

**Appendix C.2**  
**Of the**  
**Evaluation of Lifestyle Modification and Cardiac Rehabilitation in Medicare Beneficiaries\***

**Disparities in Utilization of Cardiovascular Treatment by Gender, Race and Ethnicity:  
Opportunities for Prevention<sup>+</sup>**

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April 30, 2009

\*Supported by the Centers for Medicare & Medicaid Services under contract number 500-95-0060, Task Order 02 to Brandeis University and number 500-02-0012-MDBU to the Delmarva Foundation for Medical Care

<sup>+</sup> Citation for published version: Bhalotra S, Ruwe M, Strickler G, Ryan A, Hurley CL. (2007). Disparities in Utilization of Cardiovascular Treatment by Gender, Race and Ethnicity: Opportunities for Prevention. *Journal of National Black Nurses' Association*, 18(1):36-49. Reproduced with permission of Dr. Joyce Giger, Editor.

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## **I. Introduction**

The burden of cardiovascular disease is well documented: it is the nation's leading cause of death, and kills 500,000 women annually. Since 1984, it has killed more women than men. While African-American and Hispanic women have the highest risk of death from heart disease and stroke, a survey by the American Heart Association reported in the February 4, 2004 issue of *Circulation* shows that they also have the lowest risk factor awareness of any racial or ethnic group. Management of cardiovascular disease is based on whether the patient is at low, intermediate, or high-risk for heart attack. For persons at low risk, management strategies may require only limited risk factor. For those at moderate risk, a combination is often required of more intensive risk factor modification and medical management including the use of pharmacotherapy as risk rises (for example, aspirin, lipid-lowering drugs, ACE inhibitors and beta-blockers). Finally, persons at the highest risk often require both of the previous strategies plus a coronary procedure. Cardiac catheterization is a diagnostic procedure for assessing the extent of coronary artery disease and for evaluating the patient for further intervention. Percutaneous transluminal coronary angioplasty (PTCA) includes a group of procedures designed to improve or restore the patency of coronary arteries. Coronary artery bypass surgery (CABG) involves replacement of diseased sections of coronary arteries with other native vessels.

This paper seeks to examine disparities in treatment utilization for coronary heart disease in the Medicare population from the available scientific literature. Evidence for disparities in utilization of these procedures exist by both race and gender. In this paper, we first provide an overview of cardiovascular disease in general and specifically its impact on women and ethnic minorities. Next we summarize the literature on disparities in utilization by gender and briefly describe interventions to address disparities.

## **II. Background**

Cardiovascular disease (CVD), primarily heart disease and stroke, is the leading cause of death for Americans across gender as well as racial and ethnic groups, and is a leading cause of disability in the United States (Centers for Disease Control). The American Heart Association reports that CVD has been the number one cause of mortality in the United States in every year since 1900 except 1918, when the country suffered the swine flu epidemic (American Heart Association, 2003). CVD was accountable for 38.5% (or 1 out of 2.6) of all deaths in 2001 (American Heart Association, 2003). In the year 2004, 1.2 million people in the United States were predicted to suffer a heart attack (Centers for Disease Control, 2004a, p.121). It was expected that one half of the estimated 1.2 million heart attacks, would lead to death (Centers for Disease Control, 2004a, p.121). Costs related to CVD were projected to total \$368.4 billion in 2004 in health care expenditures, medications, and lost productivity due to disability and death

(American Heart Association, 2003). Of the total \$368 billion, heart disease was estimated to cost \$238.6 billion, coronary heart disease, \$133.2 billion, hypertensive disease, \$55.5 billion, stroke \$53.6 billion, and congestive heart failure, \$28.8 billion (American Heart Association, 2003).

Cardiovascular disease is a major complication of, and the leading cause of premature death for people with diabetes (National Institutes of Health, 2001). The National Institutes of Health and the Centers for Disease Control report that at least 65 percent of people with diabetes die from heart disease or stroke, and adults with diabetes are two to four times as likely to have heart disease or suffer a stroke than people without diabetes. The costs related to CVD and type 2 diabetes accounts for more than \$7 billion of the 44.1 billion annual direct medical costs for diabetes in 1997 (National Institutes of Health, 2001). Other risk factors associated with CVD include tobacco use, high blood cholesterol and other lipids, high blood pressure, physical inactivity, and obesity (American Heart Association, 2003).

Minority and low-income populations bear a high burden of death and disability from cardiovascular disease (Centers for Disease Control). Racial and ethnic minorities have been found to have higher rates of hypertension, and develop hypertension at younger stages of life. The proportion of premature death from heart disease has been found to be greater for racial and ethnic minorities. In 2001, the proportion of premature death due to heart disease was 36% for American Indians/Alaskan Natives, 31.5% for Blacks, compared with 14.7% for Whites (Centers for Disease Control, 2004b, p. 121-125). Also in 2001, the proportion of premature death due to heart disease was higher for Hispanics (23.5%) than non-Hispanics (16.5%), and for males (24.0%) than females (10.0%). Hispanic Whites (23.3%) had lower proportions than Hispanic Blacks (27.5%), and non-Hispanic Whites had lower proportions (14.4%) than non-Hispanic Blacks (31.5%) (Centers for Disease Control, 2004b, p. 121-125). (Data for other racial/ethnic minorities were not reported in this summary).

Sixty-four percent of the over 6 million people discharged from short stays at the hospital for CVD in 2001 were 65 and older (American Heart Association, 2004). People aged 65 years and older account for approximately 84% of deaths from all cardiovascular diseases (American Heart Association, 2004). In a study of over 111,000 elderly patients who had been hospitalized for myocardial infarction, it was found that 2.5% were admitted with ischemic stroke within six months of discharge (Lichtman et al., 2002). The study finds that older patients, African American patients, and patients with any frailty are at increased risk for stroke after a heart attack.

Differences by gender, age and race in CVD for elderly population may also be seen in annual rates of coronary heart disease. Based on a population with new or recurrent heart attacks: for non-Black men, the rates are 23.0 per 1,000 aged 65-74 years (it is M.I.) and 35.3 for seventy-five and older; for Black men, the rates are 21.9 per 1,000 aged 65-74 years, and 31.4 for seventy-five and older; for non-Black women, the rates are 9.8 per 1,000 aged 65-74 years and 24.9 for seventy-five and older; for Black women, the rates are 13.8 per 1,000 aged 65-74 years and 28.1 for seventy-five and older (American Heart Association, 2004). The American Heart Association notes that elderly women are more likely than men to die from heart attack within a few weeks of having one, and are more likely than men to have heart attacks at older ages (American Heart Association, 2004).

### **III. Methods**

To identify literature on disparities or performance gaps in coronary artery disease and interventions to reduce disparities in invasive cardiac procedures, we searched MEDLINE (NLM/PubMed, 2003). We used Medical Subject Heading (MeSH) terms for: (1) target populations; (2) cardiac catheterization, (3); transluminal percutaneous angioplasty, and (4) coronary artery bypass surgery. MeSH terms are summarized in Table A.1 in Appendix A. Relevant web sites were also searched. These terms were used in multiple combinations to yield titles that were reviewed for relevance. Title and abstract review yielded articles that were subjected to further review for quality and relevance and for further in-depth review. Subsequent searches were performed to answer specific queries that arose from initial review. Thus, we used an inductive approach involving iterative searches after the initial search strategy.

Eligible reports were studies involving any of the target populations and meeting all of the following criteria: (1) Studies published between 1999-2003; (2) Studies involving population aged 65 years and over; and (3) Studies addressing coronary artery disease burden in the target populations, or possible interventions to reduce disparities in cardiovascular disease preventive services and interventional cardiology services.

Please note that the literature search meets standards of academic rigor in terms of literature sources, scholarly selection of appropriate and relevant material, and review, analysis, and synthesis. Articles are representative of the body of literature on this topic.

Our research shows that the Medicare databases are used extensively in cardiovascular research. Several studies reviewed use the Cooperative Cardiovascular Project (CCP) database of Medicare beneficiaries hospitalized between 1994 and 1996 with AMI. The American College of Cardiology (ACC) established the National Cardiovascular Data Registry (ACC-NCDR) to

provide a uniform and comprehensive database for analysis of cardiovascular procedures across the country and is a powerful source for risk-adjusted research (Brindis et al., 2001; Shaw et al., 2003). Specific regional databases such as the Maryland Health Services Cost Review have been used. Studies also relied on medical record review, and both cross-sectional and longitudinal primary patient data collection.

## **IV. Results**

### **A. Disparities in Cardiovascular Treatment by Gender and Race/Ethnicity**

Based on overall numbers, women have outpaced men in prevalence of, and mortality from, cardiovascular disease (see Table 1). One in five women has cardiovascular disease, but only in the last 10 years have the disparities in incidence, morbidity, mortality, risk factors, diagnosis, and treatment been explored, despite research that consistently shows a gap in the utilization of medical therapy, diagnostic studies, and re-vascularization procedures involving women (Duvall, 2003). This disparity is particularly marked amongst certain minorities, especially Black females.

A recent study by Epstein et al. (2003) reviewed the evidence that documents that women, ethnic minorities and uninsured persons receive fewer cardiac procedures than affluent White male patients do. However, as Leape et al. (1999) point out "rates of use are crude indicators of quality. The important question is, do women, minorities, and the uninsured fail to receive cardiac procedures when they need them. Several studies point to the fact that indeed, they do. Hannan et al. (1999) showed that African-American patients of both genders had significant access problems, even when controlling for appropriateness and necessity, and appeared not to be related to patient refusal. Saha et al. (1999) similarly demonstrated that gender disparities were unlikely to be explained by patient preference. Watson et al. (2001) showed a disparity for White women; and both Black men and women. Brown (2002) specifically demonstrated that African-American women in Maryland received significantly fewer high-technology cardiac treatments than all other race and gender categories examined, controlling for age, insurance status, and number and type of co-morbidity. In contrast, a U.K. study showed no gender difference in the use of investigational or revascularization procedures (Raine et al., 2002).

While there is more evidence pointing to disparate prescription and utilization of interventional cardiac procedures, the ACC/AHA evidence-based guidelines suggest that there is no difference in outcome given comparable care, thus laying to rest a potential explanation for the disparity. For example, a study by Woods et al. (2002) demonstrates that post-MI process and outcomes (including cardiac catheterization, PTCA, and CABG) are the same for men and women. On one hand, awareness of the issue of gender disparity in the receipt of cardiovascular procedures has increased to the level that newer technologies are specifically tested and researched by gender,

for example, the use of off-pump coronary bypass surgery (Scott et al., 2003). On the other hand, disparities persist beyond the realm of surgical diagnostic and therapeutic techniques; in a study by DiCecco et al.(2002), women were found to receive lipid-lowering medication less often than men when it was indicated. The difficulty of definitively determining whether or not gender disparity exists that is unexplained by case-mix is illustrated by some studies such as Rathore et al., (2002a, 2002b). These and some other studies fail to demonstrate a gender disparity that remains unattenuated after multivariate adjustment based on clinical guidelines for appropriateness. Even when some disparity remains, at least in one study it is because of clinically equivocal indications (Rathore et al., 2002b). However, the same series of studies also shows that women are less likely to receive coronary revascularization after cardiac catheterization for M.I. while hospitalized. Thus, definitive inferences are difficult to draw in some studies about the existence, extent, and nature of gender disparity. Suffice it to say, that inadequate evidence exists to lay the cause of gender disparities squarely on biological differences.

**Table 1: Burden of Cardiovascular Disease by Gender and Race**

Population Group	Prevalence 2001	Mortality 2001	Hospital Discharges 2001	Cost 2004
Total population	64,400,000 (22.6%)	931,108	6,226,000	\$368.4 billion
Total males	31,100,000 (21.5%)	432,245 (46.4%)*	3,058,000	---
Total females	33,300,000 (22.4%)	498,863 (53.6%)*	3,168,000	---
White males	30.0%	374,280	---	---
White females	23.8%	433,867	---	---
Black males	40.5%	48,939	---	---
Black females	39.6%	56,821	---	---
Mexican-American males	28.8%	---	---	---
Mexican-American females	26.6%	---	---	---

Note: (---) = data not available

\* These percentages represent the portion of total mortality that is males vs. females.

Source: American Heart Association, *Heart Disease and Stroke Statistics – 2004 Update*. Dallas Texas: American Heart Association; 2003.

Most studies researching the area of disparity in receipt of cardiac procedures do so using either ACC/AHA or RAND guidelines. Leape et al. (1999) used the RAND criteria to demonstrate that uninsured patients were less likely to receive revascularization procedures. Interestingly, this study did not reveal disparity among insured patients by sex or ethnic status, if the patient was admitted to a hospital that provided PTCA and CABG. Another study showed that gender differences in the receipt of diagnostic and therapeutic procedures for coronary disease were markedly narrowed by the assurance of health insurance as well as progression to serious disease (Daumit et al., 2000). Schneider et al. (2001) showed greater inappropriate use among

White men as compared to all other groups, using RAND criteria; however this did not fully account for observed racial disparities. Leape et al. (2003) have shown that as much as a quarter of PTCAs may be inappropriate (overutilization) by ACC/AHA guidelines, leading one to speculate that there may be some inappropriate underutilization as well, if indeed guidelines are not followed. This speculation is supported by a study by Hannan et al. (1999) who demonstrate race and gender disparity in the receipt of CABG after controlling for appropriateness and necessity, using RAND guidelines.

Gender and race physician-patient concordance has been shown to positively affect at least the receipt of clinical preventive services. However, at least two studies suggest that this is not the case with cardiac procedures. Chen et al. (2001) demonstrated that racial differences remained the same regardless of the race of the physician, and Rathore et al. (2001) confirmed these same findings for gender; women who were status-post M.I. underwent cardiac catheterization less often than men, regardless of the gender of the treating physician.

The latest study to be published on the topic within our study-period provided a good review of the topic to date, as well as opportunities for backward searches to assure that we had not missed any important findings. In this study, Epstein et al. (2003) used a sophisticated research methodology involving Medicare Part A and Part B administrative data, and inpatient and outpatient patient records. They found that there was greater underuse amongst Blacks, and possibly greater overuse among Whites. Underuse was associated with significantly worse outcome. Rates of underuse by men and women were similar. While there was not evidence for greater underuse by women in general, this was not reported by race. Shulman (1999) had reported previously, however, that physicians, when shown a series of video vignettes with standardized patients varying systematically by race and gender, were least likely to refer Black women for cardiac procedures. For several reasons, including the fact that women are more likely to present with “atypical” symptoms (by male standards) of myocardial infarction, women are more likely to receive cardiac procedures at later and more severe stages of disease. For example, Azar et al. (2000) showed that women who received primary revascularization procedures after an acute myocardial infarction more often presented in cardiogenic shock. Thus the weight of evidence infers that women are more likely to underuse cardiac procedures, as are racial/ethnic minorities. A very few studies crosstabulate the two to suggest that racial/ethnic minority women are underserved the most in this regard.

## **B. Evidence-Based Treatment**

Scrupulous documentation by the American College of Cardiology and the American Heart Association (ACC/AHA) of the evidence base for all three procedures has led to the formation of

guidelines and consensus statements that guide the use of these procedures. The American College of Cardiology/Society for Cardiac Angiography and Interventions Clinical Expert Consensus Document on Cardiac Catheterization (Bashore et al., 2001), the ACC/AHA Guidelines for Percutaneous Coronary Intervention (Smith et al., 2001), the ACC/AHA Guidelines for Coronary Artery Bypass Graft Surgery (Eagle et al., 1999) provide indications for the use of these procedures. There are very detailed guidelines based on, for example, different clinical presentations, co-morbid conditions, and gender. Thus, for example, the consensus statement for cardiac catheterization explains which patient sub-groups are suitable to be catheterized in different laboratory environments. The CABG guidelines provide an extensive review of the literature that examines whether female sex is an independent risk factor for in-hospital mortality and morbidity after CABG surgery (which would alter the nature of recommendations for appropriate intervention), and concludes with explicit indications and criteria for proceeding with CABG. The guidelines for PTCA similarly conclude that, "coronary intervention should be considered for women in need of revascularization with the anticipation of a favorable outcome".

### **C. Interventions to Address Disparities in Treatment for Cardiovascular Disease**

In general, interventions to address disparities in health care have addressed barriers at the system, provider, and patient level. The AHA/ACC "Guide to Preventive Cardiology for Women" (Mosca et al., 1999) addresses systemic barriers by providing guidelines for the primary care screening and treatment of women at risk for coronary heart disease risk. Similarly, Bird et al (2003) suggest strategies for the collection of data for HEDIS and other measures of the quality of cardiac care at a system level. Cabana and Kim (2003) provide specific examples of overcoming some of these barriers for providers, such as lack of awareness, self-efficacy, inertia of previous practice style, and external barriers. Patient education and self-management is also promoted as a vehicle, with the hope that, "behavioral changes on the part of women and reshaping of practice patterns by their health care providers may dramatically reduce the number of women disabled and killed by CHD each year" (Wenger, 2003).

These three studies are prototypical of interventions for cardiovascular disease, in that interventions for chronic illnesses are usually geared towards primary prevention and medical aspects of secondary prevention, such as pharmacotherapy. This is also consistent with the findings of the comprehensive Evidence Report that searched for interventions to reduce the racial/ethnic disparity in cancer care (Capitman et al., 2001). This report was produced under contract to CMS, and searched for evidence of interventions to reduce racial/ethnic disparities in cancer prevention and treatment. There was very scant evidence for such efforts to be tailored to elders of color. Interventions to increase adoption of high technology, high-cost procedures

appear not to be prevalent; a phenomenon not difficult to understand given the health care climate of burgeoning expenses. However, there has been steadily increasing attention to the issue of gender disparity in the medical and health services research community, which may eventually translate into an alleviation of this problem. In the meanwhile, we did not find evidence of specific interventions to increase utilization of cardiovascular procedures by women.

Perhaps an example can be drawn from the social marketing techniques used to improve the rates of mammography. As Capitman et al. (2001) showed, disparities in first-time screening for breast cancer have begun to diminish, although the gap in follow-up still remains wide. Improvements in mammography rates were the result of a complex interplay of system, provider, and patient factors that may provide valuable lessons for interventions to improve uptake of cardiac catheterization, PTCA, and CABG by women, when indicated.

## **V. Conclusions**

In summary, this literature review presents the evidence on disparities in cardiovascular treatment for ethnic minorities and women. The scientific evidence clearly documents the gap in treatment for disadvantaged individuals with cardiovascular disease. We also briefly reviewed interventions to reduce disparities in health care and conclude that there is little evidence of specific interventions to increase utilization of cardiovascular procedures by women. One implication of these findings is the need for increased use of high-cost technology if disparities are to be addressed. As women live longer than men, and tend to suffer more heart disease and underutilize some lifestyle modification services, females appear to be an important target group for future lifestyle modification services.

## Appendix A

**Table A.1 Medical Subject Heading (MeSH) Terms for Examining Disparities in Coronary Heart Disease: Main Terms (n=number of initial “hits”)**

1	2	3	4
<b>MeSH Terms for Target Populations (n=36,917)</b>	<b>MeSH Terms for Clinical Conditions (n=67,317)</b>	<b>MeSH Term for medical procedures (n=70,856)</b>	<b>MeSH Term for Health Care Measures (n=261,916)</b>
Asian Americans or Asian-Americans or Blacks or African-American or Hispanic or Latina or Latino Or Hispanic-Americans Indians or North American or Mexican Americans or Mexican-Americans Pacific Islands or or pacific-islanders or Rural Population or Disabled Low Income or Oldest Old or Dual Eligible or Dual Enrolled Or Medicare	Myocardial infarction or MI or Acute coronary syndrome Angina or chest pain or Coronary artery disease or coronary heart disease or ischaemic heart disease or ischemic heart disease or arteriosclerosis or Myocardial ischemia or coronary disease or arteriosclerosis	Catheterization or PCTA or PTA or percutaneous transluminal angioplasty/stenting or, CABG or coronary artery bypass graft or revascularization or invasive cardiac procedures or endovascular therapy	Accessibility or Access or utilization or prevalence or difference or disparity or Quality of care or Continuity or Outcome of care or care difference or quality

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