake of core components of a healthy diet among adult patients at risk for diet-related chronic disease (USPSTF, 2004).

The U.S. Dietary Guidelines published in January 2005 include recommendations of physical exercise (U.S. Dept HHS, 2005). A key recommendation aimed a reducing the risk of chronic disease in adulthood was to engage in at least 30 minutes of moderate-intensity physical activity, above usual activity, at work or home on most days of the week. Research on physical activity and fitness was compiled by the Centers for Disease

Control and Prevention President's Council on Physical Fitness and Sports that includes encouragement of physicians to share these guidelines with their patients, (Center for Disease Control and Prevention, 2005).

*Potential Access*

Potential access to care was be measured by the identification of a usual source of care from the MEPS HC. Usual source of care refers to a physician's office, hospital, clinic or other place where individuals seek health care. Having a usual source of care has been used as an indicator of access to care in previous studies and has been associated with an increase in the receipt of preventive health care (Broyles, Narine, and Brandt, 2002; DeVoe, Fryer, Phillips, and Green, 2003).

*Characteristics of the Population*

*Pre-disposing*

The pre-disposing factors were measured by the independent variables of population demographics as in age, race, sex, and education. The Institute of Medicine (IOM) on unequal treatment (2002) reports racial and ethnic differences in the provision of cardiovascular healthcare are still evident even after health care access is established. Male, non-minority, and better-educated patients who are of higher socio-economic status and less than 75years of age, tend to receive more CHD preventive care services on a more consistent basis than older, female or minority persons (Baker, Parker, & Williams, 1996; Dornbrook-Lavender, Roth, & Pieper; 2003; IOM 2002; Phillips et al., 2000; Pressier, Cohen & Wofford, 1998; Rathore et al., 2000; Schulman et al., 2000; Stewart et al., 2004)

*Enabling Factors*

The enabling factors based on the Aday access to care model, are commonly measured by income, insurance status and type and site of service. Previous studies have used similar measures to assess their effect on healthcare access (Honda, 2004; Shi and Stevens, 2005;Weinick et al., 2000).

The enabling factors for this study included patients' health insurance status, health insurance type, personal income, and provider type. Insurance type indicates whether the subject has an HMO or not. Income refers to personal income of the respondent. The variable for income was taken from the MEPS HC 2002 which reported poverty statistics by current population survey (CPS) and defined income as family income divided by the poverty line. For this study the variable income represents persons with low income, < 200percent of the family income/poverty line. The variable for provider type was structured to differentiate between physician, nurse or other health care providers, however due to inconsistencies in the number of necessary primary sampling units per stratum, the variable was eliminated from the analysis by the STATA program.

*Need Factors*

Rates and disparities in preventive care utilization vary by the type of service and identified need (Medicare Beneficiary use of clinical preventive care services, 2002). Therefore, this research was concerned with a diagnosed CHD population as well as those at-risk for the development of CHD.

Need factors were measured by CHD risk and CHD diagnosis. There were four CHD risk factors included; high blood pressure, hyperlipidemia, obesity, and diabetes.

There were separate categories for those who have experienced MI and smokers. Smoking was not included as a CHD risk factor as it was assessed separately for smoking cessation. A separate category for post MI patients was necessary due to the mutually exclusive nature of preventive care within this category. Preventive care for MI patients includes pharmacological care in addition to recommended lifestyle modifications.

The defining risk factors for CHD were developed using the AHA/ACC guidelines for CHD risk reduction (Smith et al., 2001) and are defined as persons with any one of these indices; BMI of >25.0 $kg/m^2$, multiple diagnosis of hypertension (>140/90), high blood cholesterol > 200mg/dl, or diagnosis of diabetes. A CHD diagnosis includes those patients with past myocardial infarction (MI), angina, or stroke, or any person identified by medical provider or by self-report as having CHD. Smoking behavior and BMI was obtained from the patient's direct response to the HC survey prompts. Diabetes, hypertension, and BMI were also obtained by self-report. High blood cholesterol and CHD was identified by 3 digit ICD-9-CM condition codes from the MEPs Medical Conditions file.

*Community-Level Factors*

Community-level factors refer to certain health service delivery and environmental characteristics that are associated with the likelihood of receiving preventive healthcare and were measured by physician availability, healthcare market factors and community level socio-economic factors. The percent of physicians per population was used as a measure of physician availability. However, the high correlation between percent specialists per population and the percent of physicians per population

eliminated the use of percent of specialists as a viable variable for analysis. The market factors were measured by HMO care penetration (Haas et al., 2004).

Community characteristics were measured by the percent of those living at or below poverty level income (Anderson et al., 1997; Diex-Rouz, 1997), the percent ethnicity in place of patient's residence (Robert, 1997). The rural versus urban location an individual's city or town was measured by (MSA). This measure may be an important predictor of receipt of CHD preventive healthcare, as stated in the literature review, CHD mortality was observed to be higher among non- metropolitan versus metropolitan areas for blacks and younger whites (Barnett, Halverson, Elmes, and Braham, 2000). A summary of the variables and their measures are listed in Table 1.

## Preliminary Data Management and Analysis

Categorical variables and selected continuous variables were recoded as dummy variables to facilitate the logistic regression analysis. Other variables were generated from the original MEPs data and recoded to specifically answer the research questions that were posed. Because of the proprietary nature of the ARF-MEPS, the MEPS and ARF were merged by the MEPS data coordination Center in Rockville, Maryland and all primary analysis was performed at the data center. Subsequent analysis was performed at the MEPs data center as directed by the researcher from Stata generated codes that were forwarded to the data center.

Table 1.Description of study variables

| VARIABLE | DEFINITION | SOURCE |
|---|---|---|
| Realized Access<br>CHD Preventive Services | Measured by 7 indicators<br>Dependent Variable | MEPS HC |
| Cholesterol monitoring | Serum lipid monitoring within 5 years (1)=yes, (0)=no | |
| Dietary counseling | (1)= service received, (0)=service not received within year | |
| Exercise counseling | (1)= service received, (0)=service not received within year | |
| Blood pressure check | Blood pressure checked within last year (1)=yes, (0)=no within year | |
| Statin use*** | (1)= yes, (0)= no | ***Relates to those patients identified with high blood cholesterol |
| Smoking cessation** | (1)= service received, (0)=service not received | **Relates to those subjects who indicate smoking behavior |
| Beta blocker post MI* | Beta-blocker use after MI (1)=yes and (0)=no | MEPS Precribed Medicines survey<br>*only for MI patients |
| Potential Access<br>Usual source of care | Dependent and Independent Variable<br>(1)= yes, (0)=no | MEPS HC |
| Need Factor<br>Condition<br>High blood pressure*<br>Diabetes*<br>BMI>25 (calculated)<br>*CHD Diagnosis<br>**High Blood Cholesterol | Independent Variable<br>Variable constructed that includes all persons who exhibit at least one risk factor and or CHD diagnosis.<br>(1)=yes (0)=no | MEPS HC<br>*Identified by condition codes<br><br>**MEPS Conditions file |
| Enabling Factors | Independent Variable | MEPS HC |
| Insurance | (1) Uninsured, (0) Insured | |
| Private HMO | (1) Yes, (0) no | |
| Income | (1) Low Income (0) other | |

Table 1. (continued)

| VARIABLE | DEFINITION | SOURCE |
|---|---|---|
| Pre-disposing Factors Independent Variable | | MEPS HC |
| Elderly | >75 years | |
| Education (HS grad) | | |
| <HS | (1)=<HS, (0)= other | |
| >HS | (1)=>HS,(0)= other | |
| MSA | (1)=urban, (0)= rural | MEPS |
| Hispanic | (1)=Hispanic, (0) other | |
| Black | (1) Black, (0)= Other | |
| Gender | (1)=female, (0)=male | |
| Community-Level Factors | | |
| Physician Availability | | |
| #Physicians /population | Number of non federal patient care physicians divided by the total population X 100,000 | ARF |
| Healthcare Market Factor | | |
| HMO Penetration | Total HMO enrollment divided by total county population Continuous | ARF |
| Income percent poverty | | ARF |
| Percent Ethnicity (White) | Quartiles then designated high, med, low with med as reference | ARF |
| Percent Hispanic | | |
| Percent Black | | |

## Analytical Considerations in the Use of Survey Data

Survey Commands in Stata were used in the logistic regression analysis to account for clustering and unequal probability of selection of participants as well as to avoid biased estimates and false-positive hypothesis test results.

Survey weights for the stratum and PSU were obtained from the MEPS data set. The person level weight, PERWT02 is used for most analysis, however the SAQWT02F was used for the analysis involving the query for smoking behavior. The questions concerning smoking was administered by the self-administered questionnaire (SAQ) therefore this weight is appropriate because it is the analytic weight that incorporates all levels of non-response.

The regression analysis required sub-setting those persons with CHD and CHD risk from the total MEPs population. The Stata Survey commands for sub setting the data, use the Taylor series approximation for the variance estimation and thus count the number of primary sampling units (PSUs) that were originally sampled. Using the entire person-level file and then sub setting the analysis by the subpop option within Stata, reduces the chances of using an incorrect number of PSUs in the variance reduction computation formula.

The Stata software has a limitation of analysis in that it requires at least two PSU per stratum, in the case that there is only one, the program will fail to run. For this analysis, the program was interrupted when using the dependent variables statin and smoking cessation but could be resolved by a program that manually regrouped the stratums. However, the technique does not work for all circumstances and can introduce

some bias for the variance estimation (Xue, Lee, Monika, & Wutoh 2005). In the case of the variables denoting provider type and site of care, it was not successful. Therefore these variables were eliminated from the analysis.

## Analytical Strategies

STATA statistical software was employed for initial data management and variable recoding, descriptive analysis, correlation matrices and bi-variate analysis for estimates of preventive care services provided to selected patient subgroups. Descriptive statistics and measures of central tendency were used to determine frequency and proportion of patient sub groups that experience incidence of specific CHD risk factors and diagnosis as well as those that receive CHD preventive care. The CHD diagnosis and CHD risk factors were used to create a comprehensive measure that was dichotomized for these analyses. The patient subgroups were defined by specific socio-economic, racial, and diagnostic characteristics.

Logistic regression models were used to measure the predictive capability of the individual-level independent variables (pre-disposing, enabling and need), and to examine the direct and modifying effects of the community-level factors on selected dichotomous dependent variable(s) of preventive care services. The dependent variables were beta-blocker use after MI, statin use, smoking cessation counseling, diet counseling, physical activity counseling, hypertension screening, and high blood cholesterol screening. These measures were defined as (0), not receiving the preventive care service or (1), receiving the preventive care service. The specific selection of dependent variable for the logistic regression model(s) varied with each hypothesis tested. The logistic

regression equation predicted the log odds that an observation will have an indicator equal to 1. Categorical independent variables that were modeled as predictor variables in the regression equation, such as insurance type, provider type, and site of service were dichotomized to facilitate analysis interpretation.

There are two levels of analysis to consider in the study model. The analytic model included both individual and community level factors in assessing affects on both potential and realized access. When community-level factors were found to significantly contribute to the models' predictive ability, the interactions between the community-level factors and individual factors were assessed.

Following is the estimation of parameters of the general logistic regression models.

(1) Potential Access $(A_{i+g})=f(P, E, N, C, M, Ph)$

(2) Realized Access (Receipt of Care) $(R_{i+g})=f(Ph, M, C, N, E, P, A)$

Where;

*(A)= Potential access*

*(R)= Realized access (receipt of preventive care services)*

*(i)= The individual*

*(g) = The group*

Those parameters affecting the receipt of preventive care are identified as:

*(Ph) = Physician availability*

*(M)=Market factors*

*(C)=Community factors*

*(N)= Need factors of the individual*

*(E)= Individual enabling*

*(P)= Predisposing factors*

The STATA software package was utilized to perform the logistic regression analyses, as well as apply the survey weights required to produce estimates when using the MEPS data.

The method of logistic regression provided information about the association between the independent predictor variables and the types of preventive care received. Additionally, including contextual factors in relation to the receipt of CHD preventive care provided a richer analysis.

## Analytic Limitations

Observational, cross-sectional design has inherent limitations in its inability to provide causal inferences. These limitations apply in estimating causal effects from observational data in multilevel studies as well. There may be certain characteristics of the group level factors that are endogenous to characteristics of the individuals that make up the group. Randomized experimental design is the only absolute way to estimate group-level effects on individual outcomes. The cross sectional study design allows for only associative relationships but can provide precise information about associations between variables when other variables are taken into account simultaneously. The one year cross sectional design of data collection may also eliminate those visits by patients just outside of the study window thereby underreporting the amount of preventive care received by the respondent.

Secondary data sources introduce the possibility of measurement inconsistencies and miscoding opportunities that can reduce the reliability of the data set. Survey data is subject to bias of the respondent, instrument threats to internal validity, and unpredictable response rates associated with the possibility of inadequate sample size. Because survey non-response is potentially a significant source of error, the MEPS full year sampling weights include an adjustment for survey attrition. The sampling weights help to reduce the impact of non-response bias and sample size.

# CHAPTER 5: RESULTS

There are a total of 39,165 observations in the 2002 household component MEPs data set. With weights applied, this equates to an estimate of the U.S. population of 288,200,000 persons. The study population was narrowed to 27,589 observations in the MEPs data that meet the age criteria of greater than 18 but less than 85 years of age. Weighted this equates to an estimate of 215,500,000 persons in the U.S. Certain analyses required a further sub-sample that included those with a diagnosis of CHD and/or one of four CHD risk factors. The CHD/risk analysis sample contained 18,308 persons and is equated to an estimate of 139,700,000 persons in the U.S. The following results include initial descriptive statistics, bi-variate analysis, and the logistic regression analysis that was used to test hypotheses about the nature of independent factors in predicting the receipt of CHD preventive care services.

## Descriptive Analysis

Descriptive analyses were conducted to examine characteristics of the study population and to further examine whether there were socio-demographic differences in the proportion of those included and excluded from the analyses. Percentages were weighted to provide unbiased estimates of the frequencies. A weighted percentage is calculated by differentially weighting observations to account for complex sampling procedures. It differs from a simple percentage in which all cases are equally weighted.

Weighted percentages are estimates of the percentages of the total population, or group that share a specific characteristic. In this study, for example, the weighted percentage of females with CHD or CHD risk in the MEPs sample that received CHD preventive care is an estimate of the percentage of females in the nation who are diagnosed with CHD or CHD risk and receive CHD preventive care.

The Stata analytic program used list-wise deletion in handling missing data, therefore contingent on the dependent variable of interest in the analysis, the exact number of persons in the CHD subpopulation varied. As this study was designed to determine the effect of socio-demographic factors on the receipt of preventive care, a comparative analysis was performed to determine whether or not personal characteristics of the analysis sub sample (persons with CHD/risk) were different from those individuals without CHD/risk, who were excluded from select analyses.

Table 2 details the characteristics of the total study population, and provides a comparison of the analysis sub-sample with those excluded in weighted percent with the standard error. Except for the variables representing Hispanic, and less than a high school education, there were significant differences for all individual characteristics between the CHD analysis sub -sample and the part of the population excluded from the analysis. The mean age for persons in the total MEPS study population was 45.4 years. For the CHD study sub-sample the mean age was 48.8 years versus 39.0 years for the excluded population. There was a majority of women (51.9%) versus men (48.1%) in the total study sample, but more men (52.3%) than women (47.7%) were identified with CHD/risk. Over 77 % of all persons in the analysis sample have at least a high school

Table 2. Sociodemographic characteristics of the study sample

| Individual Characteristic | Total MEPs Study Sample (n=27,589) | Analysis Sub-sample (Persons With CHD/Risk) (n=18,308) | Persons w/o CHD/risk (n=9,281) |
|---|---|---|---|
| Age (mean)** | 45.4(0.20) | 48.8(0.23) | 39.0(0.24) |
| Female * | 51.9(0.27) | 47.7(0.36) | 59.7(0.54) |
| Male* | 48.1(0.27) | 52.3(0.36) | 40.3(0.54) |
| Elderly >75* | 6.8(0.26) | 8.5(0.34) | 3.6(0.25) |
| Hispanic | 12.1(0.61) | 12.4(0.69) | 11.7(0.59) |
| Black * | 11.1(0.61) | 12.6(0.70) | 8.2(0.53) |
| Other races including Caucasian* | 76.6(0.83) | 74.9(0.94) | 80.0(0.77) |
| <12years Education | 22.1(0.46) | 22.4(0.54) | 21.5(0.58) |
| 12 yrs HS Education* | 32.4(0.47) | 34.7(0.50) | 28.2(0.64) |
| >12 years* | 45.4(0.63) | 42.8(0.65) | 50.3(0.84) |
| Insured with private* | 73.2(0.59) | 72.6(0.64) | 74.1(0.74) |
| Insured with public* | 13.7(0.43) | 15.4(0.48) | 10.5(0.50) |
| Uninsured * | 13.1(0.38) | 12.0(0.41) | 15.3(0.55) |
| Income (percent low income)* | 27.9(0.59) | 28.6(0.63) | 26.6(0.72) |
| Usual source of care* | 77.8(0.51) | 81.1(0.52) | 71.6(0.73) |
| HMO private * | 30.0(0.68) | 29.0(0.69) | 31.8(0.91) |
| MSA urban* | 81.2(0.77) | 80.0(0.85) | 83.5(0.79) |

** $p<0.001$ by t-test for person in analysis sub-sample and persons w/o CHD/risk

*$p<0.001$ by $\chi^2$ analysis for association between analysis sub sample and individual characteristic

Reported in Weighted percent and SE

education and more than 86% have some form of health insurance. Seventy one percent of those excluded from the analysis indicate a usual source of care in contrast to the 77 % total study population and the 81% CHD/risk sub-population.

Study subjects with CHD or risk factors for CHD were older than those without CHD/risk. The CHD/risk population was less educated and a higher proportion was insured by public insurance than those without CHD/risk. Blacks represent approximately 11% and Hispanic persons 12% of the MEPs total population, and both represent approximately 12% of the CHD/risk population, however blacks represent only 8.2% of those without CHD/risk.

## Correlation Analysis

If the independent variables in a logistic regression model are strongly correlated, the variance of the parameter estimates may be falsely inflated. This may affect the statistical significance of independent predictors in the model, as well as the direction and magnitudes of the regression coefficient estimates and ultimately lead to incorrect conclusions about the predictive ability of the independent variables on the dependent variable.

Correlation matrices were run on all of the independent variables. All correlations between independent variables found to be greater than 0.5 were assessed for significance in the analytical model. Although the Stata logistic regression analysis will remove those variables with collinearity issues from the analysis, initial judgment on the retention of highly correlated variables was determined prior to analysis. The correlation matrices are found in Appendix A. The community level variable of HMO penetration (hmopen)

and the individual level variable indicating urban and rural status of residence for the individual (MSA02) were highly correlated (0.58). However with the exception of the analysis that combined individual and community level variables HMO penetration and MSA were run in separate models. MSA was included in the individual level model and HMO penetration was included in the combined community and individual logistic regression, therefore neither variable was eliminated.

The variables of public and private insurance were highly correlated (0.67). The variables were combined and recoded to reflect the uninsured with the reference category being insured. The continuous variable of age (18-85) and the dichotomous variable designating all persons over the age of 75 (Elderly) were correlated (0.50), however both variables were retained so that effects of being elderly could be noted beyond the relationship with age.

The interaction terms of individual black persons in high prevalence black communities (Black x Hblack) was eliminated as it was highly correlated with the individual level variable of black (0.78). The interaction term denoting Hispanics residing in low prevalence black communities (Hisp x Lblack) was eliminated by the Stata logistic regression analysis program on the basis of collinearity despite that it was only moderately correlated (0.42) with the individual Hispanic variable. The variable for prescription drug coverage insurance was negatively correlated with the variable for low income (-0.45) and public insurance (-0.53), and highly positively correlated with private insurance (0.78), thus the variable for prescription drug coverage was removed from all logistic regression analytical models.

## Bivariate Analysis

Bivariate analysis was used to investigate possible relationships between the independent and dependent variables, not accounting for other variables. Pearson's chi square test was used to indicate whether or not the proportions of persons receiving a service and those not receiving the service are different as related to specific individual characteristics.

Over eighty percent of those with CHD or at risk for CHD claimed a usual source of care and more than half of all respondents with a usual source of care received their care in an urban setting. Table 3 details the unadjusted weighted percent of individuals with a usual source of care as it relates to individual characteristics. Overall more women (86.4%) than men (76.2%) claimed a usual source of care. The majority of elderly patients (96%) have a usual source of care. Seventy seven percent of Blacks and 62.4% of Hispanics report having a usual source of care whereas only 49.6% of those uninsured claim a usual source of care. Greater than 80% of patients with insurance (public or private), reported having a usual source of care.

Table 4 describes the bivariate analyses between personal characteristics of the study population and the receipt of primary preventive CHD services. Overall, 79% of the total study population with CHD or CHD risk indicated they had received cholesterol screening in the five years prior to the survey. More females (84.1%) than males (80.0%) report having been screened for high blood cholesterol within the specified time period. Most elderly (96.4%) have had a blood cholesterol check.

Table 3. Bivariate analysis of personal characteristics and usual source of care.

| Those with CHD and/or risk | Usual Source of Care (n=18,154) |
|---|---|
| Individual Characteristic | Unadjusted weighted percent (SE) |
| Gender | |
| Female | 86.4(0.39)* |
| Male | 76.2(0.43)* |
| Race/ethnicity (Other race) [a] | |
| Hispanic | 62.4(0.47)* |
| Black | 77.4(0.52)* |
| Age | |
| Elderly (>75) | 96.0(0.33)* |
| Education (HS Graduate) [a] | |
| Education< HS | 76.9(0.28)* |
| Education>HS | 73.3(0.60)* |
| Insurance | |
| Public Insurance | 88.6(0.45)* |
| Private Insurance | 84.7(0.65)* |
| HMO | 87.1(0.66)* |
| Uninsured | 49.6(0.28)* |
| Income | |
| Low income | 75.3(0.51)* |
| MSA (rural) [a] | |
| MSA urban | 80.5(0.85)* |

* $p<0.001$

[a] Reference category

Table 4. Bivariate analysis of individual characteristics and primary CHD preventive care services.

| Those with CHD and/or risk | Cholesterol Screening (n=17,410) | Blood Pressure Check (n=17,948) | Diet Counseling (n=18,092) | Exercise Counseling (n=18,092) |
|---|---|---|---|---|
| Individual Characteristic | Unadjusted Wtd percent (SE) | Unadjusted Wtd percent (SE) | Unadjusted Wtd percent (SE) | Unadjusted Wtd percent (SE) |
| % of persons who received service | 79. (0.50) | 83.4(0.37) | 40.10(.51) | 43.7(0.53) |
| Gender | | | | |
| Female | 84.1(0.41)** | 90.4(0.39)** | 42.0(0.33)** | 48.7(0.39)** |
| Male | 80.0(0.44)** | 80.0(0.40)** | 38.2(0.36)** | 39.1(0.40)** |
| Race/ethnicity (Other race) [a] | | | | |
| Hispanic | 70.3(0.50)** | 69.6(0.49)** | 28.8(0.22)** | 33.3(0.49)** |
| Black | 80.9(0.60) | 83.3(0.56) | 38.6(0.31) | 43.8(0.56) |
| Age | | | | |
| Elderly (>75) | 96.4(0.35)** | 96.1(0.33)** | 44.2(0.20)* | 41.2(0.33)** |
| Education (HSGraduate)[a] | | | | |
| Education< HS | 74.1(0.43)** | 80.3(0.45)** | 36.1(0.28)** | 38.7(0.45)** |
| Education>HS | 84.2(0.63)** | 85.2(0.61)** | 42.3(0.43)** | 46.6(0.61)** |
| Insurance | | | | |
| Public Insurance | 85.4(0.42)** | 91.2(0.44)** | 45.1(0.27)** | 46.2(0.44)** |
| Private Insurance | 82.5(0.71)** | 85.4(0.60)** | 41.8(0.53)** | 45.9(0.60)** |
| HMO private | 81.3(0.62)* | 87.4(0.62) | 40.1(0.38) | 29.0(0.62) |
| Uninsured | 85.4(0.27)** | 60.7(0.29)** | 22.9(0.16)** | 26.9(0.29)** |
| Income | | | | |
| Low income | 73.8(0.50)** | 80.8(0.53)** | 37.0(0.33)** | 39.7(0.53)** |
| MSA (Rural)[a] | | | | |
| MSA urban | 80.8(0.84)** | 82.7(0.77)** | 39.9(0.56) | 44.0(0.77)** |

*p<0.001

[a] Reference Category

In respect to individual characteristics more than 80% of persons have received blood cholesterol screening with the exception of Hispanics (70.3%), those with low income (73.8%) and those with less than a high school education (74.1%). Eighty three percent of the at-risk population reported receiving blood pressure check within the year prior to the

survey. Greater than 90% of the elderly, females and those with public insurance reported blood pressure checks.

The uninsured (60.7%) and Hispanics (69.9%) reported the least amount of blood pressure checks. Persons with public health insurance report having had more of all primary CHD preventive care services than those with private insurance did.

Overall dietary fat counseling was provided to 40% of the at-risk population, and 43% reported receiving exercise counseling. Slightly more females (42.0%) than males (38.2%) reported receiving diet counseling. More women (48.7%) than men (39.1%) also report having received diet counseling. Overall, in relation to individual characteristics, less than 50% of all respondents report exercise counseling or dietary advice.

Table 5 details the bivariate relationship between statin use, beta-blocker use and the receipt of smoking cessation advice. Eighty six percent of all respondents with high blood cholesterol (HBC) indicate receiving statins. More (86.7%) of females reported receiving statin in response to HBC versus males (85.1%). There was no significant difference in receipt of beta-blocker for males and females (33%). Conversely, 48.5% of the surveyed population claimed they received smoking cessation advice, with more women (56.2%) than men (42.0%) reporting to have received the preventive care service. The majority of elderly persons with HBC received statins (89.3 %), while only a slight majority of elderly smokers received smoking cessation advice (59.4%). More than three quarters of the uninsured (75.3%) with HBC indicated statin receipt, 36.8% of those

Table 5. Bivariate analysis between personal characteristics of those with CHD and/or risk and secondary CHD preventive care.

| | Statin [a] (n=2,173) | Beta blocker [b] (n=4,545) | Smoking cessation [c] (n=5,146) |
|---|---|---|---|
| Individual Characteristic | Unadjusted Wtd percent (SE) | Unadjusted Wtd percent (SE) | Unadjusted Wtd percent (SE) |
| % Of persons who received service | 85.9(0.84) | 33.5(0.79) | 48.5(0.79) |
| Gender | | | |
| Female | 86.7(0.97) | 33.8(0.67) | 56.2(0.65)** |
| Male | 85.1(1.02) | 33.1(0.57) | 42.0(0.72)** |
| Race/ethnicity (Other race) [d] | | | |
| Hispanic | 75.8(0.40)* | 34.9(0.24) | 33.5(0.27)** |
| Black | 88.8(0.63) | 25.2(0.29)** | 46.4(0.34) |
| Age | | | |
| Elderly (>75) | 89.3(0.93) | 35.8(0.43) | 59.4(0.18)* |
| Education (HS Graduate) [d] | | | |
| Education< HS | 85.3(1.03) | 33.7(0.46) | 45.6(0.54)* |
| Education>HS | 86.4(1.30) | 31.6(0.59) | 52.5(0.58)* |
| Insurance | | | |
| Public Insurance | 84.3(1.12) | 34.2(0.45) | 59.5(0.38)** |
| Private Insurance | 86.6(1.30) | 33.0(0.74) | 52.0(0.75)** |
| HMO | 83.6(0.31)* | 32.8(0.21) | 52.5(0.38)** |
| Uninsured | 75.3(1.17) | 36.8(0.45) | 28.8(0.55)* |
| Income | | | |
| Low income | 85.7(1.15) | 34.3(0.50) | 45.5(0.62)* |
| MSA (rural) [d] | | | |
| MSA urban | 86.0(1.44) | 32.9(0.80) | 49.2(0.83) |

*P<0.05 by Pearson $\chi^2$ test

**P<0.01

[a] population limited to those diagnosed with HBC

[b] population limited to those who have had MI

[c] Population limited to those who report smoking cigarettes

[d] Reference category

without insurance claimed to receive beta-blocker post MI and less than one third of the uninsured smokers (28.8%) claim to have received smoking cessation advice. Although

more than 75% of blacks and Hispanics report receiving statins in response to HBC, less than a third, 34.9% for Hispanics and 25.2% for Blacks, received beta-blocker in response to MI. These percentages are consistent with the overall rate of all survey participants who claim beta-blocker receipt post MI (33.5%).

## Logistic Regression Analysis

The logistic regression analyses included models to estimate individual and community level pre-disposing, enabling and need factors in relation to the receipt of CHD preventive care services for persons identified with CHD/risk. Separate logistic regression models were estimated for the effect of individual level predictor variables on each of the seven CHD dependent variables. Results of the initial logistic regression models included potential access (usual source of care) as an independent variable in the initial regression analysis. Potential access (having a usual source of care) was included in the initial analysis as an independent variable to determine its association with the receipt of CHD preventive care. Subsequently, it was assessed as a dependent variable to determine the effects of individual and community level variables on the likelihood of having a usual source of care.

The logistic regression models for the estimation of effect of community and individual level variables on the receipt of the secondary preventive care dependent variables of statin use and beta-blocker use were run in three separate models. One model was run for each dependent variable, one for individual effects, the second for the addition of community factors and third for interaction effects of community level and individual factors of ethnicity.

Results of the logistic regression analyses are reported in odds ratios. An odds ratio indicates the amount of change expected when there is one unit of change in the predictor variable while all other variables in the model are held constant. An odds ratio of 1.0 indicates no change due to the predictor variable. In order to assess the logistic regression analysis, an F test is done for model fit. Altman (1991) indicates the use of the t-test is appropriate in deciding the significance of individual predictor variables.

For the logistic regression model combining individual and community variables the Wald statistic was used to assess the significance of select groups of predictors. The Wald test is used to test the significance of selected explanatory variables in a statistical model and tests whether the parameters associated with a group of explanatory variables are zero (Polit, 1996). If not significant, variables are considered to be zero and can be omitted from the model. If the Wald test is significant, the parameters are not zero and can be retained in subsequent modeling.

### *CHD Preventive Care Service and Individual Level Analysis*

Results from the logistic regression analysis predicting the effect of pre-disposing and enabling characteristics of a CHD population on the receipt of CHD preventive care are detailed in Table 6.

#### *Race/Ethnicity*

Both blacks (1.43, $p<0.001$) and Hispanics (1.39, $p<0.001$) were found to be more likely to receive cholesterol screening than Caucasians. Hispanics were also less likely to receive blood pressure checks (0.74, $p<0.001$), dietary counseling (0.89, $p<0.05$) and smoking cessation advice (0.68, $p<0.001$) than the reference group of Caucasians.

Results indicate that blacks were significantly less likely than the reference group races to receive beta-blocker after MI (0.65, $p<0.001$).

Table 6. Logistic regression models predicting the effect of individual characteristics on the receipt of primary and secondary CHD preventive care.

| Individual Characteristic | Cholesterol screening | Blood pressure check | Diet counseling | Exercise counseling | Smoking cessation advice ϕ | Bblocker Post MI | Statin for HBC |
|---|---|---|---|---|---|---|---|
| Black | 1.43(0.08)** | 1.04(0.09) | 1.03(0.06) | 1.06(0.07) | 0.85(0.08) | 0.65(0.06)** | 1.42(0.40) |
| Hispanic | 1.39(0.11)** | 0.74(0.06)** | 0.89(0.05)* | 0.89(0.05) | 0.68(0.06)** | 1.03(0.13) | 0.66(0.18) |
| Female | 1.54(0.13)** | 2.48((0.14)** | 1.03(0.04)** | 1.38(0.05)** | 1.47(0.11)** | 1.02(0.07) | 0.99(0.13) |
| Elderly >75 | 0.41(0.09)** | 0.96(0.17) | 0.32(0.02)** | 0.31(0.03)** | 0.55(0.13)* | 0.86(0.10) | 0.59(0.15)* |
| Age | 1.08(0.00)** | 1.03(0.00)** | 1.03(0.00)** | 1.02(0.00)** | 1.01(0.00)** | 1.01(0.00)* | 1.04(0.00)** |
| Education <HS | 0.83(0.05)* | 0.97(0.07) | 0.88(0.04)* | 0.89(0.04)* | 1.10(0.08) | 0.89(0.08) | 0.87(0.17) |
| >HS | 1.49(0.08)** | 1.14(0.07)* | 1.10(0.05)* | 1.12(0.05)* | 1.14(0.09) | 0.85(0.07) | 1.20(0.18) |
| Low Income | 0.78(0.05)** | 0.99(0.06) | 1.02(0.05) | 0.97(0.05) | 1.02(0.08) | 1.02(0.08) | 0.97(0.18) |
| Uninsured | 0.58(0.04)** | 0.48(0.04)** | 0.67(0.05)** | 0.81(0.07)* | 0.53(0.05)** | 1.32(0.20) | 0.62(0.25) |
| HMO | 0.95(0.07) | 0.91(0.06) | 0.97(0.05) | 1.07(0.05) | 0.89(0.07) | 1.07(0.09) | 0.89(0.17) |
| MSA-urban | 1.41(0.11)** | 0.82(0.07)* | 1.01(0.05) | 1.09(0.06) | 1.31(0.10)* | 0.92(0.08) | 0.98(0.19) |
| Usual S of care | 2.08(0.19)** | 3.11(0.21)** | 1.51(0.13)** | 1.90(0.11)** | 3.18(0.26)** | 1.36(0.23) | 1.19(0.36) |
| *n* | 17,284 | 17,811 | 17,940 | 17,940 | 5,144 | 4,528 | 2,159 |
| *F* test | 156.14 | 109.10 | 88.09 | 19.97 | 43.67 | 3.33 | 5.27 |
| *p* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

*$p<0.05$ ;**$p<0.001$

ϕAnalysis performed on subpopulation of smokers
Reported as Odds Ratio and Standard Error

*Gender*

Female patients were more likely than men to receive cholesterol screening (1.54, $p<0.001$), blood pressure check (2.48, $p<0.001$), dietary advice (1.03, $p<0.001$), exercise advice (1.38, $p<0.001$), and smoking cessation advice (1.47, $p<0.001$). Yet gender was not a significant predictor of either statin use for high blood cholesterol (HBC) or beta-blocker receipt post myocardial infarction (MI).

*Elderly/Age*

A reduced likelihood of receiving the primary preventive care services of cholesterol screening (0.41, $p<0.001$), smoking cessation advice (0.55, $p<0.05$), diet counseling (0.32, $p<0.001$), and exercise counseling (0.31, $p<0.001$), was indicated for the elderly. Being elderly (>75 years of age), was also found to be associated with the reduced likelihood of receiving statin therapy for high blood cholesterol (0.59, $p<0.05$). Age had a significant association with all CHD preventive care services that indicates a slightly greater likelihood of receiving all CHD preventive care services as age increases.

*Education*

Having less than twelve years of high school education was associated with a reduced likelihood of cholesterol screening (0.83, $p<0.05$), dietary counseling (0.88, $p<0.05$) and exercise counseling, (0.89, $p<0.05$), as opposed to completing high school. A higher level of education (greater than twelve years), was associated with a greater likelihood of receiving cholesterol screening (1.49, $p<0.001$), blood pressure check (1.14, $p<0.05$), diet counseling, (1.10, $p<0.05$), and exercise counseling (1.12, $p<0.05$).

*Income/Insurance*

Results indicate that having a low income (0.78, $p<0.001$)) and being uninsured (0.58, $p<0.001$), are associated with a reduced likelihood of receiving cholesterol screening. Being uninsured also reduced the likelihood of receiving a blood pressure check (0.48, $p<0.001$), diet counseling (0.67, $p<0.001$), exercise counseling (0.81, $p<0.05$), and smoking cessation advice (0.53, $p<0.001$). CHD primary preventive services were no more likely to be offered for those enrolled in an HMO versus those not in HMO.

*Rural/Urban*

There was a greater likelihood of receiving cholesterol screening (1.41, $p<0.001$), and smoking cessation advice (1.31, $p<0.05$) for those in an MSA. However those with CHD or at risk for CHD have a reduced likelihood of receiving a blood pressure check (0.82, $p<0.05$) if they receive their care in an urban setting as opposed to rural areas.

*Usual Source of Care*

Having a usual source of care significantly predicts the receipt of all five of the primary preventive services; cholesterol screening (2.08, $p<0.001$), blood pressure checks (3.11, $p<0.001$), diet (1.51, $p<0.001$) and exercise counseling (1.90, $p<0.01$) and smoking cessation (3.18, $p<0.01$). Having a usual source of care however, was not associated with an increased or lowered likelihood of receiving statin or beta-blocker.

*CHD Preventive Care Services and Individual Level Analysis:*

*Models for Potential Access (Usual Source of Care)*

Results from the logistic regression analysis predicting the effect of pre-disposing and enabling characteristics on the receipt of CHD preventive care services in a population of persons with a usual source of care are detailed in Table 7.

*Race/Ethnicity*

Hispanics (1.40, $p<0.001$) and Blacks (1.65,$p<0.001$) with a usual source of care more likely to receive cholesterol testing, but less likely to receive smoking cessation advice ((0.57, $p<0.001$) for Hispanics and (0.77, $p<0.05$) for blacks). Hispanics were also less likely to have blood pressure checks (0.76, $p<0.001$), and receive diet (0.87, $p<0.05$) and exercise counseling (0.87, $p<0.05$), whereas Blacks with a usual source of care received less beta-blocker (0.66, $p<0.001$) after MI.

*Gender*

Women with a usual source of care were found to be more likely than men to receive cholesterol testing (1.31, $p<0.001$), blood pressure checks (2.54, $p<0.001$), exercise counseling (1.33, p<, 0.001) and smoking cessation (1.33, $p<0.001$) counseling.

*Elderly/Age*

The elderly with a usual source of care received less counseling for smoking cessation (0.46, $p<0.05$), diet (0.33, $p<0.001$), and exercise (0.33, $p<0.001$), as well as less cholesterol testing (0.35, $p<0.001$). Increasing age had a significant association with the receipt of all CHD primary and secondary preventive care services.

Table 7. Logistic regression results predicting the effect of individual level characteristics in the receipt of primary and secondary CHD preventive care for those with a usual source of care.

| Individual Characteristics | Cholesterol screening | Blood pressure check | Diet counseling | Exercise counseling | Smoking cessation advice ϕ | Bblocker Post MI | Statin for HBC |
|---|---|---|---|---|---|---|---|
| Black | 1.65(0.15)** | 0.97(0.09) | 1.02(0.06) | 1.07(0.07) | 0.77(0.09)* | 0.66(0.07)** | 1.38(0.39) |
| Hispanic | 1.40(0.13)** | 0.76(0.05)** | 0.87(0.05)* | 0.87(0.05)* | 0.57(0.07)** | 0.99(0.13) | 0.67(0.18) |
| Female | 1.31(0.06)** | 2.54(0.14)** | 0.98(0.03) | 1.33(0.04)** | 1.33(0.11)* | 1.01(0.08) | 1.00(0.14) |
| Elderly >75 | 0.35(0.07)** | 1.0(0.16) | 0.33(0.03)** | 0.33(0.03)** | 0.46(0.11)* | 0.83(0.10) | 0.60(0.16) |
| Age | 1.10(0.00)** | 1.03(0.00)** | 1.03(0.00)** | 1.03(0.00)** | 1.02(0.00)** | 1.01(0.00)* | 1.03(0.00)** |
| Education <HS | 0.85(0.05)* | 1.11(0.08) | 0.86(0.04)* | 0.86((0.04)* | 1.09(0.10) | 0.87(0.08) | 0.82(0.18) |
| >HS | 1.5(0.08)** | 1.17(0.07)* | 1.01(0.05) | 1.08(0.05) | 1.13(0.11) | 0.83(0.07)* | 1.20(0.19) |
| Low Income | 0.75(0.05)** | 0.90(0.06) | 1.00(0.05) | 0.97(0.05) | 1.02(0.10) | 1.03(0.08) | 1.07(0.19) |
| Uninsured | 0.55(0.04)** | 0.48(0.04)** | 0.74(0.06)** | 0.76(0.05)** | 0.62(0.07)** | 1.28(0.22) | 0.68(0.30) |
| Private HMO | 1.0(0.07) | 0.96(0.05) | 0.97(0.05) | 1.03(0.05) | 0.90(0.87) | 1.08(0.10) | 0.88(0.17) |
| MSA-urban | 1.5(0.11)** | 0.84(0.07)* | 1.03(0.05) | 1.14(0.06)* | 1.35(0.11)** | 0.92(0.08) | 0.97(0.19) |
| CHD Risk | 1.6(0.09)** | 1.43(0.08)** | 3.80(0.18)** | 3.57(0.16)** | - | - | - |
| n | 19,208 | 19,859 | 19,973 | 19,964 | 3,666 | 4,307 | 2,060 |
| *F* test of fit | 174.36 | 72.44 | 140.82 | 123.01 | 12.72 | 3.01 | 4.57 |
| *p* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

*$p<0.05$; **$p<0.001$

ϕ Analysis performed on subpopulation of smokers.

Reporting Odds Ratio and Standard Error.

*Education*

Having less than twelve years of high school education was associated with a reduced likelihood of cholesterol screening (0.85, $p<0.05$), and dietary (0.86, $p<0.001$) and exercise advice (0.86, $p<0.001$). A higher level of education (greater than twelve years) was associated with a greater likelihood of receiving cholesterol screening (1.5, $p<0.001$), and blood pressure check (1.17, $p<0.05$), but a reduced likelihood of receiving beta-blocker after MI (0.83, $p<0.05$) than those with only a high school education.

*Income/Insurance*

The uninsured that claim a usual source of care reported less cholesterol testing (0.55, $p<0.001$), blood pressure checks (0.48, $p<0.001$), and diet (0.74, $p<0.001$) and exercise (0.76, $p<0.001$) counseling than those with insurance. The uninsured with a usual source of care also claim to have received less smoking cessation advice (0.62, $p<0.001$) from their health care provider. There is no greater or lesser likelihood of receiving beta-blocker post MI or statins for HBC for those who have a usual source of care.

*Rural/Urban*

There was a greater likelihood of receiving cholesterol screening (1.50, $p<0.001$), exercise counseling (1.14, $p<0.05$)and smoking cessation advice (1.35, $p<0.001$) for those with a usual source of care. However, there was a reduced likelihood of receiving a blood pressure check (0.84, $p<0.05$) for those persons who receive their care in an urban setting as opposed to a rural area despite having a usual source of care.

*CHD/risk*

Persons at risk for CHD were identified as having a high BMI, (>26), having high blood cholesterol, having high blood pressure or having a diagnosis of diabetes. For those with a usual source of care, being identified with CHD or one of the four risk factors for CHD increased the likelihood of receiving cholesterol screening (1.6, $p<0.001$), blood pressure (1.43, $p<0.001$), and diet (3.8, $p<0.001$), and exercise Counseling (3.57,$p<0.001$).

*Community Level Analysis and Secondary CHD Preventive Care Services*

Table 8 details the analysis results from the logistic regression models predicting the effect of individual socio-demographic and county level variables in the use of secondary CHD preventive care. Beta-blocker use after MI and statin drug use for the treatment of high blood cholesterol were the dependent variables of interest.

Three separate models were run to determine the contributions of community level variables and interaction effects to the initial individual level model. The first model estimated individual level effects on the dependent variables. The second model included community level variables to estimate effects of both individual and community level variables. The Wald test was performed post hoc on the set of community level variables to determine their significance in the model. A final model included individual, community and interaction terms. Community and individual ethnicity and race variables were included as interaction terms to assess the possible affect of individual race and the ethnicity of a person's community in which they reside on the receipt of CHD preventive care.

Table 8. Logistic regression models predicting the effect of socio-demographic and county level variables in the use of secondary CHD preventive care (Beta Blocker after MI and Statin for HBC).

| Individual Variables | Bblocker Model 1 Individual Factors | Bblocker Model 2 with Community Level variables | Bblocker Model 3 with interactions | Statin Model 1 Individual Factors | Statin Model 2 with Community Level variables | Statin Model 3 with interactions |
|---|---|---|---|---|---|---|
| Black | 0.64(0.07)** | 0.70(0.08)* | 0.67(0.10)* | 1.41(0.38) | 1.58(0.44) | 1.70(0.63) |
| Hispanic (other) | 1.01(0.11) | 0.96((0.13) | 1.16(0.23) | 0.66(0.17) | 0.86(0.29) | 0.50(0.27) |
| Female (male) | 1.02(0.07) | 1.03(0.07) | 1.01(0.07) | 0.99(0.14) | 0.99(0.14) | 0.97(0.14) |
| Elderly >75 | 0.89(0.11) | 0.92(0.11) | 0.90(0.11) | 0.50(0.12)* | 0.50(0.12)* | 0.49(0.12)** |
| Age | 1.01(0.00)* | 1.01(0.00)* | 1.01(0.00)* | 1.04(0.01)** | 1.04(0.00)** | 1.04(0.01)** |
| Education (HS Grad)<HS | 0.88(0.09) | 0.89(0.09) | 0.87(0.09) | 0.88(0.19) | 0.90(0.19) | 0.90(0.19) |
| >HS | 0.83(0.07) | 0.82(0.07) | 0.83(0.07) | 1.19(0.36) | 1.20(0.18) | 1.20(0.18) |
| Low Income (Med/High) | 1.03(0.09) | 1.03(0.10) | 1.00((0.10) | 0.99(0.17) | 0.99(0.17) | 0.98(0.17) |
| Uninsured | 1.34(0.24) | 1.29(0.23) | 1.24(0.23) | 0.63(0.25) | 0.68(0.27) | 0.66(0.26) |
| Private HMO (No HMO) | 1.06(0.09) | 1.03(0.09) | 0.93(0.11) | 0.89(0.17) | 0.92(0.18) | 0.93(0.19) |
| Usual source of care | 1.36(0.24) | 1.32(0.24) | 1.35(0.24) | 1.19(0.36) | 1.16(0.34) | 1.21(0.36) |
| Community Variables | | | | | | |
| # Physicians/population | | 1.00(0.00) | 1.00(0.00) | | 1.00(0.00) | 1.00(0.00) |
| HMO penetration | | 1.38(0.39) | 1.39(0.39) | | 0.68(0.33) | 0.67(0.32) |
| Percent Poverty | | 0.99(0.01) | 1.00(0.01) | | 0.98(0.01)* | 0.97(0.01)* |
| High Hispanic area | | 1.00(0.14) | 0.92(0.16) | | 0.85(0.23) | 0.82(0.25) |
| Low Hispanic area | | 1.08(0.11) | 1.08(0.11) | | 0.88(0.13) | 0.84(0.13) |
| Low Black area | | 1.14(0.12) | 1.19(0.12) | | 1.06(0.19) | 1.08(0.19) |
| High Black area | | 0.93(0.11) | 0.95(0.11) | | 0.95(0.20) | 0.94(0.21) |
| Black x low Black area | | | 1.14(0.59) | | | 0.15(0.27) |
| Black x low Hispanic area | | | 0.94(0.21) | | | 2.08(1.52) |
| Black x high Hispanic area | | | 1.19(0.39) | | | 0.46(0.31) |
| Hispanic x high Hispanic | | | 0.93(0.26) | | | 2.25(1.35) |
| Hispanic x high Black area | | | 0.72(0.17) | | | 1.25(0.65) |
| n | 4,528 | 4,528 | 4,528 | 2,159 | 2,159 | 2,159 |
| *F* test of fit | 3.46 | 2.36 | 1.93 | 6.37 | 5.08 | 4.12 |
| *p* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| *Adjusted Wald test for* addition of variables to model | ---- | *F=1.05, (0.39)* | *F=0.47 (0.79)* | ---- | *F=1.25(0.28)* | *F=1.43(0.15)* |

*$p<0.05$; **$p<0.001$; Reporting Odds Ratio and Standard Error

The initial individual level model indicates that black persons were significantly less likely to receive beta-blockers (0.64, $p<0.001$) after MI than other races (Caucasian and others) and that the elderly are less likely to receive a statin drug in treating HBC (0.50, $p<0.05$). As age increases a slight increased likelihood of stain and beta-blocker use was observed. The community level variable of percent poverty indicated a significant relationship with statin use, however because model statistics indicate that community level variables did not provide any additional explanatory power to the individual level model for beta-blocker use post MI, or for statin use in response to HBC this relationship was not interpreted.

*Individual and Community Level Analysis of*

*Usual Source of Care (Potential Access)*

Table 9 details the analytic results from the logistic regression models predicting the effect of individual socio-demographic and county level variables on having a usual source of care. Three separate models were run to determine the contributions of community level variables and interaction effects to the initial individual level model.

*Individual Level Variables*

Being black (0.71, $p<0.001$) or Hispanic (0.49, $p<0.001$) was associated with a reduced likelihood of having a usual source of care whereas being female in reference to being male, indicated a greater likelihood of having a usual source of care (1.97, $p<0.001$). The variables indicating the elderly and a persons' educational status did not significantly predict having a usual source of care. There was no greater or less likelihood of receiving CHD preventive care services in response to age. But being

Table 9. Logistic regression models predicting the effect of socio-demographic and county level variables on potential access of CHD preventive care for those with CHD/risk

| *Individual Variables* . | Usual source of care Model 1 Individual Factors | Usual source of care Model 2 with Community Level variables | Usual source of care Model 3 with interactions |
|---|---|---|---|
| Black | 0.71(0.06)** | 0.78(0.07)* | 0.81(0.09) |
| Hispanic (other) | 0.49(0.04)** | 0.56((0.05)** | 0.58(0.07)** |
| Female (male) | 1.97(0.09)** | 1.98(0.09)** | 1.97(0.09)** |
| Elderly >75 | 1.04(0.16) | 1.04(0.17) | 1.03(0.16) |
| Age | 1.04(0.00)* | 1.04(0.00)** | 1.04(0.00)** |
| Education (HS Grad)<HS | 1.03(0.07) | 1.04(0.07) | 1.03(0.07) |
| >HS | 1.00(0.06) | 1.02(0.06) | 1.02(0.06) |
| Low Income (Med/High) | 0.87(0.05)* | 0.86(0.05)* | 0.84(0.05)* |
| Uninsured | 0.32(0.02)** | 0.33(0.02)** | 0.31(0.03)** |
| Private HMO (No HMO) | 1.69(0.12)** | 1.67(0.12)** | 1.55(0.14)** |
| *Community Variables* | | | |
| # Physicians/population | | 1.00(0.00) | 1.00(0.00)* |
| HMO penetration | | 1.72(0.39)* | 1.74(0.41)* |
| Percent Poverty | | 0.99(0.01)* | 1.00(0.01)* |
| High Hispanic area | | 0.81(0.07)* | 0.78(0.09)* |
| Low Hispanic area | | 1.21(0.10)* | 1.28(0.12)* |
| Low Black area | | 1.03(0.10) | 1.01(0.09) |
| High Black area | | 0.82(0.07)* | 0.81(0.08)* |
| Black x low Black area | | | 1.17(0.37) |
| Black x low Hispanic area | | | 0.71(0.14) |
| Black x high Hispanic area | | | 1.36(0.25) |
| Hispanic x high Hispanic | | | 0.98(0.15) |
| Hispanic x high Black area | | | 1.06(0.19) |
| *N* | 18,137 | 18,137 | 18,137 |
| *F* test of fit | 111.66 | 67.05 | 51.70 |
| *p* | *0.00* | *0.00* | *0.00* |
| *Adjusted Wald test for* addition of variables to model | _____ | *F=4.36, (0.00)* | *F=1.55 (0.17)* |

Results Reported in Odds Ratio (O.R.) and Standard Error (SE).
*p<0.05
**p<0.001

uninsured (0.32, $p<0.001$) and having a low income (0.87, $p<0.001$) were both associated with a reduced likelihood of having a usual source of care. Having a private HMO increased the likelihood of having a usual source of care (1.69, $p<0.001$).

*Community Variables*

Model statistics indicate that the addition of community level variables did not improve the model for usual source of care, but significant effects of HMO penetration and minority status of a community were observed. For the individual residing in either a high Hispanic (0.81, $p<0.05$) or high black (0.82, $p<0.05$) area there was a reduced likelihood of having a usual source of care. Conversely, for those residing in a low Hispanic area there was an increased likelihood of having a usual source of care (1.21, $p<0.05$). Residing in an area of high HMO penetration increased the likelihood for a usual source of care (1.72, $p<0.39$).

## Summary of Results

In summary, with the exception of cholesterol testing, Hispanic populations were less likely to receive CHD primary preventive care (blood pressure checks, diet and exercise and smoking cessation advice). Blacks with a usual source of care were less likely to receive smoking cessation advice, and like Hispanics, more likely to receive cholesterol testing. Women consistently reported receiving more primary preventive care than men, whereas the elderly report receiving less primary preventive care. Being uninsured and having a low income was associated with receiving less overall CHD preventive care.

Receiving healthcare in an urban environment and having a usual source of care was associated with receiving more CHD preventive care overall.

The logistic regression analyses indicated blacks as receiving significantly less secondary CHD preventive care (beta-blocker post MI). A reduced likelihood for statin use was observed for the elderly (>75 years of age). However, the addition of community level factors did not improve the regression model for statin or beta-blocker use.

Although being female and having an HMO increased the likelihood of having a usual source of care, being black or Hispanic, of low income or being uninsured was associated with a reduced likelihood of having a usual source of care. Further, although the preventive care model was not improved by the addition of community level factors, a significant association with the percentage minority population in a community and the likelihood of having a usual source of care was observed, such that the greater minority percent in a population, the less likelihood of an individual having usual source of care. In the following chapter, these results will be presented within the framework of the study hypotheses and the implications of these results discussed.

# CHAPTER 6: DISCUSSION

The objective of this study was to utilize the Anderson and Aday theoretical framework of access (1974) to investigate the association of predisposing, socio-demographic, enabling, and need factors of the individual, external factors of the health service delivery system and community on the variability in the receipt of coronary heart disease preventive care. In this chapter, the results of the statistical analysis will be discussed as they relate to the proposed hypotheses of the associations between individual and community factors with the receipt of CHD preventive care in a CHD population. Study limitations, policy implications and areas for future research will also be addressed.

## Discussion of Findings by Hypothesis

Findings from the hypothesis testing are detailed based on pre-disposing and enabling factors, potential access and community level factors. The discussion is further categorized by race/ethnicity, gender, age, and health insurance coverage.

### *Race and Ethnicity*

The first study hypothesis, supported by literature on health disparities and minority patients (Nelson, Norris and Mangione, 2002; Shiefer, Escarce, and Schulman, 2000; Stewart et al., 2004; Zuniga, Anderson, and Alexander, 2003), specifically stated that minorities are less likely to receive CHD preventive care services than non-minority

patients. The results from this study noted in Table 10, partially support this hypothesis in that Hispanics reported a reduced likelihood in the receipt of most all primary preventive care services except cholesterol testing, as compared to other races (Caucasians and others), and blacks exhibit a reduced likelihood of receiving secondary preventive care.

Table 10. Hypotheses testing for Pre-Disposing Factors and CHD Preventive Care

| Hypothesis | Diet counseling | Exercise counseling | Blood pressure check | Cholesterol testing | Smoking cessation advice | Statin | Beta-blocker |
|---|---|---|---|---|---|---|---|
| H-1 Black | o | o | o | o | o | o | - |
| H-1 Hispanic | - | o | - | o | - | o | o |
| H-2 Elderly | - | - | o | - | - | - | o |
| H-3 Female | nt | nt | nt | nt | nt | o | o |

+ Hypothesis supported (greater likelihood of receiving care)
- Hypothesis supported (less likelihood of receiving care)
o Hypothesis not supported (no more or less likelihood)
nt Not tested

Hispanics and blacks at risk for CHD reported a greater likelihood of receiving blood cholesterol screening within five years than other races, findings contrary to hypothesis one. The increase in cholesterol screening might be attributed to a greater awareness of personal risk factors. Public awareness of CHD risk associated with high blood cholesterol has increased due to public information strategies initiated in part by the National Cholesterol Education programs in the last two decades (Summary of the second report of the National Cholesterol Education Program (NCEP) 1993; Schucker et al 1991). Natarajan and Nietert (2003), in their examination of national trends in

screening and treatment of CHD risk factors, report that the proportion of U.S. adults who claim to have received cholesterol screening in the past five years rose from 47% to 70% in the ten years prior to 1998. The greater likelihood of cholesterol testing in blacks and Hispanics may be a result of initiatives to reduce disparity in health care, which are more likely to target minority groups at risk. Additional support in the literature for a minority increase in the receipt of cholesterol screening for minorities includes the Williams, Flocke, and Stange, (2001) report that indicates Black patients with primary care access receive preventive services at rates equal to or greater than white patients.

Disparities in smoking cessation advice between minorities and non-minorities are well supported in the literature (Franks, Fiscella and Meldrum 2005; Fiscella and Franks, 2005). Although a reduced likelihood of receiving smoking cessation advice was observed for Hispanics, it was not observed for blacks as compared to non-smokers. It may be possible that blacks did not exhibit a significantly lower likelihood to receive smoking cessation advice in this study due to differences in agreement between provider notes and patient recall concerning smoking cessation advice (Pollak, Yarnall, Rimer, Lipkus, & Lyna, 2002). It is interesting to note however that assessing those persons with a usual source of care did result in blacks exhibiting a significant less likelihood of receiving smoking cessation advice.

*Age and the Elderly*

Cardiovascular disease prevention guidelines that are targeted to the elderly over 75 years of age provide a considerable cost benefit (Marshall 2005). However it is supported in the background literature and thus stated as the second study hypothesis that

elderly patients, greater than 75 years of age, would experience less CHD preventive care overall (Ganz et al., 1999; Krumholz et al., 1999; Rathore et al., 2000;Wang and Stafford, 1998). This was found to be true for the primary preventive care services of cholesterol testing, diet, exercise and smoking cessation counseling as well as statin drug use for the treatment of high blood cholesterol as noted in table 10. The hypothesis was not supported however when examining the data for patients receiving a blood pressure check or beta-blocker use after MI. The finding that there is no less likelihood of blood pressure check for the elderly may indicate that this particular screening tool is common for the elderly. The study hypothesis suggests that the elderly will have a reduced likelihood of beta-blocker use, yet this was not supported by the analytic results. Conversely, an increased likelihood of beta-blocker use in the elderly was reported in a study with elderly Medicare patients who had a higher overall income (Rao, Schulman, Curtis, Gersh, and Jollis, 2004) or employee-sponsored coverage in addition to Medicare, (Federman, Adams, Ross-Degnan, Soumeral, and Ayanian, 2001). However when controlling for income and insurance coverage in this study, no significant association of beta-blocker use and the elderly was found. The lack of significant findings may be reflective of the complexity of pharmacological treatment in the elderly population. Co-morbidities and contraindications for prescribed medications may play a significant role in use of beta-blocker in this age group and should be further explored.

*Gender*

The study's third hypothesis states that female patients would be less likely to receive secondary CHD preventive care. Yet despite the majority of literature that

indicates women are receiving less CHD pharmacological care than men (Barakat, 2001; Hayes, Weisman, & Clark, 2003; Phillips et al., (2000);Rathore et al., 2000; Sambamoorthi and McAlpine, 2003;Sheifer, Escarce, & Schulman, 2000), women in this study were found to be no less likely to receive secondary preventive care as men. There are limited data on physician knowledge and behavior concerning CHD prevention in women, yet the observed increase in secondary CHD prevention for the women in this study may reflect improvements in physician and patient awareness of CHD as a significant risk to women's health versus the stereotype of CHD as a male disease. Specific clinical guidelines like those developed by the American Heart Association for CHD prevention in women and detailed by Mosca et al. (2004) may increase the opportunity for women to receive appropriate CHD care.

*HMO and Provider Type*

The enabling factors of provider type and HMO insurance coverage were addressed in hypothesis four and five. Hypothesis four was unable to be tested due to inconsistencies in the variable measurement for provider type, however the results of hypothesis testing for hypothesis five is detailed in Table 11.

Table 11. Hypotheses testing for enabling factors in relationship to CHD preventive care

| Hypothesis | Diet counseling | Exercise counseling | Blood pressure check | Cholesterol testing | Smoking cessation advice |
|---|---|---|---|---|---|
| H-4 Provider Type | nt | nt | nt | nt | nt |
| H-5 HMO | o | o | o | o | o |

o Hypothesis not supported (no more or less likelihood)
nt not tested

*Provider of Care*

Hypothesis four, which states patients of primary care providers are less likely to receive secondary CHD preventive care, was unable to be tested as the variable of provider type was eliminated from the regression analysis on the basis of insufficient primary sampling units per stratum. Attempts to utilize the variable in question required recoding into different sub groups to satisfy the analytical program requirements. However multiple recoding still did not allow for testing of the specific hypothesis posed. Further details are provided in the results section of Chapter 4. Future analysis would need other physician variables that could provide more specific data detailing specialist and primary care physicians.

*Managed Care Coverage*

Hypothesis five indicates that patients enrolled in an HMO are more likely to receive primary CHD preventive care. There was no evidence that patients who were enrolled in an HMO were more likely to receive primary CHD preventive care than those who although were otherwise insured but were not a part of an HMO. Although Rizzo (2005) suggests that there is a higher incidence of preventive care among HMO enrollees, it may be that other factors like continuity of care (Doescher, Saver, Fiscella, & Franks, 2004) have a greater impact on the receipt of CHD preventive care than type of health plan. The incorporation of a variable that measures continuity of care within health plans may have provided additional information to the role of health plan and CHD preventive care.

Table 12 details support or lack of support for hypothesis six through nine that addresses potential access, (usual source of care) and the effect of controlling for usual source of care for minorities, the elderly and women in the receipt of CHD preventive care.

Table 12. Hypotheses testing for potential access in relationship to CHD preventive care

| Hypothesis | Diet counseling | Exercise counseling | Blood pressure check | Cholesterol testing | Smoking cessation advice | Statin | Beta-blocker |
|---|---|---|---|---|---|---|---|
| H-6 Usual Source of Care | + | + | + | + | + | + | + |
| H-7 Black | o | o | o | o | - | o | - |
| H-7 Hispanic | o | o | o | o | - | o | o |
| H-8 Female | nt | nt | nt | nt | nt | o | o |
| H-9 Elderly | - | - | o | o | - | - | o |

+ Hypothesis supported (greater likelihood of receiving care)
- Hypothesis supported (less likelihood of receiving care)
o Hypothesis not supported (no more or less likelihood)
nt - not tested

*Potential Access*

As hypothesized, having a usual source of care was associated with an increased likelihood of receiving all CHD preventive care services. However in addressing hypotheses seven through nine by further limiting the regression analysis to the sub sample of those with a usual source of care, it was found that having a usual source of care was not associated with an increased likelihood of receiving CHD preventive care services for Hispanics and the elderly, or for secondary preventive services for women beyond the findings from the first three hypotheses. As stated previously, Blacks however, when controlling for usual source of care, experienced a reduced likelihood of

receiving smoking cessation advice indicating that access to care does not improve likelihood of receiving smoking cessation advice. It is also possible that having a usual source of care over time leads to the assumption on the part of the health care provider that the patient has already received preventive care information. Patient factors relating to inaccurate recall (Pollak, Yarnall, Rimer, Lipkus,& Lyna ,2002), or minority patients' lack of trust for their health care provider (Corbie-Smith, Thomas, & St. George, 2002) may play a role in the lack of CHD care received. It is possible that physician bias in preventive care practices for the minority CHD patient also plays a role in the lack of care received. Fincher et al (2004) suggest that socioeconomic factors, individual racism, and institutional racism also contribute to differential CHD treatment. Usual source of care was predicted by the percent ethnicity of the patients' resident county such that, being in either a high black or high Hispanic area was associated with a less likelihood of having a usual source of care. Prior research suggests this may be related to less availability of primary care physicians or health care providers in urban areas (Rabinowitz and Paynter, 2003).

Hypotheses seven suggests that beyond having a usual source of care, minorities are still less likely to receive CHD preventive care. Despite that having a usual source of care greatly increased the likelihood of receiving smoking cessation advice for most, it did not increase the likelihood of receiving smoking cessation advice for blacks or Hispanics. With the exception of cholesterol testing, which remained at a higher likelihood of receipt for both blacks and Hispanics, Hispanics with a usual source of care did not improve their likelihood of receiving any primary preventive services and blacks

continued to exhibit a reduced likelihood of receiving beta-blocker after MI. These results indicate that beyond potential access racial disparity persists in the receipt of primary CHD preventive care. The results may also suggest that although improvements in primary prevention may be occurring in the black community, they are not necessarily occurring in the Hispanic community. Cultural sensitivity plays a role in reducing healthcare disparity in the ethnic community (Tucker, Herman, Pederson, Higley, Montrichard, and Ivery 2003). It is possible that targeted attention to the access and preventive healthcare needs of the black community may have increased the receipt of these services. Further the Hispanic population has specific cultural needs like language barriers and immigration status (Napoles-Springer, Santovo, Houston, Perez-Stable, Stewart, 2005) which when not sufficiently addressed, may contribute to reduce realized access to CHD preventive care.

In relation to secondary CHD preventive care, (beta-blocker after MI, and statin use for cholesterol control), results indicate that blacks and Hispanics did not exhibit any significant difference from whites and others in the likelihood for statin use. However, as hypothesized, blacks were significantly less likely than whites and others to receive beta-blocker after MI. Despite recent research that suggests beta-blocker use is appropriate and beneficial for African Americans as well as Caucasian heart patients (Douglas et al. 2003; Goldstein, 2004; Smith et al. 2001; Yancy, Laskar &Eichhorn, 2004), it is possible that some physicians may be prescribing a different class of drugs other than beta-blocker to the black population in response to concerns that black patients may respond differently and less beneficially to certain heart failure drugs than Caucasian patients

(Carson, Ziesche, Johnson,& Cohn,1999). The role of co-morbidities may play role in disparities for beta-blocker use, such that if minorities present later with more contraindications, certain pharmaceuticals maybe less likely to be prescribed.

*Community Effects*

The hypothesis that stated patients who reside in areas of high managed care penetration are less likely to receive secondary CHD preventive care (H-10) and patients who reside in an area of high prevalence of minority persons will be less likely to receive CHD secondary preventive care (H-11), required community level factors in the models tested. The hypotheses addressing community level factors and the receipt of CHD preventive care services were not substantiated by the results of this study as seen in Table 13.

Table 13. Hypotheses testing for community level factors and CHD preventive care

| Hypothesis | Statin | Beta-blocker |
|---|---|---|
| H-10 MC Penetration | o | o |
| H-11 High % Minority | o | o |

o- Hypothesis not supported (no more or less likelihood)

Specifically, no significant effect of living in an area with greater managed care penetration was observed for secondary preventive care. Additionally persons living in areas of high prevalence minority concentration although more likely to be without a usual source of care, were no less likely to receive CHD secondary preventive care than those living in low to moderately minority-concentrated areas.

It is possible that the lack of effect of community level factors on the receipt of CHD preventive care may be attributed to the lack of specificity of the data. Yet it is also possible that care is being provided equitably and that community level factors are not contributing to disparate health care practices.

## Overall Summary Of Results

Overall, factors of gender and race and insurance status were consistent predictors of CHD preventive care receipt. The hypotheses concerning diet counseling and smoking cessation were supported more often than those concerning the other primary preventive care services.

Women did not demonstrate a reduced likelihood of receiving secondary preventive care as originally hypothesized, but surprisingly were found to be more likely to receive primary preventive CHD services than men. The Hispanic population did not indicate a reduced likelihood for secondary preventive care as compared to the Caucasian/other race community, although they did exhibit a significant reduced likelihood of receiving most primary CHD preventive care services. Blacks demonstrated a reduced likelihood of receiving secondary CHD preventive care (beta-blocker post MI) indicating that disparities in secondary CHD preventive care persist for segments of the study population, however, no less likelihood for the receipt of primary CHD preventive care was observed for blacks. Elderly persons over 75 years of age exhibited a reduced likelihood of receiving most primary CHD preventive care services as well as statin use for high blood cholesterol.

Although community ethnic factors indicated a higher percent ethnicity of a community is associated with less likelihood of an individual having a usual source of care, other community level factors failed to provide any predictive ability to the receipt of CHD preventive care. However, prior literature indicates their continued importance for inclusion in the research equation (Benjamins, Kirby & Huie, 2004;Diex-Rouz, 1997; Has et al 2003).

## Limitations

The limitations of observational cross-sectional design and survey secondary data sources apply to this study as discussed previously in chapter four. Study limitations relating to variable selection are included in this section.

Personal and behavioral characteristics of the provider or patient were not included in this analysis but may provide additional information about the nature of disparities in the provision of CHD preventive care. The provider survey has the advantage of incorporating patient's medical records, however, the provider survey is also subject to self report bias by the physicians (Adams, Soumerai,, Lomas, and Ross-Degnan, 1999). Patient behavioral characteristics were not addressed in this study but would be an asset in providing a more complete picture of variability in preventive care receipt of which some is driven by the patient. Other less understood health service delivery factors like hospital level effects of different practice patterns in Black areas, differences in hospital procedures between different ethnic communities, and the mix of physician type within a community may contribute to disparity as well (Barnato et al 2005).

This study is limited by the definition of CHD and CHD risk in that it does not include metabolic syndrome. Metabolic syndrome is a combination of several indices including body weight and compromised insulin response that independently are also contributing factors in the development of CHD. An estimated 47 million adults in the U.S. are thought to have this syndrome (AHA 2005). Information on this specific condition is not provided by the MEPS data. This study addressed the impact of diabetes on CHD risk by including diabetes in the CHD risk (need) variable. Yet for other possible confounding issues concerning the nature of CHD diagnosis, future research may need to further address the issue of co-morbidities associated with CHD. A detailed severity index may also contribute to the understanding of predictive variables for CHD preventive care.

Another indicator or indicators may measure potential access better than the measure of usual source of care used in this analysis. The MEPS 2002 data set does not provide a variable to assess a regular source of care, which would be valuable in assessing continuity of care.

The variables selected to measure provider type and site of care were eliminated from the analysis due to reducing the secondary preventive care sub-sample to conditions treated by limited specialty providers and the statistical limitations of the STATA program. The availability of more specific provider data would likely provide additional information about what factors predict the receipt of CHD preventive care.

It would have been interesting to follow the indications from the bivariate analysis that suggests those with publicly provided health insurance receives more CHD

preventive care services than those with private health insurance. Other variables highly correlated with public and private insurance variables made the distinction impossible in this analysis.

Limitations of the data include less than optimal measures of physician availability, and percent ethnicity of the community in which patients live. The percent ethnicity of where a person lives does not reflect the area from which they receive their healthcare thereby possibly compromising the measure intended to assess a difference of racial composition of the community on receipt of preventive care. There may also be certain characteristics of the community level factors that are endogenous to characteristics of the individuals who make up the community. Randomized experimental design is the only absolute way to estimate group-level effects on individual outcomes.

Although this inquiry is concerned with provider based preventive care it is acknowledged that there are other sources of preventive care sources not identified in this study, i.e., public health information, and that it is impossible to account for all sources of preventive care information that patients may receive.

## Policy Implications and Future Research

CHD preventive care like many areas of health care is subject to potential racial, age and gender disparities. The implications for inconsistent CHD preventive care are both costly and unnecessary. Evidence-based medicine clearly indicates the value added effect of CHD preventive care measures for the groups described in this study. Patients and healthcare providers can benefit by increased awareness of subtle inconsistencies in

the application of these health care guidelines concerning a disease state that costs U.S. in healthcare costs and lives lost.

It would be interesting to repeat this study including additional years to assess the effects of change in CHD preventive care services provided over time. A greater geographical breakdown may also contribute additional information on provider practice patterns concerning CHD preventive care and the populations they serve.

The limited diet and exercise care that is observed in this study may be related to the shortage of credible information on evidence-based guidelines for diet and physical activity in relation to the prevention and treatment of CHD risk. As a response to federal health disease prevention initiatives like Healthy People 2010, researchers are attempting to detail nutrition and physical activity research strategies and recommendation for chronic disease prevention (Prentice et al. 2004). Collecting data on individual achievement toward meeting the recommendations will enrich future studies.

Future research on CHD preventive care might also include information on provider and patient behavior to elucidate inconsistencies in the receipt of CHD preventive care not accounted by access issues. Although they were not tested in this study, physician, patient and system level barriers likely contribute to the lack of CHD preventive care beyond establishing a usual source of care. Physician barriers may include provider beliefs and lack of preventive care education. Patient level barriers of patients lack of trust in their healthcare provider and lack of awareness of personal health risk may also contribute to the preventive care inadequacies identified in this study. System level barriers like organization of care around the acute care visit, time constraints

in healthcare settings, reimbursement and health plan issues, inadequate physician education and materials, lack of behavioral programs for referral, and lack of incentives to provide better care for the chronically ill (Amonkar 1999; Cabana and Kim 2003; Cheng 1999; Hayes et al. 2003) may also contribute to the inconsistent preventive care provided to the study population.

For future research it would be valuable to examine the design of insurance coverage as a factor in the prediction of the receipt of CHD preventive care, a measure not available for this inquiry. However it would be necessary to first determine if specific insurance coverage policies include CHD preventive care as a benefit, and to obtain agreement within organizations on the definition of these services and their subsequent appropriate utilization within the CHD population.

Different practice patterns of health care providers and health care systems would be important to include in future research on disparities in CHD preventive care. Barnato et al. (2005), discusses racial disparity for MI treatment including beta-blocker post MI, by suggesting that investigating differences in hospital procedures between different ethnic communities may contribute to an understanding of healthcare disparity and that hospital level interventions may be beneficial in reducing those disparities.

Weintraub and Vaccarion (2003), in addressing racial disparities in coronary outcomes in women, pose the questions of whether some of the observed racial disparities in CHD healthcare may relate to the question of when blacks seek care, if in fact a delay occurs because they may be sicker when seeking treatment than other racial

groups. It would be interesting to investigate whether a delay in seeking treatment is a function of patients' lack of trust of the health care provider.

Additionally, by including variables that more precisely target community level factors of access, physician availability and social capital, it may be possible to define the relationship between community and individual factors in the receipt of CHD preventive care. Currently there is limited, but promising research on community level factors as they relate to preventive care (Benjamins, Kirby, and Huie, 2004; Diez-Roux et al 2003; Finkelstein et al. 2004; Haas et al. 2004). The use of consistent measures across study settings and design will help to contribute to a more cohesive body of literature from which to build a frame of reference in this area of research.

In conclusion, the results of this research provide some evidence of the improved likelihood of receiving appropriate CHD preventive care for minorities and women as well as a lack of disparate secondary preventive care practices in response to community ethnic make up and health care access issues. On the other hand, the findings of this study also reinforce previous findings of insufficient, and at times disparate, CHD preventive care in a population of need in relation to individual enabling and pre-disposing variables. The results should encourage a more detailed investigation into the factors that affect the receipt of CHD preventive care as the U.S. is witnessing a rise in the incidence of chronic disease, including CHD, that is costly in dollars and human lives. That the incidence of CHD and CHD risk factors are clearly related to mutable lifestyle behaviors, should encourage individuals, healthcare providers, health care systems, health

educators, and policy makers to further CHD preventive care on the agenda for health initiatives in the U.S.

# Literature Cited

# Literature Cited

Adams, A.S., Soumerai, S.B., Lomas, J.D., & Ross-Degnana, D. (1999). Evidence of self report bias assessing adherence to guidelines. *Int. J. for Quality in Healthcare*, 11, 187-192.

Aday, L. A. & Andersen, R. M. (1974). A framework for the study of access to medical care. *Health Serv Res,* 9, 208-220.

Aday, L. A. & Andersen, R. M. (1981). Equity of access to medical care: a conceptual and empirical overview. *Med Care*, 19, 4-27.

Aday, L. A., Begley, C. E., Lairson, D. R., & Slater, C. H. (1993). Evaluating the medical care system: effectiveness, efficiency and equity, (First ed.) Health Administration Press, Ann Arbor, MI.

Aday, L. A., Begley, C. E., Lairson, D. R., & Slater, C. H. (1998). Evaluating the healthcare system: effectiveness, efficiency and equity, (Second ed.) Health Administration Press, Chicago.

Almeida, R.A., Dubay, L.C., Ko, G. (2001). Access to care and use of health services by low-income women. *Health Care Financing Review*, 22(4) 27.

Altman D.G. (1991). Practical statistics for medical research, Chapman and Hall, London.

American Heart Association. (2003). Heart disease and stroke statistics-2003 update. American Heart Association, Dallas, TX.

American Heart Association. (2004). Heart disease and stroke statistics-2004 update. American Heart Association, Dallas, TX.

American Heart Association. (2005). Heart disease and stroke statistics-2005 update. American Heart Association, Dallas, TX.

Amonkar, M.M., Madhavan, S., Rosenbluth, S.A., & Simon, K.J. (1999). Barriers and facilitators to providing common preventive screening services in managed care settings. *J Community Health*, 24, 229-247.

Andrews, J. O., Graham-Garcia, J., & Raines, T. L. (2001). Heart disease mortality in women: racial, ethnic, and geographic disparities. *J Cardiovasc.Nurs.*, 15, 83-87.

Anis, N. A., Lee, R. E., Ellerbeck, E. F., Nazir, N., Greiner, K. A., & Ahluwalia, J. S. (2004). Direct observation of physician counseling on dietary habits and exercise: patient, physician, and office correlates. *Prev Med*, 38, 198-202.

Artinian Nancy T., Schim Stephanie Myers, Wal Jillon S.Vander, & Nies Mary A. (2004) eating patterns and cardiovascular disease risk in a Detroit Mexican American population. *Public Health Nursing*, 21, 425-435.

Ayanian, J. Z., Zaslavsky, A. M., Weissman, J. S., Schneider, E. C., & Ginsburg, J. A. (2003). Undiagnosed hypertension and hypercholesterolemia among uninsured and insured adults in the Third National Health and Nutrition Examination Survey. Am J Public Health, 93, 2051-2054.

Baker, D. W., Parker, R. M., Williams, M. V., Pitkin, K., Parikh, N. S., Coates, W., & Imara, M. (1996). The health care experience of patients with low literacy. *Arch.Fam.Med*, 5, 329-334.

Baker, D. W., Stevens, C. D., & Brook, R. H. (1996). Determinants of emergency department use: are race and ethnicity important? *Ann Emerg.Med*, 28, 677-682.

Barakat, K. (2001). Acute myocardial infarction in women: Contribution of treatment variables to adverse outcomes. *JAMA,* 285, 520-530.

Barnato, A. E., Lucas, F. L., Staiger, D., Wennberg, D. E., & Chandra, A. (2005). Hospital-level racial disparities in acute myocardial infarction treatment and outcomes.

Barnett, E. & Halverson, J. (2000). Disparities in premature coronary heart disease mortality by region and urbanicity among black and white adults ages 35-64, 1985-1995. *Public Health Rep.*, 115, 52-64.

Barnett, E., Halverson, J. A., Elmes, G. A., & Braham, V. E. (2000). Metropolitan and non-metropolitan trends in coronary heart disease mortality within Appalachia, 1980-1997. *Ann.Epidemiol.*, 10, 370-379.

Bedinghaus, J., Leshan, L., & Diehr, S. (2001). Coronary artery disease prevention: what's different for women? *Am.Fam.Physician*, 63, 1393-1396.

Bednarek, H. L. & Schone, B. S. (2003). Variation in preventive service use among the insured and uninsured: does length of time without coverage matter? *J Health Care Poor Underserved*, 14, 403-419.

Benjamins, M.R., Kirby, J.B., & Bond Huie, S.A. (2004). County characteristics and racial and ethnic disparities in the use of preventive services. *Prev Med.* 39, 704-12.

Bernadet, P. (1995). Benefits of physical activity in the prevention of cardiovascular diseases. *Journal of Cardiovascular Pharmacology*, 25, S3-S8.

Betancourt, J. R. & Maina, A. W. (2004). The Institute of Medicine report "Unequal Treatment": implications for academic health centers. Mt.Sinai J.Med., 71, 314-321.

Bolin, J. and Gamm,L.(2003). Access to Quality Health Services in Rural areas-Insurance. Rural Healthy People 2010: A companion document to Healthy People 2010. Volume 1. College Station, TX: The Texas A&M University System Health Science Center, School of Rural Public Health, Southwest Rural Health Research Center.

Broyles, R. W., Narine, L., & Brandt, E. N. (2002). The temporarily and chronically uninsured: Does their use of primary care differ? *Journal of Health Care for the Poor and Underserved,* 13, 95-111.

Bundorf, M. K., Schulman, K. A., Stafford, J. A., Gaskin, D., Jollis, J. G., & Escarce, J. J. (2004). Impact of managed care on the treatment, costs, and outcomes of fee-for-service Medicare patients with acute myocardial infarction. *Health Serv.Res*, 39, 131-152.

Buttram, R.T., Folger, R & Sheppard, B.H. (1995) "Equity, equality and need: Three faces of social justice," In Conflict, Cooperation, and Justice: Essays Inspired by the Work of Morton Deutsch, Eds. B.B. Bunker and Morton Deutsch, p. 261. Jossey-Bass Inc. Publishers, San Francisco.

Cabana, M. D. & Kim, C. (2003). Physician adherence to preventive cardiology guidelines for women. *Womens Health Issues*, 13, 142-149.

Carrasquillo, O., Lantigua, R. A., & Shea, S. (2001). Preventive services among Medicare beneficiaries with supplemental coverage versus HMO enrollees, Medicaid recipients, and elders with no additional coverage. *Med Care*, 39, 616-626.

Carson, P., Ziesche,S., Johnson,G., & Cohn,J. (1999). Racial differences in response to therapy for heart failure: analysis of the vasodilator-heart failure trials. Vasodilator-Heart Failure Trial Study Group. *Journal of Cardiac Failure*, 5(3):178-187.

Centers for Disease Control and Prevention (2002). Smoking-attributable mortality, morbidity, and economic costs (SAMMEC): adult SAMMEC and maternal and child health (MCH) SAMMEC software. Available at http://www.cdc.gov/tobacco/sammec.

Center for Medicaid and Medicare Services, (2004). National Health Expenditures for 1995. Retrieved February 9,2006 http://new.cms.hhs.gov/apps/media/press/release.asp.

Centers for Disease Control, (2005). Trends in Cholesterol Screening and Awareness of High Blood Cholesterol - United States, 1991—2003. Morbidity and Mortality Weekly Review. Retrieved February 9,2006. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5435a2.htm.

Centers for Disease Control and Prevention (2005). Racial/Ethnic Disparities in Prevalence, Treatment, and Control of Hypertension --- United States, 1999—2002. Morbidity and Mortality Weekly Review. Retrieved, January 20, 2005. **http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5401a3.htm**

Cheng, T.L., DeWitt, T.G., Savageau, J.A., & O'Connor, K.G. (1999). Determinants of counseling in primary care pediatric practice: Physician attitudes about time, money, and health issues. *Archives of Pediatrics & Adolescent Medicine*, 153(6), 629-635.

Cohen, R. A., Bloom, B., Simpson, G., & Parsons, P. E. (1997). Access to health care. Part 3: Older adults. Vital Health Stat 10, 198, 1-32.

Coleman, J. S. (1990). Foundations of Social Theory. The Belknap Press of Harvard University Press, Cambridge, MA.

Cooper, R., Cutler, J., Desvigne-Nickens, P., Fortmann, S. P., Friedman, L., Havlik, R., et al. (2000). Trends and disparities in coronary heart disease, stroke, and other cardiovascular diseases in the United States - Findings of the National Conference on Cardiovascular Disease Prevention. *Circulation*, 102, 3137-3147.

Corbie-Smith, G., Flagg, E. W., Doyle, J. P., & O'Brien, M. A. (2002). Influence of usual source of care on differences by race/ethnicity in receipt of preventive services. *J.Gen.Intern.Med.*, 17, 458-464.

Corbie-Smith G., Thomas, S.B., & St George, D.M. (2002). Distrust, Race and research. Arch. *Inter Med* 162(21), 2458-63.

Critchley, J. & Capewell, S. (2004). Smoking cessation for the secondary prevention of coronary heart disease. Cochrane.Database.Syst.Rev. CD003041.

Cunningham, P. J. (1999). Pressures on safety net access: the level of managed care penetration and uninsurance rate in a community. *Health Serv.Res.*, 34, 255-270.

Cunningham, P. J. & Trude, S. (2001). Does managed care enable more low income persons to identify a usual source of care? Implications for access to care. *Med Care*, 39, 716-726.

Daniels, N., Kennedy, B., & Kawachi, I. (2000). Is inequality bad for our health? Beacon Press, Boston, MA.

Deedwania, P.C., Amsterdam, E.A., & Vagelos, R.H. (1997). Evidence-based, cost-effective risk stratification and management after myocardial infarction. *Archives of Internal Medicine,*157(3), 273-280.

DeLaet, D. E., Shea, S., & Carrasquillo, O. (2002). Receipt of preventive services among privately insured minorities in managed care versus fee-for-service insurance plans. *J Gen.Intern Med,* 17, 451-457.

De Parle, N.A. (2000). Promoting Prevention, *JAMA*, 283(12), 1558.

DeVoe, J. E., Fryer, G. E., Phillips, R., & Green, L. (2003). Receipt of preventive care among adults: Insurance status and usual source of care. *American Journal of Public Health,* 93, 786-791.

Diez-Roux, A. V., Link, B. G., & Northridge, M. E. (2000). A multilevel analysis of income inequality and cardiovascular disease risk factors. *Soc.Sci.Med.*, 50, 673-687.

Diez-Roux, A. V. (2003). Residential environments and cardiovascular risk. *J Urban.Health*, 80, 569-589.

Diez-Roux, A. V., Borrell, L. N., Haan, M., Jackson, S. A., & Schultz, R. (2004). Neighbourhood environments and mortality in an elderly cohort: results from the cardiovascular health study. *J Epidemiol Community Health*, 58, 917-923.

Doescher, M.P., Saver, B.G., Fiscella, K., & Franks, P. (2004). Preventive care. *J Gen Intern Med.*, 19(6), 708-9.

Doll, R. (1992). The lessons of life: Keynote address to the nutrition and cancer conference. *Cancer Res*, 52, 2024s-2029s.

Donabedian, A. (1966). Evaluating the quality of medical care. *Milbank Mem.Fund.Q.*, 44, Suppl-206.

Dornbrook-Lavender, K. A., Roth, M. T., & Pieper, J. A. (2003). Secondary prevention of coronary heart disease in the elderly. *Ann.Pharmacother.*, 37, 1867-1876.

Douglas, J.G., Bakris, G.L., Epstein, M., Ferdinand, K.C.,Ferriario, C., Flack,J.M., et al. (2003).Management of High Blood Pressure in African Americans. *Arch Int Med.* 163, 525-541.

Eaton, C. B., Goodwin, M. A., & Stange, K. C. (2002). Direct observation of nutrition counseling in community family practice. *American Journal of Preventive Medicine*, 23, 174-179.

Egede, L. E. & Zheng, D. (2002). Modifiable cardiovascular risk factors in adults with diabetes: prevalence and missed opportunities for physician counseling. *Arch.Intern Med,* 162, 427-433.

Erlinger, T. P., Vollmer, W. M., Svetkey, L. P., & Appel, L. J. (2003). The potential impact of nonpharmacologic population-wide blood pressure reduction on coronary heart disease events: pronounced benefits in African-Americans and hypertensives. *Prev.Med.*, 37, 327-333.

Escarce, J. J., Polsky, D., Wozniak, G. D., & Kletke, P. R. (2000). HMO growth and the geographical redistribution of generalist and specialist physicians, 1987-1997. *Health Serv.Res*, 35, 825-848.

Evashwick, C., Rowe, G., Diehr, P., & Branch, L. (1984). Factors explaining the use of health care services by the elderly. *Health Serv.Res.*, 19, 357-382.

Everly, M. J., Heaton, P. C., & Cluxton, R. J., Jr. (2004). Beta-blocker underuse in secondary prevention of myocardial infarction. *Ann.Pharmacother.*, 38, 286-293.

Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, And Treatment of High Blood Cholesterol In Adults (Adult Treatment Panel III) (2001). *JAMA*, 285, 2486-2497.

Eyre, H., Kahn, R., Robertson, R. M., Clark, N. G., Doyle, C., Hong, Y., Gansler, T., Glynn, T., Smith, R. A., Taubert, K., & Thun, M. J. (2004). Preventing cancer, cardiovascular disease, and diabetes: a common agenda for the American Cancer Society, the American Diabetes Association, and the American Heart Association. *Circulation,* 109, 3244-3255.

Federman, A. D., Adams, A. S., Ross-Degnan, D., Soumerai, S. B., & Ayanian, J. Z. (2001). Supplemental insurance and use of effective cardiovascular drugs among elderly medicare beneficiaries with coronary heart disease. *JAMA*, 286, 1732-1739.

Fields, D.H. (1999, February 22). Prevention usually costs more than cure. Business Week, February 22, 1999, 14.

Fincher, C., Williams, J. E., MacLean, V., Allison, J. J., Kiefe, C. I., & Canto, J. (2004). Racial disparities in coronary heart disease: A sociological view of the medical literature on physician bias. *Ethnicity & Disease*, 14, 360-371.

Finkelstein, E. A., Khavjou, O. A., Mobley, L. R., Haney, D. M., & Will, J. C. (2004). Racial/ethnic disparities in coronary heart disease risk factors among WISEWOMAN enrollees. *Journal of Womens Health*, 13, 503-518.

Fiscella, K., & Franks, P. (2005). Is patient HMO insurance or physician HMO participation related to racial disparities in primary care? *Am J Manag Care* 11(6). 397-402.

Fisher, E. S., Wennberg, D. E., Stukel, T. A., Gottlieb, D. J., Lucas, F. L., & Pinder, E. L. (2003). The content, quality, and accessibility of care (The implications of regional variations in Medicare spending, part 1). *Annals of Internal Medicine*, 138, 273-288.

Franks, P., Fiscella, K., & Meldrum, S. (2005) Racial disparities in the content of primary care office visits. *J Gen Intern Med* 20(7), 599-603.

Frijling, B. D., Lobo, C. M., Keus, I. M., Jenks, K. M., Akkermans, R. P., Hulscher, M. et al. (2004). Perceptions of cardiovascular risk among patients with hypertension or diabetes. *Patient Educ Couns.*, 52, 47-53.

Gamm, L., Castillo, G., & Pittman, S. (2003). Access to quality health services in rural areas-primary care. In Rural Healthy People 2010: A companion document to Healthy People 2010. Vol.1. 45-51.

Ganz, D. A., Lamas, G. A., Orav, E. J., Goldman, L., Gutierrez, P. R., & Mangione, C. M. (1999). Age-related differences in management of heart disease: a study of cardiac medication use in an older cohort. Pacemaker Selection in the Elderly (PASE) Investigators. *J Am Geriatr.Soc*, 47, 145-150.

Gentry, D., Longo, D. R., Housemann, R. A., Loiterstein, D., & Brownson, R. C. (1999). Prevalence and correlates of physician advice for prevention: impact of type of insurance and regular source of care. *J Health Care Finance.*, 26, 78-97.

Glasgow, R. E., Eakin, E. G., Fisher, E. B., Bacak, S. J., & Brownson, R. C. (2001). Physician advice and support for physical activity - Results from a national survey. *American Journal of Preventive Medicine,* 21, 189-196.

Goff, D. C., Jr., Gu, L., Cantley, L. K., Parker, D. G., & Cohen, S. J. (2002). Enhancing the quality of care for patients with coronary heart disease: the design and baseline results of the hastening the effective application of research through technology (HEART) trial. *Am.J.Manag.Care*, 8, 1069-1078.

Goldstein S.(2004). Beta-blocker therapy in African American patients with heart failure. *Heart Fail Rev*, 9(2), 161-7.

Gorin, S. S. & Heck, J. E. (2004). Meta-analysis of the efficacy of tobacco counseling by health care providers. *Cancer Epidemiol.Biomarkers Prev.*, 13, 2012-2022.

Gotsman, M. S. & Admon, D. (1998). Paradigm shifts in coronary artery disease: the old new initiatives. *Arch.Intern Med*, 158, 949-953.

Greene, J., Blustein, J., & Laflamme, K. A. (2001). Use of preventive care services, beneficiary characteristics, and Medicare HMO performance. *Health Care Financ.Rev.*, 22, 141-153.

Gresenz, C. R., Stockdale, S. E., & Wells, K. B. (2000). Community effects on access to behavioral health care. *Health Serv.Res*, 35, 293-306.

Grundy, S. M. (2000). Cholesterol management in the era of managed care. *American Journal of Cardiology*, 85, 3A-9A.

Grundy, S. M., Balady, G. J., Criqui, M. H., Fletcher, G., Greenland, P., Hiratzka, L. F., et al. (1998). Primary prevention of coronary heart disease: Guidance from Framingham : A Statement for healthcare professionals From the AHA Task Force on Risk Reduction. *Circulation*, 97, 1876-1887.

Gulzar, L. (1999). Access to health care. *Image J.Nurs.Sch*, 31, 13-19.

Haas, J. S., Phillips, K. A., Sonneborn, D., McCulloch, C. E., & Liang, S. Y. (2002). Effect of managed care insurance on the use of preventive care for specific ethnic groups in the United States. *Med Care,* 40, 743-751.

Haas, J. S., Phillips, K. A., Sonneborn, D., McCulloch, C. E., Baker, L. C., Kaplan, C. P., et al. (2004). Variation in access to health care for different racial/ethnic groups by the racial/ethnic composition of an individual's county of residence. *Medical Care*, 42, 707-714.

Hagdrup, N. A., Simoes, E. J., & Brownson, R. C. (1997). Health care coverage: traditional and preventive measures and associations with chronic disease risk factors. *J.Community Health*, 22, 387-399.

Hargraves, J. L. & Hadley, J. (2003). The contribution of insurance coverage and community resources to reducing racial/ethnic disparities in access to care. *Health Serv.Res*, 38, 809-829.

Harris, J.R., Gordon, R.L., White, K.E., Stange, P.V., & Harper, S.M. (1996). Prevention and managed care:opportunities for managed care organizations, purchasers of health care, and public health agencies. *JAMA,* 275(1), 26-29.

Hayes, S. N., Weisman, C. S., & Clark, A. (2003). The Jacobs Institute of Women's Health report on the prevention of heart disease in women: findings and recommendations from the "Women and Heart Disease: Putting Prevention into Primary Care" conference. *Womens Health Issues*, 13, 115-121.

Healthy People 2010, 2000. Heart disease and Stroke. Centers for Disease Control and Prevention, National Institutes of Health. Retrieved May 1, 2005, from http://www.healthypeople.gov/Document/HTML/Volume1/12Heart.htm#_Toc49 0544220).

Hedley, A. A., Ogden, C. L., Johnson, C. L., Carroll, M. D., Curtin, L. R., & Flegal, K. M. (2004). Prevalence of overweight and obesity among US children, adolescents, and adults, 1999-2002. *JAMA*, 291, 2847-2850.

Hendryx, M. S., Ahern, M. M., Lovrich, N. P., & McCurdy, A. H. (2002). Access to health care and community social capital. *Health Serv.Res.*, 37, 87-103.

Holmes, J. S., Arispe, I. E., & Moy, E. (2005). Heart disease and prevention: race and age differences in heart disease prevention, treatment, and mortality. *Med.Care*, 43, I33-I41.

Holt, N., Johnson, A., & de Belder, M. (2000). Patient empowerment in secondary prevention of coronary heart disease. *The Lancet*, 356(9226), 314.

Honda, K. (2004). Factors underlying variation in receipt of physician advice on diet and exercise: applications of the behavioral model of health care utilization. *Am J Health Promot.*, 18, 370-377.

Hooper, L., Griffiths, E., Abrahams, B., Alexander, W., Atkins, S., Atkinson, G., et al. (2004). Dietetic guidelines: diet in secondary prevention of cardiovascular disease (first update, June 2003). *J.Hum.Nutr.Diet.*, 17, 337-349.

How the Docs are doing: (At practicing preventive medicine), (1997). Newsletter-People's Medical Society, 16(6), 7.

Huttin C. (2002). The Role of different types of health insurance on access and utilization of antihypertensive drugs-An empirical study in a US hypertensive population. *Disease Management&HealthOutcomes*, 10(7),419-430.

Inciardi, J. F., McMahon, K., & Sauer, B. L. (2003). Factors associated with uncontrolled hypertension in an affluent, elderly population. *Annals of Pharmacotherapy*, 37, 485-489.

Institute of Medicine (2002). Unequal Treatment; confronting racial and ethnic disparities in healthcare. National Acadamey Press, Washington (DC).

Jha, A. K., Varosy, P. D., Kanaya, A. M., Hunninghake, D. B., Hlatky, M. A., Waters, D. D., et al. (2003). Differences in medical care and disease outcomes among black and white women with heart disease. *Circulation*, 108, 1089-1094.

Johnson, P. A. & Fulp, R. S. (2002). Racial and ethnic disparities in coronary heart disease in women: prevention, treatment, and needed interventions. *Womens Health Issues*, 12, 252-271.

Kaplan, R. M. (2000). Two pathways to prevention. *Am.Psychol.*, 55, 382-396.

Kreuter, M. W., Scharff, D. P., Brennan, L. K., & Lukwago, S. N. (1997). Physician recommendations for diet and physical activity: which patients get advised to change? *Prev Med*, 26, 825-833.

Krumholz, H. M., Radford, M. J., Wang, Y., Chen, J., Heiat, A., & Marciniak, T. A. (1998). National use and effectiveness of beta-blockers for the treatment of elderly patients after acute myocardial infarction: National Cooperative Cardiovascular Project. *JAMA*, 280, 623-629.

Kuchler, F. & Lin, B. H. (2002). The influence of individual choices and attitudes on adiposity. *Int.J.Obes.Relat Metab Disord.*, 26, 1017-1022.

Landon, B. E., Zaslavsky, A. M., Bernard, S. L., Cioffi, M. J., & Cleary, P. D. (2004). Comparison of performance of traditional Medicare vs. Medicare managed care. *JAMA*, 291, 1744-1752.

Lee, T.H., Cleeman, J.I., Grundy, S.M., Gillett, C., Pasternak, R.C., Seidman. J., et al. (2000). Clinical goals and performance measures for cholesterol management in secondary prevention of coronary heart disease. *JAMA* 283(1), 94-103.

Lefler, L. L. & Bondy, K. N. (2004). Women's delay in seeking treatment with myocardial infarction: a meta-synthesis. *J.Cardiovasc.Nurs.*, 19, 251-268.

Litiker D., & Cebul, R.D., (2003). Managed care penetration, insurance status, and access to health care. *Medical Care.* 41(9) 1086-1090.

Lynch, J. W., Kaplan, G. A., Pamuk, E. R., Cohen, R. D., Heck, K. E., Balfour, J. L., & Yen, I. H. (1998). Income inequality and mortality in metropolitan areas of the United States. *Am.J Public Health*, 88, 1074-1080.

Marin, M. G. & Zitter, J. N. (2004). Expenditures associated with preventive healthcare. *Preventive Medicine*, 39, 856-862.

Marshall,T.(2005). Evaluating National Guidelines in the Prevention of Cardiovascular Disease in Primary Care. *Journal of Evaluation in Clinical Practice*. 11, 452-456.

Mensah, G.A. (2002). Eliminating disparities in cardiovascular health: six strategic imperatives and a framework for action. *Circulation* 11(10), 1332-1336.

McDonagh. (2005). Lessons from the management of chronic heart failure. *Heart*. 91, 24-27.

McGinnis, J. M. & Foege, W. H. (1993). Actual causes of death in the United States. *JAMA*, 270, 2207-2212.

McGinnis, M. J., Williams-Russo, P., & Knickman, J. R. (2002). The case for more active policy attention to health promotion. To succeed, we need leadership that informs and motivates, economic incentives that encourage change, and science that moves the frontiers. *Health Aff.*(Millwood.), 21, 78-93.

McLean, R.A. (1989). Agency costs and complex contracts in health care organizations. *Health Care Manage Rev*, 14(1), 65-71.

Meigs, J. B. & Stafford, R. S. (2000). Cardiovascular disease prevention practices by U.S. Physicians for patients with diabetes. *J Gen.Intern.Med*, 15, 220-228.

Merzel, C. & Moon-Howard, J. (2002). Access to health services in an urban community: does source of care make a difference? *J Urban Health*, 79, 186-199.

Mold, J. W., Fryer, G. E., & Thomas, C. H. (2004). Who are the uninsured elderly in the United States? *Journal of the American Geriatrics Society*, 52, 601-606.

Mosca, L., Appel, L. J., Benjamin, E. J., Berra, K., Chandra-Strobos, N., Fabunmi, R. P., et al. (2004). Evidence-based guidelines for cardiovascular disease prevention in women. *J.Am.Coll.Cardiol.*, 43, 900-921.

Napoles-Springer, A.M., Santoyo, J., Houston, K., Perez-Stable, E.J., & Stewart, A.L. (2005). Patients' perceptions of cultural factors affecting the quality of their medical encounters. *Health Expect*. 8(1), 4-17.

Natarajan, S. & Nietert, P. J. (2003). National trends in screening, prevalence, and treatment of cardiovascular risk factors. *Preventive Medicine*, 36, 389-397.

National Cholesterol Education Program (NCEP), (1993). Summary of the second report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel II). *JAMA*, 269, 3015-23.

National Institues of Health. 2006 Addressing health Disparities; NIH Program of Action. Retrieved February 9, 2006. http://healthdisparities.nih.gov/whatare.html.

Nelson, K., Norris, K., & Mangione, C. M. (2002). Disparities in the diagnosis and pharmacologic treatment of high serum cholesterol by race and ethnicity: data from the Third National Health and Nutrition Examination Survey. *Arch.Intern.Med.*, 162, 929-935.

Nissen, S. E., Tuzcu, E. M., Schoenhagen, P., Crowe, T., Sasiela, W. J., Tsai, J., et al. (2005). Statin therapy, LDL cholesterol, C-reactive protein, and coronary artery disease. *N.Engl J Med*, 352, 29-38.

O'Connor, G. T., Quinton, H. B., Traven, N. D., Ramunno, L. D., Dodds, T. A., Marciniak, T. A., & Wennberg, J. E. (1999). Geographic variation in the treatment of acute myocardial infarction: the Cooperative Cardiovascular Project. *JAMA,* 281, 627-633.

Ogden, C. L., Flegal, K. M., Carroll, M. D., & Johnson, C. L. (2002). Prevalence and trends in overweight among US children and adolescents, 1999-2000. *JAMA*, 288, 1728-1732.

Pancholi, M. (2005). Reasons for lacking a usual source of care:2001. Estimates for the U.S. Civilian noninstutionalized population (Rep. No. Statistical Brief #32).

Park, J. & Buechner, J. S. (1997). Race, ethnicity, and access to health care, Rhode Island, 1990. *J Health Soc.Policy*, 9, 1-14.

Pearson, T. A., Blair, S. N., Daniels, S. R., Eckel, R. H., Fair, J. M., Fortmann, S. P., et al. (2002). AHA Guidelines for Primary Prevention of Cardiovascular Disease and Stroke: 2002 Update: Consensus Panel Guide to Comprehensive Risk Reduction for Adult Patients Without Coronary or Other Atherosclerotic Vascular Diseases. *Circulation*, 106, 388-391.

Penchansky, R. & Thomas, J. W. (1981). The concept of access: definition and relationship to consumer satisfaction. *Med.Care*, 19, 127-140.

Phillips, K. A., Shlipak, M. G., Coxson, P., Heidenreich, P. A., Hunink, M. G., Goldman, P. A., et al. (2000). Health and economic benefits of increased beta-blocker use following myocardial infarction. *JAMA,* 284, 2748-2754.

Phillips, K. A., Fernyak, S., Potosky, A. L., Schauffler, H. H., & Egorin, M. (2000). Use of preventive services by managed care enrollees: an updated perspective. Health Aff.(Millwood.), 19, 102-116.

Pickett, K. E. & Pearl, M. (2001). Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *Journal of Epidemiology and Community Health*, 55, 111-122.

Polit D. (1996) Data Analysis and Statistics for Nursing Research. Appelton & Lange, Stamford CT.

Pollak,K.I., Yarnall,K.S., Rimer,B.K., Lipkus,I., & Lyna,P.R. (2002). Factors associated with patient-recalled smoking cessation advice in a low-income clinic *J Natl Med Assoc* 94(5), 354-363.

Polsky, D., Kletke, P. R., Wozniak, G. D., & Escarce, J. J. (2000). HMO penetration and the geographic mobility of practicing physicians. *J Health Econ.*, 19, 793-809.

Powell-Griner E., B. J. B. S. (1999). Health care Coverage and use of preventive services among the near elderly in the United States. *Am J Public Health*, 6, 882-886.

Preisser, J. S., Cohen, S. J., Wofford, J. L., Moran, W. P., Shelton, B. J., McClatchey, M. W., & Wolfe, P. (1998). Physician and patient predictors of health maintenance visits. *Arch.Fam.Med*, 7, 346-351.

Prentice, R.L., Willett, W.C., Greenwald, W.C., Alberts, D., Bernstein, L. Blyd, N.F., et al (2004). Nutrition and physical activity and chronic disease prevention: research strategies and recommendations. *J Natl Cancer Inst.*, 96(17), 1276-87.

Probstfield, J. L. (2003). How cost-effective are new preventive strategies for cardiovascular disease? *American Journal of Cardiology*, 91, 22G-27G.

Putsch, R. W. & Pololi, L. (2004). Distributive justice in American healthcare: institutions, power, and the equitable care of patients. *Am.J.Manag.Care*, 10 Spec No, SP45-SP53.

Rabinowitz, H.K., and Paynter, N.P., (2003). The Rural vs. Urban practice Decision. *JAMA*. 287, 113. Retrieved October 6, 2005.

Ramsey, S. D., Cheadle, A. D., Neighbor, W. E., Gore, E., Temple, P., Staiger, T., & Goldberg, H. I. (2001). Relative impact of patient and clinic factors on adherence to primary care preventive service guidelines: an exploratory study. *Med.Care*, 39, 979-989.

Rao, S. V., Schulman, K. A., Curtis, L. H., Gersh, B. J., & Jollis, J. G. (2004). Socioeconomic status and outcome following acute myocardial infarction in elderly patients. *Arch.Intern.Med.*, 164, 1128-1133.

Rathore, S. S., Berger, A. K., Weinfurt, K. P., Feinleib, M., Oetgen, W. J., Gersh, B. J., & Schulman, K. A. (2000). Race, sex, poverty, and the medical treatment of acute myocardial infarction in the elderly. *Circulation*, 102, 642-648.

Reschovsky, J. D., Kemper, P., & Tu, H. (1999). Do HMOs make a difference? Introduction. *Inquiry* 36 (4), 374-377.

Reschovsky, J. D., Kemper, P., & Tu, H. (2000). Does type of health insurance affect health care use and assessments of care among the privately insured? *Health Serv.Res.*, 35, 219-237.

Ribisl, K. M., Winkleby, M. A., Fortmann, S. P., & Flora, J. A. (1998). The interplay of socioeconomic status and ethnicity on Hispanic and white men's cardiovascular disease risk and health communication patterns. *Health Educ Res*, 13, 407-417.

Rizzo, J. A. (2005). Are HMOs bad for health maintenance? *Health Econ.*, 14(11), 1117-1131.

Robert, S. A. (1998). Community-level socioeconomic status effects on adult health. J *Health Soc.Behav.*, 39, 18-37.

Sambamoorthi, U. & McAlpine, D. D. (2003). Racial, ethnic, socioeconomic, and access disparities in the use of preventive services among women. *Prev.Med*, 37, 475-484.

Satcher, D., Fryer, McCann, J.,Troutman,A., Woolf,S.H. & Rust, G. (2005).What If We Were Equal? A Comparison Of The Black-White Mortality Gap In 1960 And 2000
*Health Affairs*, 24, 459-464.

Schmedtje, J. F., Jr., Evans, G. W., Byerly, W., King, M., Goonan, K., Blastock-Glenn, C., et al. (2003). Treatment of chronic heart failure in a managed care setting. Baseline results from the Achieving Cardiac Excellence Project. *N.C.Med.J.*, 64, 4-10.

Schulman, K. A., Berlin, J. A., Harless, W., Kerner, J. F., Sistrunk, S., Gersh, B. J., et al. (1999). The effect of race and sex on physicians' recommendations for cardiac catheterization. *N.Engl.J.Med.*, 340, 618-626.

Sheifer, S. E., Escarce, J. J., & Schulman, K. A. (2000). Race and sex differences in the management of coronary artery disease. *Am.Heart J.*, 139, 848-857.

Shen, J. J., Wan, T. T., & Perlin, J. B. (2001). An exploration of the complex relationship of socioecologic factors in the treatment and outcomes of acute myocardial infarction in disadvantaged populations. *Health Serv.Res.*, 36, 711-732.

Shi, L. & Stevens, G. D. (2005). Vulnerability and the receipt of recommended preventive services: the influence of multiple risk factors. *Med.Care*, 43, 193-198.

Schucker,B.; Wittes,J.T.; Santanello,N.C.; Weber,S.J.; McGoldrick,D.; Donato,K.; et al. (1991). Change in cholesterol awareness and action. Results from national physician and public surveys. *Arch Int Med.*,151(4), 666-673

Sial, S. H., Malone, M., Freeman, J. L., Battiola, R., Nachodsky, J., & Goodwin, J. S. (1994). Beta blocker use in the treatment of community hospital patients discharged after myocardial infarction. *J Gen.Intern Med*, 9, 599-605.

Smith S.C., Blair, S.N., Bonow, R.O., Brass, L.M., Cerqueira, M.D., Dracup, K., et al. (2001). AHA/ACC Scientific Statement: AHA/ACC guidelines for preventing heart attack and death in patients with atherosclerotic cardiovascular disease: 2001 update. A statement for healthcare professionals from the American Heart Association and the American College of Cardiology. *Circulation,* 104,1577–1579

Stamler, J., Stamler, R., Neaton, J. D., Wentworth, D., Daviglus, M. L., Garside, D., et al. (1999). Low risk-factor profile and long-term cardiovascular and noncardiovascular mortality and life expectancy: findings for 5 large cohorts of young adult and middle-aged men and women. *JAMA,* 282, 2012-2018.

Stewart, D. E., Abbey, S. E., Shnek, Z. M., Irvine, J., & Grace, S. L. (2004). Gender differences in health information needs and decisional preferences in patients recovering from an acute ischemic coronary event. *Psychosom.Med*, 66, 42-48.

Stryer, D. B., Weinick, R. M., & Clancy, C. M. (2002). Reducing racial and ethnic disparities in health care. *Health Serv.Res.*, 37, xv-xxvi.

Sudano, J. J., Jr. & Baker, D. W. (2003). Intermittent lack of health insurance coverage and use of preventive services. *Am.J Public Health*, 93, 130-137.

Sundquist, J., Winkleby, M. A., & Pudaric, S. (2001). Cardiovascular disease risk factors among older black, Mexican-American, and white women and men: an analysis of NHANES III, 1988-1994. Third National Health and Nutrition Examination Survey. J *Am.Geriatr.Soc.*, 49, 109-116.

Tabenkin, H., Goodwin, M. A., Zyzanski, S. J., Stange, K. C., & Medalie, J. H. (2004). Gender differences in time spent during direct observation of doctor-patient encounters. *J Womens Health* (Larchmt.), 13, 341-349.

Terry, P. (1998). How mature is your organization's prevention effort? Four stages of managed care health promotion. *Healthc Forum J*, 41(5), 54-58.

Tsui, J. I., Dodson, K., & Jacobson, T. A. (2004). Cardiovascular disease prevention counseling in residency: resident and attending physician attitudes and practices. *J Natl.Med* Assoc, 96, 1080-1091.

Tudiver F., & Talbot, Y.,(1999). Why don't men seek help? Family physicians' perspectives on help-seeking behavior in men. *J Fam.Prac.*, 48(1), 47-52

U.S.Department of Health and Human Services (2000). Healthy People 2010 2nd ed. With Understanding and Improving Health and Objectives for Improving Health. U.S. Government Printing Office, Washington D.C.

U.S. Department of Health and Human Services (1990). The Health Benefits of Smoking Cessation. A report of the Surgeon General. Public Health Service, Centers of Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, Rockville, MD.

U.S. Department of Health and Human Services (2005). Dietary Guidelines for Americans 2005. Retrieved March 6,2005 from http://www.healthierus.gov/dietaryguidelines/.

U.S. Department of Health and Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute (2006). What Causes Coronary Artery Disease? Retrieved February 9,2006, from http://www.nhlbi.nih.gov/health/dci/Diseases/Cad/CAD_Causes.html

U.S.Preventive Services Task Force (2002). Behavioral counseling in primary care to promote physical activity: Recommendation and rationale. *Annals of Internal Medicine*, 137, 205-207.

U.S. Preventative Services Task Force (1996) Guide to clinical preventative services (2d edition) Retrieved January 4, 2006, from http://www.fhea.com/CertificationCols/level_prevention.htm.

U.S. Preventive Services Task Force (2004): US Preventive Services Task Force. Guide to Clinical Preventive Services, Third Edition: Periodic Updates. Rockville, MD: Agency for Healthcare Research and Quality; 2004. AHRQ Publication No. 04-IP003.

University of Texas at Austin (2002). Screening for hypertension in adults. University of Texas at Austin, School of Nursing, Family Nurse Practitioner Program, Austin,TX.
Retrieved May 5,2005 from
http://www.guideline.gov/summary/summary.aspx?ss=15&doc_id=3226&nbr=2452

Vestfold Healthcare Study Group. Influence on lifestyle measures and five-year coronary risk by a comprehensive lifestyle intervention programme in patients with coronary heart disease (2003). *Eur.J Cardiovasc.Prev.Rehabil.*, 10, 429-437.

Wallerstein, N. (2002). Empowerment to reduce health disparities. *Scand.J Public Health* Suppl, 59, 72-77.

Wang, T.J., & Stafford, R.S. (1998). National patterns and predictors of beta-blocker use in patients with coronary artery disease. *Archives of Internal Medicine*, 158(17), 1901-1906.

Wee, C. C., Phillips, R. S., Burstin, H. R., Cook, E. F., Puopolo, A. L., Brennan, T. A., & Haas, J. S. (2001). Influence of financial productivity incentives on the use of preventive care. *Am.J.Med.*, 110, 181-187.

Weinick, R. M., Zuvekas, S. H., & Cohen, J. W. (2000). Racial and ethnic differences in access to and use of health care services, 1977 to 1996. *Med.Care Res.Rev.*, 57 Suppl 1, 36-54.

Weinick, R. M., Jacobs, E. A., Stone, L. C., Ortega, A. N., & Burstin, H. (2004). Hispanic healthcare disparities: challenging the myth of a monolithic Hispanic population. *Med.Care*, 42, 313-320.

Westfall, J. M. (2000). Physicians, pharmaceutical representatives, and patients: who really benefits? *J Fam.Pract.*, 49, 817-819.

Williams,R.L.; Flocke,S.A. & Stange,K.C. (2001). Race and preventive services delivery among black patients and white patients seen in primary care. *Med Care*.39,(11), 1260-1267

Williams, S. & P. Torrens (1999). Introduction to Health Services, 5th ed., Delmar Publishers, New York.

Winkleby, M. A., Kraemer, H. C., Ahn, D. K., & Varady, A. N. (1998). Ethnic and socioeconomic differences in cardiovascular disease risk factors: findings for women from the Third National Health and Nutrition Examination Survey, 1988-1994. *JAMA*, 280, 356-362.

World Health Organization (1948). Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.

Xu, K.T. (2002). Usual source of care in preventive service use: a regular doctor versus a regular site. *Health Services Research.* 37 (6), 1509-1529.

Yancy, C.W., Laskar, S. & Eichhorn, E. (2004). The use of beta-adrenergic receptor antagonists in the treatment of African Americans with heart failure. *Congest Heart Fail.* 10(1), 34-37.

Xue, Z., Lee, E., Monika, D., & Wutoh, A. (2004). Building logistic regression models to analyze survey data with complex sampling design. Proceedings of the Northeastern SAS Users Group, 2004. Retreived August 10, 2005 from http://www.nesug.org/html/Proceedings/nesug04/an/an08.pdf

Zuniga, M., Anderson, D., & and Alexander, K. (2003). Heart Disease and Stroke in Rural America. In Rural Healthy People 2010: A companion document to Healthy People 2010. Volume 1. 133-136.

# APPENDIX A

## Correlation Matrices

(obs=34682)

| | msa02 | hispanic | black | income | inspriva | inspubli | medhmo | mednohmo |
|---|---|---|---|---|---|---|---|---|
| msa02 | 1.0000 | | | | | | | |
| hispanic | 0.1506 | 1.0000 | | | | | | |
| black | 0.0414 | -0.2347 | 1.0000 | | | | | |
| income | -0.0555 | 0.2461 | 0.1330 | 1.0000 | | | | |
| inspriva | 0.0205 | -0.2692 | -0.0914 | -0.4850 | 1.0000 | | | |
| inspubli | -0.0366 | 0.0981 | 0.1292 | 0.3990 | -0.6774 | 1.0000 | | |
| medhmo | 0.0323 | 0.0862 | 0.1158 | 0.2654 | -0.3252 | 0.4981 | 1.0000 | |
| mednohmo | -0.0655 | 0.0655 | 0.0873 | 0.2654 | -0.3133 | 0.4803 | -0.0830 | 1.0000 |
| educ1 | -0.0117 | 0.2711 | 0.0366 | 0.2986 | -0.2882 | 0.2648 | 0.1980 | 0.1845 |
| educ2 | 0.0646 | -0.2045 | -0.0626 | -0.2836 | 0.2673 | -0.2208 | -0.1469 | -0.1406 |
| prescrip | 0.0389 | -0.2187 | -0.0866 | -0.4570 | 0.7872 | -0.5382 | -0.2772 | -0.2694 |
| hmop | 0.1253 | -0.0618 | -0.0288 | -0.2670 | 0.4622 | -0.3131 | -0.1578 | -0.1579 |
| nohmop | -0.0925 | -0.2080 | -0.0790 | -0.2560 | 0.5221 | -0.3537 | -0.1834 | -0.1700 |
| uscare | -0.0513 | -0.1860 | -0.0004 | -0.1119 | 0.1707 | 0.0852 | 0.0487 | 0.0486 |
| female | 0.0015 | -0.0126 | 0.0361 | 0.0600 | -0.0317 | 0.0799 | 0.0431 | 0.0483 |
| age | -0.0598 | -0.1719 | -0.0465 | -0.1123 | 0.0547 | 0.0179 | -0.1802 | -0.0641 |
| CHDsubpop1 | -0.0703 | -0.1251 | 0.0080 | -0.0608 | 0.0669 | 0.0391 | -0.0626 | -0.0019 |
| elderlyx | -0.0304 | -0.0777 | -0.0246 | 0.0490 | -0.0647 | 0.1687 | -0.0376 | 0.0313 |
| numphy | 0.2958 | 0.3281 | 0.0118 | 0.0608 | -0.1123 | 0.0472 | 0.0633 | -0.0063 |
| physpec | 0.3000 | 0.3195 | 0.0232 | 0.0590 | -0.1114 | 0.0500 | 0.0625 | -0.0014 |
| hmopen | 0.5811 | 0.1406 | -0.0351 | -0.0670 | 0.0273 | -0.0243 | 0.0552 | -0.0854 |
| pctpov | -0.2234 | 0.2482 | 0.1272 | 0.2383 | -0.2407 | 0.1832 | 0.0785 | 0.1749 |
| hhisp | 0.1630 | 0.5435 | -0.1076 | 0.1627 | -0.1970 | 0.0862 | 0.0814 | 0.0399 |
| hblack | 0.0720 | -0.0586 | 0.3731 | 0.0587 | -0.0646 | 0.0479 | 0.0170 | 0.0535 |
| lhisp | -0.3531 | -0.3046 | 0.0295 | -0.0386 | 0.0741 | -0.0104 | -0.0408 | 0.0206 |
| lblack | -0.2960 | -0.0503 | -0.2241 | -0.0258 | 0.0474 | -0.0275 | -0.0445 | 0.0104 |
| blackxhblack | 0.0080 | -0.1848 | 0.7875 | 0.1028 | -0.0740 | 0.0988 | 0.0761 | 0.0729 |
| blackxlblack | -0.0048 | -0.0363 | 0.1547 | 0.0109 | -0.0037 | 0.0058 | 0.0112 | 0.0109 |
| blackxlhisp | -0.0932 | -0.1171 | 0.4990 | 0.1013 | -0.0719 | 0.0929 | 0.0612 | 0.0726 |
| blackxhhisp | 0.0590 | -0.0808 | 0.3441 | 0.0589 | -0.0439 | 0.0473 | 0.0572 | 0.0315 |
| hipsxlhisp | -0.0342 | 0.1095 | -0.0257 | 0.0077 | -0.0077 | -0.0051 | -0.0077 | 0.0057 |
| hipsxhhisp | 0.1176 | 0.7743 | -0.1817 | 0.2117 | -0.2435 | 0.0986 | 0.0862 | 0.0574 |
| hipsxlblack | -0.0050 | 0.4265 | -0.1001 | 0.1292 | -0.1209 | 0.0597 | 0.0329 | 0.0666 |
| hipsxhblack | 0.1037 | 0.4165 | -0.0977 | 0.1020 | -0.1285 | 0.0305 | 0.0070 | 0.0459 |

| | educ1 | educ2 | prescrip | hmop | nohmop | uscare | female | age |
|---|---|---|---|---|---|---|---|---|
| educ1 | 1.0000 | | | | | | | |
| educ2 | -0.5922 | 1.0000 | | | | | | |
| prescrip | -0.2492 | 0.2466 | 1.0000 | | | | | |
| hmop | -0.1178 | 0.1259 | 0.4972 | 1.0000 | | | | |
| nohmop | -0.1781 | 0.1530 | 0.4272 | -0.4218 | 1.0000 | | | |
| uscare | -0.0083 | 0.0314 | 0.1653 | 0.1266 | 0.0668 | 1.0000 | | |
| female | -0.0241 | 0.0116 | -0.0276 | -0.0171 | -0.0150 | 0.1032 | 1.0000 | |
| age | -0.3937 | 0.2244 | -0.0069 | -0.0580 | 0.1167 | 0.1078 | 0.0532 | 1.0000 |
| CHDsubpop1 | -0.2537 | 0.1285 | 0.0470 | -0.0100 | 0.0783 | 0.2124 | 0.0576 | 0.5162 |
| elderlyx | 0.0002 | -0.0290 | -0.1302 | -0.1103 | 0.0383 | 0.0975 | 0.0455 | 0.5049 |
| numphy | 0.0794 | -0.0277 | -0.0745 | 0.0336 | -0.1360 | -0.0982 | -0.0033 | -0.0618 |
| physpec | 0.0762 | -0.0248 | -0.0734 | 0.0343 | -0.1351 | -0.0939 | -0.0015 | -0.0586 |
| hmopen | -0.0280 | 0.0758 | 0.0483 | 0.2116 | -0.1636 | -0.0012 | -0.0037 | -0.0364 |
| pctpov | 0.1454 | -0.1360 | -0.2131 | -0.1362 | -0.1175 | -0.0694 | 0.0163 | -0.0284 |
| hhisp | 0.1576 | -0.0964 | -0.1520 | -0.0163 | -0.1772 | -0.1307 | -0.0029 | -0.0919 |
| hblack | 0.0146 | -0.0286 | -0.0537 | -0.0592 | -0.0150 | -0.0323 | 0.0212 | 0.0028 |
| lhisp | -0.0529 | -0.0126 | 0.0537 | -0.0511 | 0.1219 | 0.0945 | 0.0000 | 0.0639 |
| lblack | -0.0140 | -0.0012 | 0.0310 | -0.0081 | 0.0589 | 0.0327 | -0.0164 | 0.0154 |
| blackxhblack | 0.0291 | -0.0543 | -0.0761 | -0.0325 | -0.0549 | -0.0108 | 0.0314 | -0.0246 |
| blackxlblack | -0.0007 | 0.0064 | -0.0024 | 0.0021 | -0.0126 | 0.0028 | 0.0085 | -0.0189 |
| blackxlhisp | 0.0349 | -0.0548 | -0.0742 | -0.0490 | -0.0354 | 0.0098 | 0.0175 | -0.0097 |
| blackxhhisp | 0.0115 | -0.0131 | -0.0326 | 0.0119 | -0.0583 | -0.0174 | 0.0182 | -0.0359 |
| hipsxlhisp | 0.0199 | -0.0174 | -0.0092 | -0.0072 | -0.0086 | -0.0077 | -0.0045 | -0.0238 |
| hipsxhhisp | 0.2266 | -0.1679 | -0.1929 | -0.0575 | -0.1812 | -0.1585 | -0.0065 | -0.1211 |
| hipsxlblack | 0.1348 | -0.0969 | -0.0979 | -0.0391 | -0.0815 | -0.0705 | -0.0080 | -0.0795 |
| hipsxhblack | 0.0906 | -0.0642 | -0.1017 | -0.0435 | -0.0849 | -0.0897 | 0.0003 | -0.0554 |

| | CHDsub~1 | elderlyx | numphy | physpec | hmopen | pctpov | hhisp | hblack |
|---|---|---|---|---|---|---|---|---|
| CHDsubpop1 | 1.0000 | | | | | | | |
| elderlyx | 0.2009 | 1.0000 | | | | | | |
| numphy | -0.0764 | -0.0303 | 1.0000 | | | | | |
| physpec | -0.0753 | -0.0286 | 0.9970 | 1.0000 | | | | |
| hmopen | -0.0719 | -0.0118 | 0.3542 | 0.3559 | 1.0000 | | | |
| pctpov | -0.0038 | -0.0081 | 0.1495 | 0.1525 | -0.2603 | 1.0000 | | |
| hhisp | -0.0799 | -0.0414 | 0.4420 | 0.4164 | 0.1714 | 0.4128 | 1.0000 | |
| hblack | 0.0149 | -0.0070 | 0.0647 | 0.0890 | -0.0734 | 0.2840 | -0.0945 | 1.0000 |
| lhisp | 0.0800 | 0.0299 | -0.2746 | -0.2768 | -0.2791 | -0.0108 | -0.3308 | 0.0314 |
| lblack | 0.0169 | 0.0079 | -0.2546 | -0.2625 | -0.1878 | -0.0442 | -0.0547 | -0.3591 |
| blackxhblack | 0.0114 | -0.0137 | 0.0062 | 0.0203 | -0.0806 | 0.2058 | -0.1180 | 0.5492 |
| blackxlblack | 0.0024 | -0.0158 | -0.0266 | -0.0275 | -0.0073 | -0.0343 | -0.0182 | -0.0384 |
| blackxlhisp | 0.0200 | 0.0011 | -0.0847 | -0.0842 | -0.0937 | 0.1574 | -0.1191 | 0.2304 |
| blackxhhisp | -0.0185 | -0.0173 | 0.1406 | 0.1363 | 0.0405 | 0.0941 | 0.2493 | 0.0595 |
| hipsxlhisp | -0.0053 | -0.0111 | -0.0255 | -0.0256 | -0.0301 | -0.0132 | -0.0355 | 0.0025 |
| hipsxhhisp | -0.0923 | -0.0527 | 0.3690 | 0.3490 | 0.1182 | 0.3638 | 0.7611 | -0.0825 |
| hipsxlblack | -0.0567 | -0.0349 | -0.0466 | -0.0514 | -0.0544 | 0.2316 | 0.2711 | -0.1435 |
| hipsxhblack | -0.0422 | -0.0251 | 0.1452 | 0.1590 | 0.0602 | 0.1335 | 0.1641 | 0.3940 |

| | lhisp | lblack | b~hblack | b~lblack | bl~lhisp | bl~hhisp | hipsxl~p | hipsxh~p |
|---|---|---|---|---|---|---|---|---|
| lhisp | 1.0000 | | | | | | | |
| lblack | 0.1816 | 1.0000 | | | | | | |
| blackxhblack | 0.0535 | -0.1972 | 1.0000 | | | | | |
| blackxlblack | 0.0128 | 0.1069 | -0.0211 | 1.0000 | | | | |
| blackxlhisp | 0.3601 | -0.1092 | 0.4587 | 0.0952 | 1.0000 | | | |
| blackxhhisp | -0.0825 | -0.0778 | 0.1686 | 0.0485 | -0.0297 | 1.0000 | | |
| hipsxlhisp | 0.1073 | 0.0052 | -0.0202 | -0.0040 | -0.0128 | -0.0088 | 1.0000 | |
| hipsxhhisp | -0.2518 | -0.0152 | -0.1431 | -0.0281 | -0.0907 | -0.0625 | -0.0270 | 1.0000 |
| hipsxlblack | -0.1270 | 0.3997 | -0.0788 | -0.0155 | -0.0499 | -0.0344 | 0.0675 | 0.3764 |
| hipsxhblack | -0.1244 | -0.1415 | -0.0770 | -0.0151 | -0.0488 | -0.0336 | 0.0633 | 0.2492 |

| | hipsxl~k | hipsxh~k |
|---|---|---|
| hipsxlblack | 1.0000 | |
| hipsxhblack | -0.0566 | 1.0000 |

# VITA

Patricia Carcaise-Edinboro was born on February 7, 1962 in Beaver, Pennsylvania. She graduated with a Bachelors of Science in Chemistry from Gannon University, Erie, Pennsylvania in 1984. In 1990, she graduated from Virginia Polytechnic Institute and State University with a Masters of Science in Human Nutrition and Foods. In 1998, she joined the department of Health Administration, Virginia Commonwealth University as a part-time graduate student. She has held various positions in recombinant and life science laboratory work. She has participated in areas of clinical research that pertain to public health and nutrition, and health promotion and disease prevention in both the academic and non-profit setting. Prior to and during her doctoral studies, she held the position of Research Associate at Massey Cancer Center, Virginia Commonwealth University Health System, Richmond, Virginia.