

# Health Belief Model Perceptions, Knowledge of Heart Disease, and its Risk Factors in Educated African-American Women: An Exploration of the Relationships of Socioeconomic Status and Age

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## Abstract

*Heart disease is the leading cause of death for African-American women in the United States. Although African-American women experience higher rates of heart disease with earlier onset and more severe consequences than White women do, they are not aware of their risk for the disease. The Health Belief Model (HBM) has been commonly used to guide preventive interventions in cardiovascular health. However, the HBM has not been evaluated for African-American women regarding its effectiveness. This study explored the perceptions of susceptibility and seriousness of heart disease, and the relationships between socioeconomic status (SES), age, and knowledge of heart disease and its risk factors among 194 educated African-American women from the southern United States. Participants did not perceive themselves to be at high risk for developing heart disease while perceiving heart disease as serious. African-American women who were older perceived heart disease to be more serious than their younger counterparts did. Older women and those with higher SES knew more about heart disease and risk factors. Neither SES nor age moderated the relationship between knowledge and perceived susceptibility or seriousness.*

who died of heart disease, 52% were women (Anderson & Smith, 2003). Nearly 40% of female deaths in America occur from CVD, which includes CHD and stroke (American Heart Association, 2006). In 2006 in the United States, approximately \$403.1 billion will be spent for healthcare services, medications, and lost productivity related to CVD (Thorn et al., 2006).

African-American women shoulder a greater burden from CVD morbidity and mortality than White women do (Anderson & Smith, 2003). Disparities in the risk for heart disease mortality have existed since the 1940s (Bransford & Ofili, 2000). African-American women's heart-disease-related death rates are the highest among five other race and ethnic groups. Their death rates are 2.6 times higher than Asian and Pacific Islander women, 2.1 times higher than Latino, American Indian, and Alaskan Native women, and 1.4 times higher than White women (Casper et al., 2000). In 2003, African-American women had a preliminary heart disease death rate of 354.8, which was higher than the overall preliminary heart disease death rate of 308.8 (American Heart Association, 2006). The prevalence of CVD risk factors for African-American women is higher than that for White women of comparable socioeconomic status (SES) (Winkleby, Kraemer, Ahn, & Varady, 1998). Although overall the death rate from heart disease has declined over the past few decades for the general population, it has declined less for women than it has for men, and it has declined less for African-American women than it has for White women (American Heart Association, 2006).

Because women head most African-American households, illness or death from heart disease produces an even greater burden on African-American families and

## Introduction

Heart disease is the leading cause of death for women in the United States (Centers for Disease Control and Prevention [CDC], 2004). Heart disease encompasses a number of conditions affecting the heart, including hypertensive heart disease (HTN), coronary heart disease (CHD), congestive heart failure (CHF), cardiovascular disease (CVD), and any other heart condition or disease (International Classification of Diseases, 2004). According to the 2003 National Vital Statistics Reports, of the 700,142 people

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communities (Mansfield, Wilson, Kobrinski, & Mitchell, 1999). Reduction of heart disease risk and prevalence is a national priority (U.S. Department of Health and Human Services, 2000). To date, risk reduction efforts have been directed at both the national and the community levels using campaigns, prevention programs, and publications.

Both the Health Belief Model (HBM) and the Social Cognitive Theory have been commonly used to guide preventive interventions in cardiovascular health. These interventions have been mainly concerned with exploring behavioral change, with an emphasis on self-efficacy, a behavioral construct found in both theories (Humphries & Krummel, 1999; Yanek et al., 2001). The HBM establishes a causal connection between perceived susceptibility and perceived seriousness of the disease to preventive behaviors (Maiman & Becker, 1974). Perceived susceptibility is one's subjective judgment about their personal risk and their opinion of the chances of their getting a condition. Perceived seriousness is one's subjective judgment about the weightiness or gravity of a condition and its consequences. The HBM has been extensively used to identify the factors that may predict preventive behaviors for heart disease in largely White populations (Ali, 2002; Boudreau, 1995; Humphries & Krummel 1999; Mirotznik, Feldman, & Stein, 1995; Reno, 1988; Umeh & Rogan-Gibson, 2001). For example, perceived susceptibility, perceived seriousness, knowledge of coronary heart disease (CHD), and general health motivation, explained over 70% of the variance of CHD preventive behaviors in 178 well-educated, moderate to upper income White women (Ali, 2002). In reviewing the literature, no studies were found that evaluated interrelationships among factors that may influence preventive behavior regarding in coronary heart disease in African-American populations.

The few studies that applied the Health Belief Model (HBM) to preventive health behavior in African-American women involved primarily low-income women (Behera, Winkleby, & Collins, 2000; Walcott-McQuigg, 2000). While it is well known that socioeconomic status (SES), age, and knowledge are related to the use of preventive behaviors, the studies that included these variables and the HBM constructs, involved primarily White women (Ali, 2002; Erblich, Bovbjerg, Norman, Valdimarsdottir, & Montgomery, 2000; Humphries & Krummel, 1999; Legato, Patus, & Slaughter, 1997; Mosca, et al., 2000; Mosca, Ferris, Fabunmi, & Robertson, 2004; Oliver-McNeil & Artinian, 2002). No studies examined the moderating effects of socioeconomic status (SES) and age on relationships of perceived susceptibility, perceived seriousness, and knowledge of heart disease and its risk factors in African-American women.

Based on the utility of the Health Belief Model (HBM) in largely White populations, this study was designed to explore the application of the HBM in African-American women. Examination of the moderating effects and associations between the HBM constructs, age, SES, and knowledge may provide an understanding of some of the factors that affect the adoption of health-promoting behaviors and therefore may provide guidance in designing

heart disease risk reduction programs for the vulnerable female African-American population.

### Review of the Literature

This review of the literature begins with the exogenous variables (the variables beyond the control of the individual such as SES and age), followed by a review of the endogenous variables (the variables within an individual such as knowledge, perceived susceptibility, and perceived seriousness). The exogenous variables are variables identified as having some causal relationship with perceived susceptibility, perceived seriousness, and knowledge of heart disease and its risk factors. The empirical basis for including these variables will be identified in this section. Knowledge of heart disease and its risk factors consists of knowledge of the prevalence, causes, and consequences of heart disease.

### Perceived Susceptibility, Perceived Seriousness and Knowledge of Heart Disease and its Risk Factors

Women generally do not perceive themselves to be at risk for heart disease. An exploration of 1,481 college students' knowledge of heart disease, their risk perception, and the risk management strategies that were characteristic of college students, found that cancer was perceived to be more of a risk to them than heart disease, especially if they were women. Only 25% recognized that heart disease was the most common cause of death for women and 66% believed that heart disease was second to cancer. African-American women were less aware of heart disease than White women. The African-Americans believed that Whites were more affected by heart disease and they were unable to identify themselves as an at risk population (Collins, Dantico, Shearer, Mossman, 2004). When African-American women from 20 to 94 years of age ( $M = 40.5$ ) ( $n = 1,055$ ) were asked to list the most serious health problems affecting African-American women in general, only 31% identified heart disease as a serious threat compared to 81% for cancer, 59% for diabetes, and 52% for cerebrovascular disease (Sadler et al., 2005).

In a study conducted by King et al., (2002), trained nurse research coordinators interviewed 450 women post coronary angiography. The ethnic make-up of the sample was 94% White, 5.8% African-American, and 0.2% Hispanic. The sample was well educated; 36.2% had completed high school and 41.5% had completed college. The interview was intended to examine the relationship between risk knowledge and risk assessment because these women were at an increased risk for coronary heart disease (CHD). After the interviews and data collection, the investigators reported that only 35% of the women in the sample recalled being told that they were at risk for CHD, but 84% reported having at least three or more risk factors. The investigators determined that most of the women in this sample did not understand the seriousness of their personal heart disease risk factors or their relationship to CHD risk.

In another study, a large majority (87% of 200) of subjects from 25 to 44 years of age, largely (74%) African-American women, did not know that heart disease was the leading cause of death for women. Only 6% identified heart disease as the greatest health concern and the leading cause of death for women. Most of the women identified breast cancer as the greatest health concern and leading cause of death (Prendergast, Bunney, Roberson, & Davis, 2004). These women were aware that their knowledge of heart disease was poor. Only 12% rated their knowledge as very good and 46% rated their level of knowledge from fair to poor. Similarly, in two telephone surveys of a total of 2,024 women (12.5% African-American), the women identified cancer as the greatest health problem for women (Mosca et al., 2000; 2004). In addition, these women considered themselves to be more knowledgeable about heart disease than the women in the previous study did. Less than 20% of African-American women identified themselves as "very well informed" about heart disease knowledge (Mosca et al., 2000). Only 13% of those women saw themselves to be at risk for heart disease (Mosca et al., 2004). Among other ethnic groups, fewer African-American women reported worrying about developing heart disease than any other minority group (Mosca et al., 2000). In a similar study by Legato et al., (1997), 1,002 women, 11% of whom were African-American, were interviewed by telephone about risk for coronary artery disease (CAD). The women reported that they were knowledgeable about heart disease and 74% reported that they were fairly knowledgeable about heart disease. They did not perceive themselves to be at risk and 44% considered themselves "somewhat" or "very unlikely" to have a heart attack at some point in their lives.

### **Relationship of Socioeconomic Status to Perceived Susceptibility, Perceived Seriousness, and Knowledge of Heart Disease and its Risk Factors**

Socioeconomic status has been found to be related to perceived susceptibility. Among 193 participants in the West Virginia Women's Health Study of married, White, pre-menopausal women with greater than a high school education and with annual incomes at or below \$40,000, the women with incomes of less than \$20,000 felt more susceptible to heart disease. Women with less than a high school education felt less susceptible to heart disease (Humphries & Krummel, 1999). In another study, 202 mostly economically disadvantaged African-American women with a high prevalence of cardiovascular risk factors (minimum of 2.6 risk factors/woman), the women perceived others, but not themselves, to be at risk for heart disease (Poduri & Grisso, 1998). Low-income African-American women participants in focus groups identified low SES as a risk factor for heart disease for them and they expressed an interest in improving their health behaviors if they were offered affordable interventions (Behera, Winkleby, & Collins, 2000).

Studies have found that individuals with low SES tend to have a low knowledge of heart disease risk (Ford & Jones, 1991; Andersson & Leppert, 2001). In the National Health Interview Survey of 1985, a national representative

sample of 27,716 of the United States population, including 2,547 African-American women, the women with lower education and income had the least knowledge of cardiovascular disease risk. These women also had either less access to medical care, were smokers, or were physically inactive (Ford & Jones, 1991). Education was the strongest predictor of knowledge of cardiovascular disease risk. Low-income African-American women who participated in focus groups did not realize that CVD was the leading cause of death among African-American women and did not identify it as a health priority (Behera, Winkleby, & Collins, 2000). Among 554 women in Sweden, low education and low SES was related to poor knowledge of CHD risk factors (Andersson & Leppert, 2001).

### **Relationship of Age to Knowledge, Perceived Susceptibility, and Perceived Seriousness of Heart Disease and its Risk Factors**

In the Health Belief Model, age is defined as a modifying factor that may shape an individual's perception of risk, and may have a direct effect on perceived susceptibility, perceived seriousness, and knowledge of heart disease and its risk factors. Older women perceived themselves to be at a higher risk of coronary artery disease (CAD) in a sample of 490 women, 20% of whom were African-American (Hass, 1996). In contrast, in a study of 328 women veterans, from 35 years of age or older, 32% of whom were African-American, younger age was among the factors associated with worry. Higher risk women, those possessing at least one heart disease risk factor (diabetes, smoking, or hypertension), did not perceive themselves at risk for heart disease (Biswas, Calhoun, Bosworth, & Bastian, 2002). In the previously mentioned study of 1,055 African-American adult women's perceptions about the seriousness of heart disease risk, women 50 years of age or older were more likely to list heart disease as a serious risk than younger women were. Less-educated women were less likely to list heart disease as a serious risk than women with a higher level of education were (Sadler, et al., 2005). In a telephone survey of 1,024 women, younger women were less aware of heart disease as a leading cause of death than women who were over 45 years of age (Mosca et al., 2004).

### **Conceptual Framework**

In the original development of the Health Belief Model, emphasis was placed on explaining and predicting preventive health behavior. With the influence of theorist Kurt Lewin, Rosenstock (1974) stated that it is the world of the perceiver that determines which preventive health behaviors an individual will and will not do. A person will only act on what he or she believes to exist.

The HBM provided the underlying theoretical framework for this study. Based on this framework, it is proposed that an African-American woman will respond best to messages about heart disease and its risk factors when the following conditions for change exist. She believes that she is at risk for developing heart disease, she believes that heart disease

is a serious health condition, and she has the appropriate knowledge regarding her risk for heart disease. If a woman does not see a behavior as risky or threatening, there is no stimulus to act.

### Purpose of the Study

The purpose of this study was to explore the relationships between socioeconomic status (SES), age, and knowledge about heart disease and its risk factors among educated African-American women. Specifically, the study examined the following associations. These associations were between perceived susceptibility and SES, age, and knowledge of heart disease and its risk factors, the associations between perceived seriousness and SES, age, and knowledge of heart disease and its risk factors. The study also examined the moderating role of SES in the associations between knowledge and perceived susceptibility and between knowledge and perceived seriousness, plus the moderating role of age in these relationships.

### Methodology

#### Research Design

A cross-sectional survey design was employed to address the purposes of this study. The survey contained demographic questions, two Likert scale questions (one for perceived susceptibility and one for perceived seriousness of heart disease) and the Heart Health IQ for assessment of knowledge of heart disease and its risk factors (National Heart, Lung, & Blood Institute, 1992).

#### Institutional Review Board Approval

Approval from the University of Alabama at Birmingham Internal Review Board was granted. Return of a completed survey served as consent to participate in the study. Permission from the Southeast Regional Director of Alpha Kappa Alpha Sorority, Incorporated was obtained.

#### Recruitment, Sample, and Setting

African-American women who were members of Alpha Kappa Alpha Sorority in the Southeastern Region (Alabama, Mississippi, and Tennessee) and attended its annual regional conference in the spring of 2005 were invited to participate. The setting for the regional conference was a designated hotel/conference center. This population was used to obtain a group of African-American women of varied socioeconomic status who were attending or had graduated college and lived in areas with high rates of heart disease. Only African-American women from 19 to 85 years of age without known heart disease were eligible to participate.

At the conference registration, potential subjects received a flyer entitled "Submit Your Heart AKA" that included an invitation to participate in the study and a brief description of the study. There was also a question that asked the potential subjects if they had ever been told by a doctor or nurse that they had heart disease. They were then given directions to the actual data collection point. Upon

arrival at the data collection point, any volunteer who indicated that she had heart disease was thanked and given a bottle of water and healthy snack. Those who hadn't been told that they had heart disease received a survey, were provided with a comfortable place in which to complete the survey, and provided a low-fat snack and bottled water. Participants also received a specially designed, embroidered AKA sorority handkerchief as a token of appreciation. A total of 194 women ( $N = 194$ ) were recruited to participate in this study.

#### Power Analysis

A power analysis was conducted for the determination of sample size (Polit & Hungler, 1995). A Type I error rate of .05 was used for all hypothesis tests. A minimum sample size of 126 was required based on an alpha of .05, power of .80, multiple regression model containing four predictors and a moderate effect size index of  $f^2 = .15$  (Cohen, 1988). The final sample was 194 participants.

#### Instrumentation

**Perceived Susceptibility and Perceived Seriousness.** Perceived susceptibility was measured using one statement adapted from a similar study that involved breast cancer research (Champion, 1987). The phrasing for Champion's research was, "I feel that I will get breast cancer in the future" (Test-retest reliabilities ranged from .47 to .62). The perceived susceptibility statement for this study was phrased, "I am likely to get heart disease in the future." The responses ranged from "strongly disagree" to "strongly agree," with the latter response representing the strongest chance the woman perceives herself to be at risk for heart disease (Champion). Test-retest reliability of this objective statement in a pilot study prior to this research and was .60.

Perceived seriousness was measured using one statement adapted from a similar study that involved heart disease research. The perceived seriousness statement read, "Heart disease in women has more serious consequences than breast cancer." The responses for the statement ranged from "strongly disagree" to "strongly agree" (Ali, 2002). No reliability was reported in Ali's study. The test-retest reliability of this objective statement was reported in a pilot study prior to this research and was .33.

**Demographic Questionnaire.** Questions concerning age, current household income, the number of individuals living in the home supported by the indicated incomes, the education and occupation of self, spouse, and parents, and their status as an undergraduate student were used for assessment of demographics.

**Knowledge Test.** The knowledge of heart disease and its risk factors was a one page questionnaire that consisted of 14 "true/false" questions on knowledge of heart disease and its risk factors (NHLBI, 1992). It addressed the known risk factor areas for heart disease including high blood pressure, blood cholesterol, diet, smoking, and physical activity as well as knowledge in these areas. Information on the reliability of this questionnaire has

not been reported in a group of African-Americans (Aesha Turner, personal communication, November 4, 2004). This questionnaire is a criterion-referenced measurement and emphasis is on determining what an individual knows or does not know so internal consistency, as a reliability estimate, is not applicable (Waltz, Strickland, & Lenz, 1991).

**The Hollingshead (1975) Four-Factor Index of Social Position.** This instrument was used to measure socioeconomic status. The four factors used were education, occupation, sex, and marital status. Educational scale values ranged from 1 (less than a 7th grade education) to 7 (graduate & professional education). Occupational scale values were ranked from 1 (day laborer, janitor, house cleaner, farm worker, food counter sales, food preparation worker, busboy) to 9 (physician, attorney, professor, chemical and aerospace engineer, judge, CEO, senior manager, public official, psychologist, pharmacist, accountant). Social status for the participants was calculated by multiplying the scale value for education by a weight of 3 and the scale value for occupation by a weight of 5. The two figures were then added to obtain a single score for each participant. Scores ranged from a low of 8 (unskilled laborers, menial service workers with a 7th grade education) to a high of 66 (major business and professionals, with advanced degrees). If the participant was married, the husband and wife's scores were averaged. The results were used to delineate categories of socioeconomic status, with Class I (8-19) the lowest level and Class V (55-66) as the highest. SES for the fulltime undergraduate students was calculated by rating their parent's occupation and education.

**Data Management and Analysis**

Data were analyzed using the SAS Version 9 Statistical Package. Descriptive statistics, including frequency distributions, measures of central tendency, and measures of dispersion appropriate to level of measurement, were examined for all variables.

Hypotheses were tested using multiple regression analysis. An alpha level of .05 was used to denote statistical significance. Moderating effects were analyzed by testing regression weights for interaction effects between corresponding variables, controlling for other variables in the regression model. Further, bivariate correlations were examined using Spearman's Rank Correlations. Additional analysis was carried out as necessary.

**Results**

**Sample**

Of the total of 214 women who volunteered to participate in the study, 20 did not meet the inclusion criteria, resulting in a final sample of 194 (N = 194) women. The median age category was 45-54 years of age with an interquartile range (IQR) of 35-44 and 55-64 years of age. Subjects were mostly married (60.8%), had a graduate or professional education (60%), had an income range of \$50,000 - \$74,999 (44.3%), and had one to three people in

their households (87.1%). The median occupational status for participants was 8 (IQR = 6-8), representing the "mechanical, nuclear, and electrical engineer, educational administrator, veterinarian, military officer, elementary, high school and special education teacher" grouping. Of the 194 participants, 34 (18%) were undergraduates. The minimum observed participant social class on a scale of 1 (lowest) to 5 (highest) was 2, and the maximum was 5. The median social class was 4 (IQR = 4-4).

**Participant's Perceptions of Susceptibility and Seriousness of Heart Disease and their Knowledge about Heart Disease**

Median perceived susceptibility to heart disease was 3 (IQR = 2-3), indicating that half of the sample disagreed that they were susceptible to heart disease and the other half had no opinion or were uncertain of their susceptibility to heart disease. Collapsing the Likert-type categories into agreement (agree and strongly agree) and disagreement (disagree and strongly disagree), 33.7% disagreed and only 24% agreed that they were susceptible to heart disease in the future. Median seriousness was 4 (IQR = 3-4), which indicated that at least half of the participants had no opinion or were uncertain and half strongly agreed that heart disease was serious. In fact, 66.7% either agreed or strongly agreed that heart disease was serious, and only 13.5% disagreed or strongly disagreed that it was serious. Participants answered 6 (43%) to 13 (93%) of the 14 heart disease knowledge questions correctly. The median score was 11 (79%).

**Correlations between Age and SES**

The associations of perceived susceptibility to, perceived seriousness of, and knowledge about heart disease and its risk factors, SES, and age were examined initially with Spearman's correlations (see Table 1). Perceived susceptibility was not related to age or SES. Perceived seriousness was related to age. The older the woman, the greater she perceived her risk for heart disease. Knowledge was associated with both SES and age. The older the woman and the higher her SES, the more she knew about heart disease and its risk factors.

**Table 1. Spearman's Correlations of participants' (n = 194) perceived susceptibility to, perceived seriousness of, and knowledge about heart disease and its risk factors, SES, and age**

Variable	Knowledge	Perceived Susceptibility	Perceived Seriousness	SES
Perceived Susceptibility	-.042			
Perceived Seriousness	.032	.198*		
SES	.191*	-.0197	.083	
Age	.176*	.095	.161*	.098

\*(p < 0.05)

**Table 2. Results of regression analyses**

**Hypothesis 1: Results from Multiple Regression Model Testing SES, Age, and Knowledge Relationships with Perceived Susceptibility**

Variable	$\hat{\beta}$	Standard Error	<i>t</i>	<i>p</i>
Intercept	2.73	.731	3.75	.0002
SES	-0.108	.134	-.80	.423
Age	.107	.057	1.88	.061
Knowledge	.004	.050	.08	.933

**Hypothesis 2: Results from Multiple Regression Model Testing SES, Age, and Knowledge Relationships with Perceived Seriousness**

Variable	$\hat{\beta}$	Standard Error	<i>t</i>	<i>p</i>
Intercept	2.80	.839	3.34	.001
SES	.248	.154	1.61	.101
Age	.065	.065	1.00	.319
Knowledge	-.038	.058	-0.66	.507

**Hypothesis 3a: Results from General Linear Model, Testing Moderation Effect of SES on Knowledge Relationship with Perceived Susceptibility**

Variable	$\hat{\beta}$	Standard Error	<i>t</i>	<i>p</i>
Intercept	2.35	.239	9.82	<.0001
SES	-.108	.135	-0.80	0.423
Knowledge	.005	.051	0.09	.925
Age	.108	.057	1.87	.063
SES*Knowledge	.007	.105	0.07	.947

**Hypothesis 3b: Results from General Linear Model, Testing Moderation Effect of SES on Knowledge Relationship with Perceived Susceptibility**

Variable	$\hat{\beta}$	Standard Error	<i>t</i>	<i>p</i>
Intercept	3.38	.275	12.29	<.0001
SES	.248	.154	1.61	.110
Knowledge	-.038	.059	-0.66	.510
Age	.065	.066	0.99	.325
SES*Knowledge	-.005	.120	-0.05	.962

**Hypothesis 4a: Results from General Linear Model Testing Moderation Effect of Age on Knowledge Relationship with Perceived Susceptibility.**

Variable	$\hat{\beta}$	Standard Error	<i>t</i>	<i>p</i>
Intercept	3.23	.543	5.96	<.0001
SES	-0.11	.136	-0.86	.391
Knowledge	.010	.052	0.20	.844
Age	.112	.058	1.93	.056
SES*Knowledge	-0.02	0.05	-0.45	.652

**Table 2 (con't). Results of regression analyses (continued)****Hypothesis 4b: Results from General Linear Model Testing Moderation Effect of Age on Knowledge Relationship with Perceived Susceptibility.**

Variable	$\hat{\beta}$	Standard Error	<i>t</i>	<i>p</i>
Intercept	2.74	.622	4.40	<.0001
SES	.228	.156	1.46	.146
Knowledge	-.025	.060	-0.41	.679
Age	.076	.066	1.14	.258
SES*Knowledge	-.047	.050	-0.88	.380

**Prediction of Perceived Susceptibility and Seriousness by SES, Age, and Knowledge**

The multiple regression analyses predicting perceived susceptibility ( $R^2 = .023$ ;  $F = 1.28$ ;  $DF = 3, 165$ ;  $p = 0.283$ ) and perceived seriousness ( $R^2 = .026$ ;  $F = 1.46$ ;  $DF = 3, 164$ ;  $p = 0.227$ ) were not statistically significant. This indicated that SES, age, and knowledge in college-educated African-American women may not predict her perceptions about heart disease risk (see Table 2).

**Moderation of the Prediction of Perceived Susceptibility and Seriousness by SES and Age**

Interaction effects were added to each of the previous regression models to examine the moderating effects of SES and of age with knowledge in prediction of perceived susceptibility and perceived seriousness. Four separate analyses were conducted. The multiple regression analyses that included the interaction of SES and knowledge predicting perceived susceptibility ( $R^2 = .023$ ;  $F = 0.96$ ;  $DF = 4, 164$ ;  $p = 0.433$ ), and perceived seriousness ( $R^2 = .026$ ;  $F = 1.09$ ;  $DF = 4, 163$ ;  $p = 0.363$ ) were not statistically significant. The interaction terms between SES and knowledge also were not significant predictors of perceived susceptibility ( $\beta = .007$ ,  $t = .07$ ,  $p = .947$ ) or perceived seriousness ( $\beta = .120$ ,  $t = -.05$ ,  $p = .962$ ). SES does not appear to moderate the relationship between knowledge and perceived susceptibility or perceived seriousness in college-educated African-American women (see Table 2).

The multiple regression analyses that included the interaction of age and knowledge predicting perceived susceptibility ( $R^2 = .024$ ;  $F = 1.01$ ;  $DF = 4, 164$ ;  $p = 0.405$ ) and perceived seriousness ( $R^2 = .031$ ;  $F = 1.29$ ;  $DF = 4, 163$ ;  $p = 0.277$ ) were not statistically significant. The interaction terms between age and knowledge also were not significant predictors of perceived susceptibility ( $\beta = -0.02$ ,  $t = -0.45$ ,  $p = .652$ ) or perceived seriousness ( $\beta = -.047$ ,  $t = -.88$ ,  $p = .380$ ). Age does not appear to moderate the relationship between knowledge and perceived susceptibility or perceived seriousness in college-educated African-American women (see Table 2).

**Discussion**

The heart disease knowledge observed in this study's participants ( $M = 75\%$ ) was comparable to the heart disease knowledge reported in other studies of

African-Americans (DeForge, et al., 1998; Webb, 1996). In a study using the same knowledge test on 1,389 African-American men and women, 70% of whom were men and 50% hypertensive, the mean knowledge of heart disease and its risk factors was 70% (DeForge). Webb (1996) reported an average knowledge of 75% in 40 women, 25% of whom were African-American.

The perceived susceptibility to heart disease in this sample was comparable to the perceived susceptibility to heart disease reported previously using a similar scale (Webb, 1996). The mean for perceived susceptibility to heart disease for this sample was 2.79 ( $SD = .97$ ), indicating that, on average, subjects had no opinion or were uncertain about their perceived risk for developing heart disease in the future. Similarly, in a sample of women, 25% of whom were African-American, average self-perception of susceptibility to coronary artery disease (CAD) was 3 (Webb, 1996). Those women, like the women in this sample, had neither a high nor low perceived future susceptibility to heart disease. This uncertainty on the part of these women could be interpreted to mean that these subjects might not have had enough information or education about the disease and its risk factors, or of their actual individual level of risk, to make a precise judgment. On the other hand, this uncertainty could also indicate that there is some disconnect between knowledge of heart disease and an objective interpretation of individual risk, or that the individual may be in denial. Despite the known high death rate for African-American women from heart disease, only 24% of the women in this study viewed themselves as having some risk for heart disease in the future.

On average, the women in this study agreed that heart disease was serious. The mean score, on a 5-point Likert-type scale of perceived seriousness of heart disease in women, relative to breast cancer, was 4 ( $SD = 1.1$ ). In fact, only 13.5% were in disagreement with the statement that "heart disease has more serious consequences than breast cancer," and 19.8% had no opinion or were uncertain of the seriousness of heart disease relative to breast cancer. These findings were not consistent with past research. In a sample of low-income, young and middle-aged African-American women in focus groups, women did not view cardiovascular disease as a major health concern or realize that heart disease was the leading cause of death among African-American women (Behera et al., 2000). Similarly out of 1,055 African-American women between 20 and 94

years of age, only 31% reported that heart disease was a serious health threat (Sadler et al., 2005).

Perceived susceptibility was correlated with seriousness, indicating that individuals who perceived themselves as susceptible to future heart disease tended to view heart disease as serious. This outcome is consistent with theory, as both constructs are types of perceived threats, and the HBM proposes that people will respond best to messages about health promotion or disease prevention when a person believes that he or she is at risk for developing some condition, such as heart disease, and that the condition is serious.

Findings from this study suggest that age was not related to perceived susceptibility was inconsistent with a previous study of perceived susceptibility of heart disease in a largely White population (Hass, 1996; Mosca et al., 2004). In these larger studies of 490 and 1,024 women, 20% and 12% African-American, respectively, older women perceived themselves as more susceptible to heart disease than their younger counterparts.

In the present study, the older the participant, the more seriously they perceived the consequences of heart disease. This finding was consistent with a previous study of perceived seriousness of heart disease in African-American women. In 1,055 African-American women between 20 and 94 years of age, women 50 years of age or older were more likely than those under 50 to list heart disease as their most serious health problem (Sadler et al., 2005). The statistically significant relationship found between seriousness and age is consistent with theory, as age is considered a modifying factor, which is postulated by the HBM as having some influence on perception of seriousness.

Findings from the current study were similar to those from previously reported studies indicating that, regardless of economic status, African-American women tended to perceive themselves as not susceptible to heart disease. For example, Poduri and Grisso (1998) reported that economically disadvantaged African-American women did not perceive themselves at risk for heart disease but did identify family members and friends who had risk factors. Similarly, Erblich et al. (2000) reported that women who had salaries under \$40,000, 64% of whom were African-Americans, perceived themselves at higher risk of breast cancer and lower risk of heart disease. In contrast, 193 largely White women with incomes of less than \$40,000 felt more susceptible to heart disease (Humphries & Krummel, 1999).

This study's finding that knowledge was related to SES in African-American women is in concordance with previous studies of largely White populations (Ford & Jones, 1991; Andersson & Leppert, 2001). Women with lower education and income tended to have lower knowledge of heart disease risk.

According to the HBM, SES and age shape individual perceptions and thus moderate the relationship of knowledge to perceptions. Results indicated that neither SES

nor age moderated the association between knowledge and perceived susceptibility or between knowledge and perceived seriousness. No previous reports of studies were found that explored the moderating effects of SES or age on relationships between knowledge and perceived susceptibility or perceived seriousness. These findings cannot be evaluated in terms of consistency with findings from other samples and they need to be validated in future studies.

It is necessary to consider the appropriateness of the HBM to predict health promotion/disease prevention behaviors of African-American women. The HBM postulates that a person must first sense threats, perceived susceptibility, and perceived seriousness before they change health behaviors or accept messages about health promotion and disease prevention. In a study containing 94% White women, perceived susceptibility to and perceived seriousness of CHD together explained over 50% of the variance of CHD preventive behaviors (Ali, 2002). This has not been tested in African-American women. This difference, or other aspects of the HBM that were not included in the current study, may impact the suitability for application of the HBM to African-American women.

Based on a review of the literature, usefulness of the HBM in African-American women has been limited and is not clearly understood. The Theory of Reasoned Action/Planned Behavior might be more appropriate in that it offers guidance for people at all stages of readiness for change. The Theory of Reasoned Action/Planned Behavior is based on the premise that people are at different stages of motivational readiness for engaging in health behavior and that intervention approaches are most useful when they are matched to a person's current stage of change. This model can also assist in tailoring behavioral change interventions to maximize successful outcomes for African-American women who may be at risk for heart disease (Kohler, Grimley, & Reynolds, as cited in Handbook of Health Promotion and Disease Prevention, Raczynski & DiClemente, 1999). In the Theory of Reasoned Action, the concern for behavioral change is determined by an intention to perform a particular behavior and the degree to which a person perceives her control over the behavior (Ajzen & Fishbein, 1980). For prediction of behavior, this theory takes into account factors that are external to the model but are said to influence other variables in the model to predict behavior. The Theory of Reasoned Action may be applicable to this population, and warrant future investigation.

### Limitations

Knowledge and awareness related to heart disease of women in the current study could have been influenced by the *Go Red for Women Campaign*, a national media campaign sponsored by the American Heart Association (Jacobs & Eckel, 2005). This campaign, conducted two months prior to the study, was highly visible, as evidenced by billboards along the highways, radio advertisements, and magazine ads in February 2005, which was Heart Health

Awareness month. The reliability of the measures employed to assess knowledge and perceptions had not been previously validated in African-American women. The reliability coefficient alpha of 0.16 for the 14-item heart disease and risk factors knowledge test should be interpreted with certain facts in mind. Potential reasons for such a low index of reliability are that the 14-item knowledge test is criterion-referenced and composed of a limited number of test items (14, true-false items). There may have been problems with internal consistency since the test was composed of a set of items that measured different attributes of heart disease and its risk factors, all of which were to measure one critical attribute, "knowledge of heart disease and its risk factors." One-item measures were used to assess perceived susceptibility and perceived seriousness. These questions were derived from a pilot study. A lack of significance in any finding in this study is not conclusive due to insufficient power with these instruments. The generalizability of this study may be limited to populations similar to African-American women living in Alabama, Mississippi, or Tennessee, who have completed or attended college. Finally, this study was limited to only two of the four main components of the HBM. Further testing of the HBM including perceived benefits and barriers, and cues to action is necessary to evaluate the applicability of the HBM to this population.

#### Implication for Nursing Research

Development and testing of HBM-related measures with improved validity and reliability is necessary for use in this population. It is also necessary to evaluate whether or not the HBM components (SES, age, perceived susceptibility, and perceived seriousness) add explanatory power. Future research in nursing needs to focus on validating the findings of this study and developing and testing measures to confirm the absence of moderating influences. Based on the findings of non-statistically significant models, validation of regression findings in independent samples from the population may be necessary. Finally, future nursing research should test whether causal mechanisms are producing observed associations, using randomized clinical trials (e.g., interventions to increase perceived susceptibility, and determinations about whether perceived seriousness is increased and positive behavioral changes occur). As for practice, nurses need to be aware of the levels of influence these variables may play when delivering messages about health promotion and disease prevention.

#### Recommendations for Future Research

It is crucial that instruments are developed to evaluate the knowledge of heart disease risk factors, perceived susceptibility to heart disease, and perceived seriousness of heart disease in African-American women. Valid and reliable tools for testing perceptions of heart disease and its risk factors in African-American women need to be designed and developed. It is also crucial that interventions are designed that focus on increasing awareness of

heart disease and its risk factors in younger women. The applicability of the full HBM with African-American women across the life span needs to be tested to determine if those factors may be manipulated to produce positive behavioral change and reduce the risk of heart disease.

Other recommendations include focussing on assisting African-American women in identifying their personal risk factors in order to assist them with perceptions of susceptibility, teaching them the benefits of taking action, and assisting them in identifying solutions to any barriers that may exist. Explore application of other theories and models, such as the Theory of Reasoned Action, that are used to explain behavior or to design interventions that focus on health promotion and disease prevention. Design interventions for use by nurses and doctors that focus on raising awareness and adoption of evidence-based guidelines for heart disease prevention in women. Adapt some of the same tactics that were used to increase breast cancer awareness in an effort to design appropriate interventions and messages concerning heart health. Design effective marketing tools for heart disease prevention in women. In addition, it is important to design valid, reliable tools that would measure the effects of modifying factors (demographic variables, such as age, sex, race, and ethnicity), the sociopsychological variables (e.g., personality, social class, and peer and reference group pressure), and the structural variables (e.g., knowledge about the disease and prior contact with the disease) on perceptions of heart disease in African-American women.

#### Conclusions

The outcomes of the present studies may provide useful information in the development of interventions for African-American women of similar age, education, and socioeconomic status to those who participated in the present study. Since perceptions of the seriousness of heart disease increased with age in this sample, interventions directed at producing a more realistic evaluation of the seriousness of heart disease in younger African-American women may need to be developed.

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