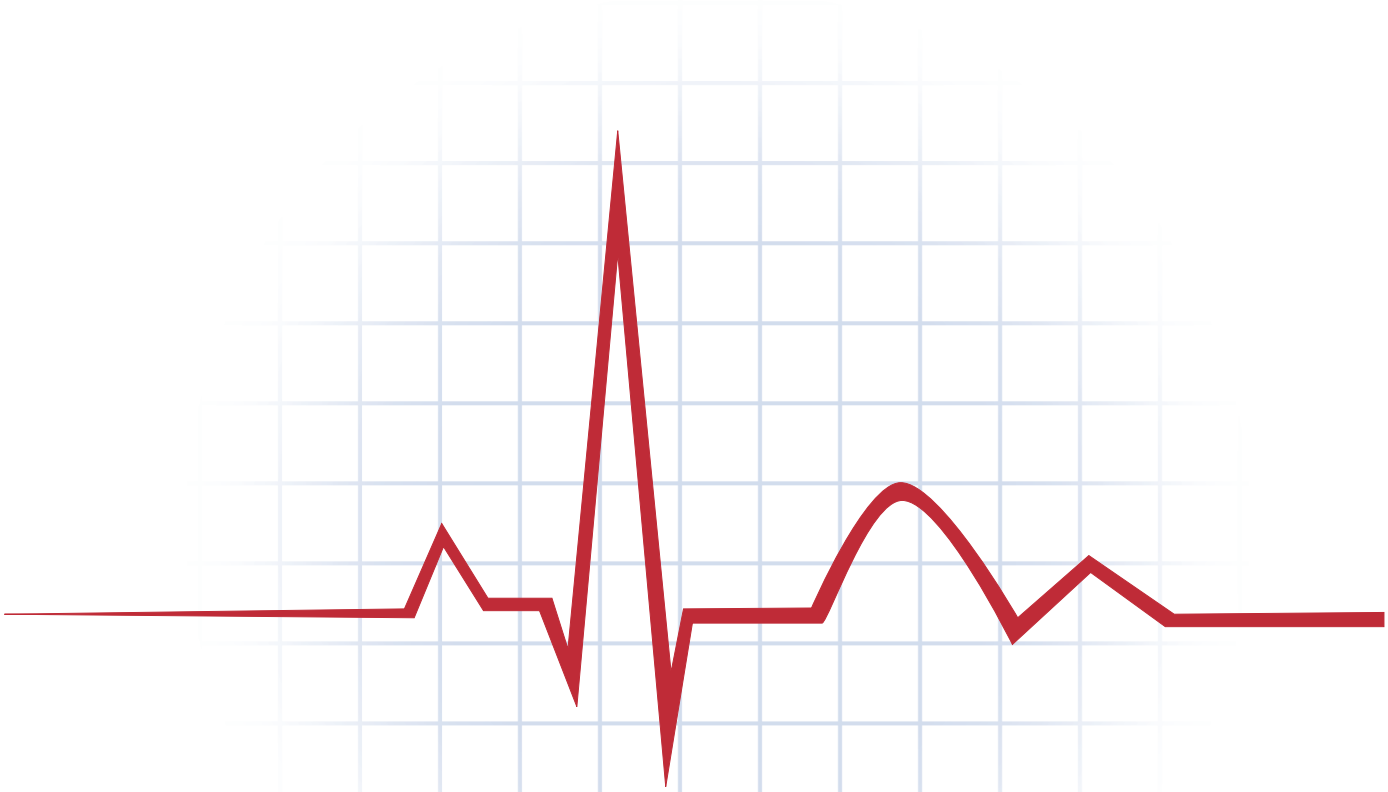
Racial/Ethnic Differences in Cardiac Care: The Weight of the Evidence



FULL REPORT

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THE HENRY J. KAISER FAMILY FOUNDATION

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Prepared by

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*Included in full report only

EXECUTIVE SUMMARY

Coronary heart disease is the leading cause of death among every racial and ethnic group in the United States. An individual's ability to access and use modern cardiac therapy and procedures may have profound implications for improving diagnostic precision, relieving symptoms, and reducing premature mortality from heart-related conditions (Bernstein et al., 1993; Hillborne et al., 1991; Leape et al., 1991). Numerous studies over the past two decades have documented racial and ethnic differences in use of cardiac care. This review focuses on the most methodologically rigorous studies with the intent of addressing perceptions that reported differentials in care reflect unmeasured clinical and socioeconomic factors (Epstein & Ayanian, 2001; Kaiser Family Foundation, 2002).

Eighty-one studies were included in this review. Though both physicians and researchers have questioned the quality of the research on racial/ethnic differences in medical care, we classified more than half of the studies as methodologically strong, largely based on how well they measured and controlled for appropriateness of care and other factors known to be associated with medical care use.

Sixty-eight of the 81 studies found racial/ethnic differences in cardiac care for at least one of the minority groups under study. Of the 68, 46 found differences in cardiac care for all of the procedures and treatments investigated, and 22 found differences in cardiac care for some procedures and treatments and not others. The 13 remaining studies included 11 that found no racial/ethnic differences in cardiac care, and two that found the minority group more likely than whites to receive appropriate care. Figures 4a–8a present the main finding (i.e., whether a study found a statistically significant racial/ethnic difference in cardiac care) of each of the 81 studies included in this review.

The strong studies in this review provide credible evidence that African Americans are less likely than white Americans to receive diagnostic procedures, revascularization procedures and thrombolytic therapy, even when patient characteristics are similar. Figures 4b–7b display odds ratios (ORs) from these studies. Evidence of racial/ethnic disparities in drug therapy and other cardiac treatments, such as care for congestive heart failure, is mixed. Data on Latinos, Asians, and Native Americans is limited and the evidence is less conclusive than that for African Americans.

This review also found that, in general, disparities in receipt of appropriate care remain after adjusting for factors known to affect care such as age, sex, insurance status, co-morbidities, and heart disease severity. Documented disparities persist among patients already in the health care system and with similar health insurance status, suggesting that the patterns observed are not the "typical" problems of health care access such as not having a source of medical care, or being uninsured. Although bias and discrimination are often cited as factors that may be responsible for health care disparities, that conclusion cannot be drawn from the studies examined in this report. There is an abundance of evidence that racial/ethnic variations in medical care are infinitely more complex (IOM, 2002).

Research to investigate underlying causes, subsequent outcomes and effective interventions is an important next step in efforts to reduce racial/ethnic disparities in medical care. However this research should not delay the uniform application of proven guidelines for optimal cardiac care without regard to race or ethnicity; nor should it delay efforts to address known barriers to health care access, such as lack of insurance coverage.

It is likely that a mix of patient, provider, and health system factors contribute to disparities in care. Physicians are often in a postion to impact these factors. They therefore play an important role in efforts to understand why disparities occur and in implementing strategies that seek to assure the highest quality medical care for every individual.

MAIN FINDINGS

The majority of the peer-reviewed studies investigating racial/ethnic differences in cardiac care:

- Are methodologically rigorous
- Compare African Americans to whites
- Find a racial/ethnic minority group less likely than whites to receive the procedure or treatment under study

The strong studies:

- Provide credible evidence that African Americans are less likely than whites to receive diagnostic procedures, revascularization procedures and thrombolytic therapy
- Find that racial/ethnic differences in care remain after adjustment for clinical and socioeconomic factors

INTRODUCTION

As a first step in a multifaceted effort, The Henry J. Kaiser Family Foundation (KFF) has launched an initiative to raise awareness among physicians about racial and ethnic disparities in medical care. The initial focus is on cardiac care because heart disease is the leading cause of death among racial/ethnic groups in the United States and because there is substantial research on disparities in this area.

As a part of this initiative, the American College of Cardiology Foundation (ACCF) agreed to participate in a process that would systematically review the evidence on racial/ethnic differences in cardiac care. The objectives of this process were: 1) to assess the extent to which there is credible evidence of racial and ethnic differences in cardiac care, after controlling for confounding factors known to explain variations in medical care; and 2) to summarize the research findings in a way that makes the information easily accessible to a physician audience.

Although previous reviews of the literature provide compelling evidence of racial/ethnic differences in cardiac care (Ford and Cooper, 1995; Mayberry et al., 2000; Sheifer et al., 2000; Kressin and Petersen, 2001), some clinicians continue to question whether studies have adequately adjusted for clinical and socioeconomic factors that might explain racial/ethnic variations in care (Epstein & Ayanian, 2001; Kaiser Family Foundation, 2002; Barnhart and Wassertheil-Smaller, 2002; Koroukian, 2002).

This review, therefore, focuses on evidence from studies considered the most methodologically rigorous, a classification made by two independent review teams using a uniform set of criteria to determine how well a study measured and controlled for critical confounding variables. This review also examines findings separately for specific cardiac interventions, allowing conclusions to be drawn separately for each.

Though a systematic assessment of the health outcomes related to racial/ethnic differences in cardiac care is important to undertake, it was beyond the scope of this effort.

REVIEW STRATEGY

An advisory committee that included representatives of the American College of Cardiology Foundation and the Association of Black Cardiologists guided the framework for this review of the evidence (see Appendix B.1). Two teams of researchers/analysts, one from the Kaiser Family Foundation and the other from the Morehouse School of Medicine (MSM), had responsibility for independently reviewing the studies.

The research team searched the MEDLINE database to find studies conducted in the United States and published in peer-reviewed journals from January 1985 to October 2001 (see Appendix B.2). The year 1985 was chosen to coincide with the report of the DHHS Secretary's Task Force on Black and Minority Health. The research team supplemented the search with previously published bibliographic sources from review articles. One study (Oberman & Cutter, 1984) published before 1985 was identified through the latter process and was included in the review. The intent of the literature search was to retrieve all studies related to racial/ethnic differences in access and quality of care for invasive, diagnostic or therapeutic cardiac care.

The committee developed criteria for studies that would be included in this review (see Appendix B.3). Studies selected for inclusion into the body of evidence were those that (1) were conducted primarily in the United States, (2) indicated that a primary purpose was to study racial or ethnic differences in cardiac care, (3) reported original findings, (4) presented actual quantitative and comparative data, and (5) identified specific ethnic or racial groups for comparison to whites or other

racial/ethnic groups. The teams uniformly applied the criteria to all studies. Seventy-seven of the 158 articles produced from the search were excluded. The 81 studies that met the inclusion criteria were then abstracted and evaluated during the review process. (Note: A number of studies examined specific hypotheses to explain racial/ethnic differences in cardiac care observed in previous research. These explanatory studies were excluded from our review, but are listed in Appendix B.4).

The 81 studies included in the review were categorized based on their use of administrative or clinical data. Studies based on administrative data described their data sources as discharge or claims data. Studies based on clinical data included additional personal medical record information, derived from registries, clinical databases or medical charts. If a study analyzed both administrative and clinical data, it was classified as a study based on clinical data.

The teams used an abstraction form to assure consistency in the information obtained from each study (see Appendix B.5). The KFF and MSM teams independently reviewed the studies, completed the abstraction forms and evaluated the strength of the evidence provided by each study. A study was classified as "strong" or "less strong" by criteria agreed upon by the committee (see Figure 1). Strong studies had well-defined parameters, internal validity, and measured and controlled for critical variables. (For example, a strong study based on clinical data would have controlled for age, insurance status, co-morbidities, and severity of heart disease—using a recognized measure such as Killip class or RAND appropriateness criteria—and would have used multivariate analysis to adjust for these variables simultaneously.) Less strong studies did not control for critical variables, or had design flaws that potentially undermined the validity of the evidence.

Most of the studies analyzed data on more than one cardiac procedure or treatment. The committee decided to present and analyze information separately for diagnostic procedures, revascularization procedures, thrombolytic therapy, drug therapy, and other cardiac procedures. As such, an individual study may appear in more than one table, figure, or discussion section.

Figure 1
Criteria for Evaluating the Strength of Individual Studies on Racial/Ethnic Differences in Cardiac Care

A strong study has well defined parameters.

- The study design is well described.
- The study population is well defined.
- Clear criteria are given for the eligibility of study subjects.
- The procedures for selecting study subjects are well described.
- Inclusion and exclusion criteria for study subjects are well described.
- The proportion of eligible study subjects who entered the study is given (i.e., potential for selection bias is addressed).
- The representativeness of the study sample (to the defined population) is (can be) addressed, based on definition of study population.
- Independent (main exposure and covariates) and dependent (outcomes) variables are well defined.
- Assessment/ascertainment procedures for study variables are well articulated.
- Potential biases (e.g., main exposure, selection, response, lost to follow-up, confounding, etc.) are addressed (or can be addressed based on description of study methods).

A strong study is internally valid.

- No critical study design flaw is noted.
- No critical bias is identified.

A strong study includes and accounts for critical variables.

- The most important covariables are accounted for in the study. For clinical studies, severity of disease and insurance and/or socioeconomic status are considered the most important covariables. For administrative studies, health status and insurance and/or socioeconomic status are considered the most important covariables.
- Multivariate statistical analyses are performed and important covariates (age, gender, socieconomic status, heath status or health behavioral factors, comorbidities, insurance, and severity of disease) are accounted for.

A strong study has internal validity, even when external validity (i.e., generalizability) may be limited.

The stronger evidence comes from clinical data.

SUMMARY OF FINDINGS

A total of 81 studies ultimately comprised the body of evidence for this review. The majority (n=56) of the studies included recent data (collected between 1991 and 2001), a large number (n=54) compared only African Americans and whites, and most (n=51) analyzed clinical data (see Figure 2).

Sixty-eight of the 81 studies found differences in cardiac care for at least one of the racial/ethnic minority groups under study. Of the 68, 46 found differences in cardiac care for all of the procedures and treatments investigated, and 22 found differences in cardiac care for some procedures and treatments and not others. The 13 remaining studies included 11 that found no racial/ethnic differences in cardiac care[1], and two studies of congestive heart failure that found the racial/ethnic minority group less likely to be hospitalized than whites, indicating better access to appropriate care[2].

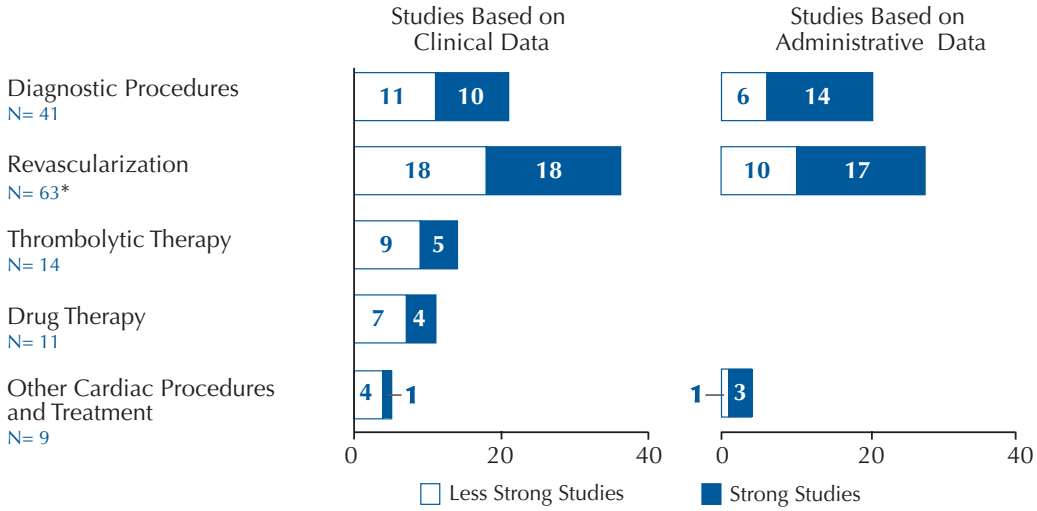
Most of the studies investigated more than one procedure and/or treatment. Of the 81 studies, 41 included data on diagnostic procedures, 63 included data on revascularization, 14 included data on thrombolytic therapy, 11 included data on drug therapy, and 9 included data on other cardiac procedures and

Figure 2
Studies Investigating Racial/Ethnic Differences in Cardiac Care, 1984–2001‡

Data Years [a,b]	
Pre-1990	42
1991–2001	56
Data Type	
Administrative	30
Clinical	51
Racial/Ethnic Groups Studied [b]	
White + African Americans only	54
African Americans	74
Latinos	21
Asians	11
Native Americans	4
Summary groupings	10

[a] Excludes two studies that did not identify data years.
[b] A study may appear more than once
‡ Evidence from studies published 1984–2001. (This figure includes Oberman & Cutter, 1984.)

Figure 3
Evidence of Racial/Ethnic Differences in Cardiac Care, 1984-2001‡

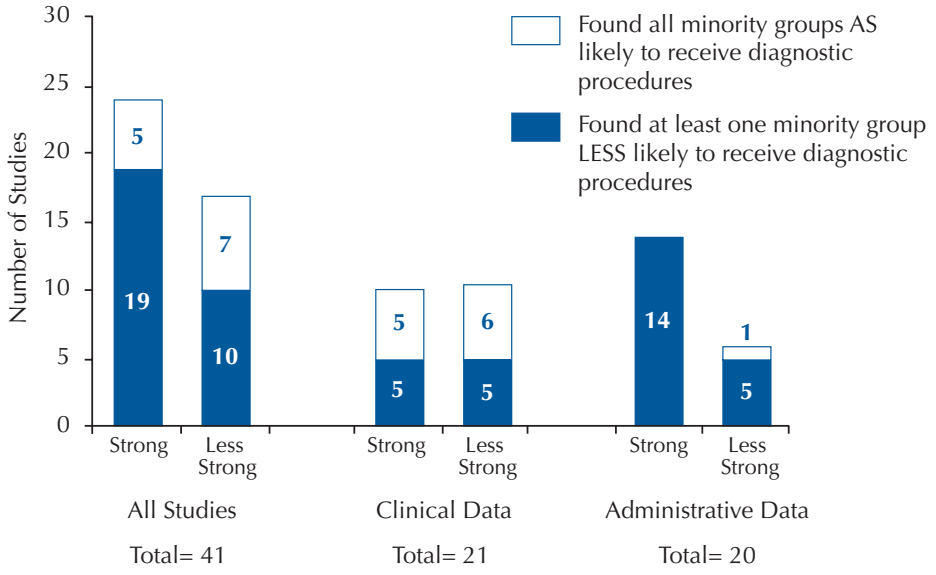


NOTE: A study that analyzes more than one procedure or treatment may appear in more than one category.
‡Evidence from studies published 1984–2001. *(This figure includes Oberman & Cutter, 1984.)*
*The revascularization studies include data on PTCA, CABG, and "any revascularization procedure."

[1] The 11 studies that found no racial/ethnic difference in cardiac care were Bearden et al., 1994; Carlisle et al., 1999; Davis et al., 2001; Gillum et al., 1997 [a]; Griffiths et al., 1999; Laouri et al., 1997 [a]; Leape et al., 1999; Marks et al., 2000; Peniston et al., 2000; Taylor et al., 1997; and Watson et al., 2001.

[2] The two studies that found the racial/ethnic minority group less likely than whites to be hospitalized were Bourassa et al., 1993 and Wolinsky et al., 1997.

Figure 4a
Evidence of Racial/Ethnic Differences in Rates: Diagnostic Procedures, 1985–2001‡



‡Evidence from studies published 1985–2001.

treatments resulting in a total of 138 separate analyses. While the majority (72 of 138) of these analyses were classified as strong methodologically, slightly less than half of the analyses based on clinical data (38 of 87) were classified as strong (see Figure 3).

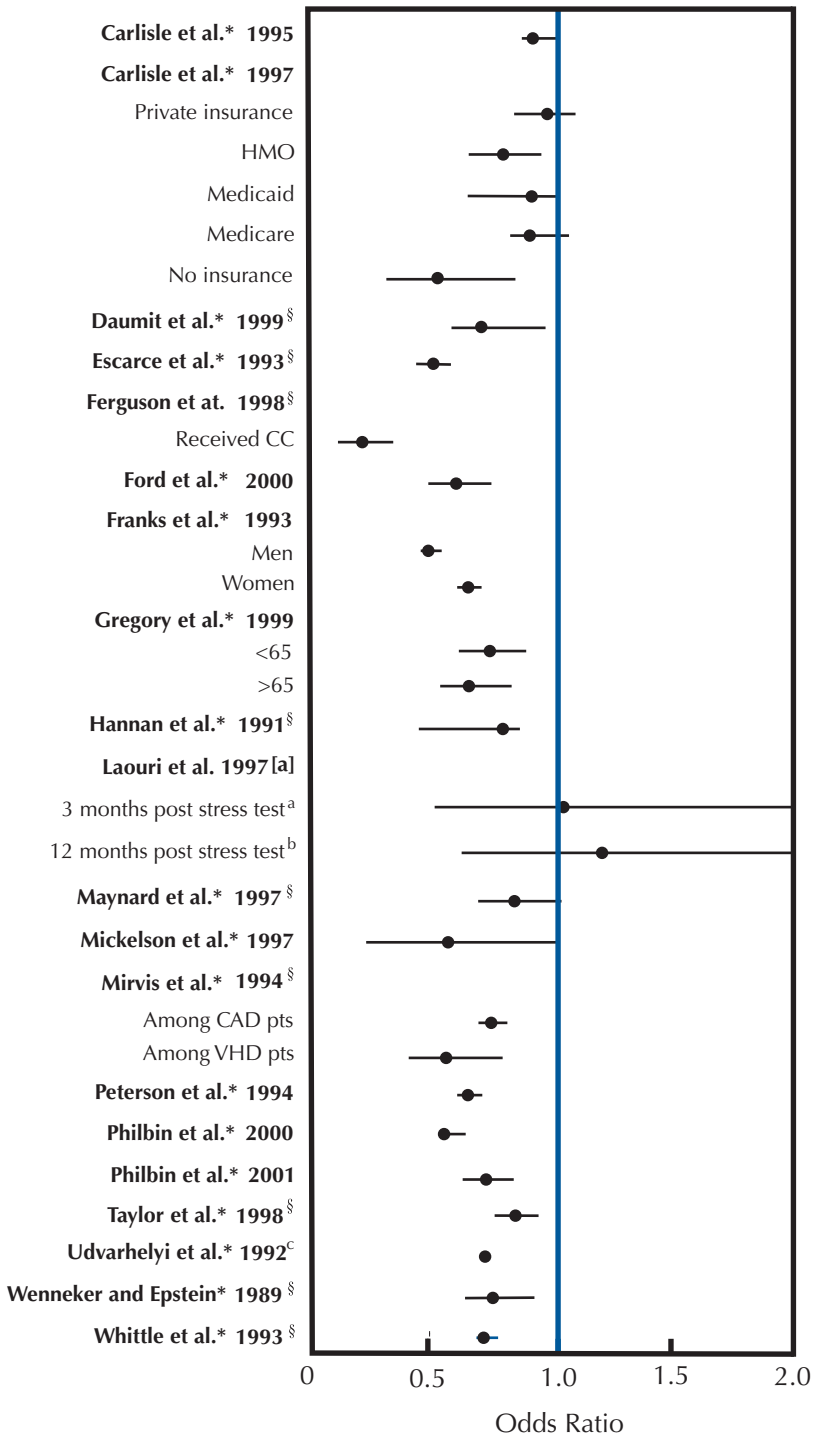
Diagnostic Procedures

Twenty-four of the 41 studies of cardiac catheterization and angiography rates were classified as strong (see Appendix C.1). Of the 24, 19 studies found that at least one racial/ethnic minority group was less likely to undergo cardiac catheterization or angiography than whites even when age, insurance, co-morbidities and/or disease severity were taken into account (see Figure 4a).

African Americans were less likely than whites to undergo catheterization or angiography in 15 of the 20 strong studies that calculated odds ratios to compare use of diagnostic tests (the statistically significant ORs ranged from 0.23 to 0.85; Figure 4b).[3]

[3] The studies in which the odds of a cardiac diagnostic test did not statistically differ between African Americans and whites were Carlisle et al., 1995; Laouri et al.[a], 1997; Maynard et al., 1997; and Mickelson et al., 1997. Carlisle, et al., 1997 found that African Americans were less likely than whites to undergo catheterization if they were HMO patients or uninsured, but not if they had private insurance, Medicaid, or Medicare.

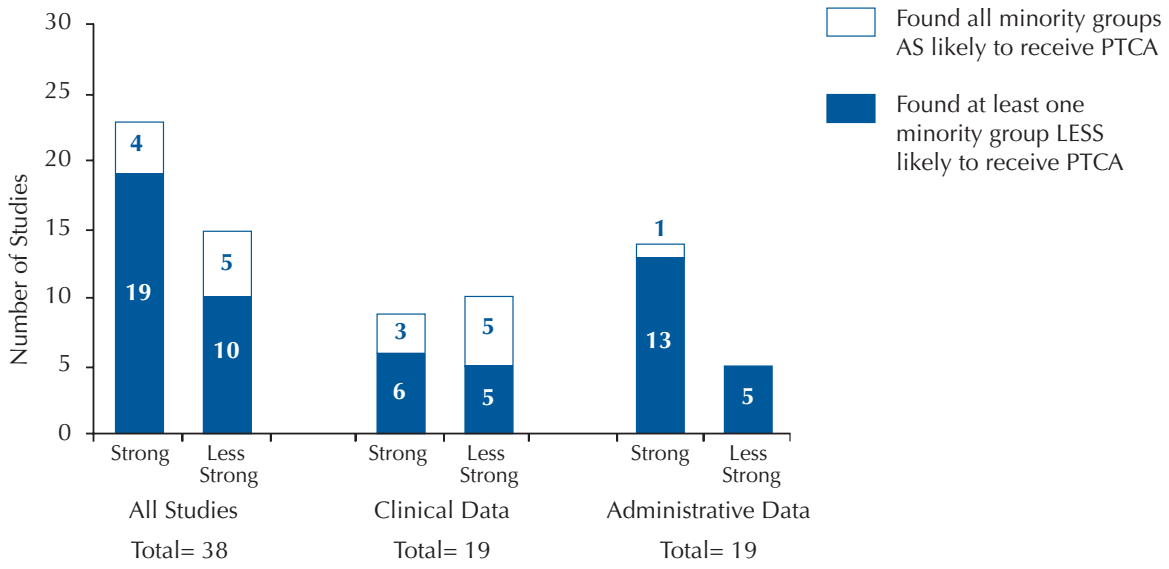
Figure 4b
Odds Ratios for Selected Strong Studies: Diagnostic Procedures (African Americans/Whites)



*Study analyzes more than one procedure or treatment and appears in more than one table.
§ Odds ratio findings taken from Kressin and Petersen. *Annals of Internal Medicine,* 2001.
[a] Odds ratio: AA/W 1.05 (0.54–2.06).
[b] Odds ratio: AA/W 1.24 (0.64–2.40).
[c] The authors computed relative risks, which are comparable to odds ratios when the events are rare. Both measure the strength of an association between a factor and an outcome.

NOTE: Studies selected for this figure were all strong studies that used odds ratios for analyzing statistical differences between African Americans and whites. An odds ratio of 1.0 means there is an equal likelihood of receiving the procedure or treatment. An odds ratio of <1.0 means African Americans are less likely to receive the procedure or treatment.

Figure 5a
Evidence of Racial/ Ethnic Differences in Rates: PTCA, 1985–2001‡



‡ Evidence from studies published 1985–2001.

Revascularization

The body of evidence on racial/ethnic differences in cardiac care is most extensive for revascularization (see Appendix C. 2). Nearly 80 percent (63 of 81) of the studies in this review analyzed revascularization rates. Of the 63 studies analyzing revascularization rates, 38 included data on PTCA, 44 included data on CABG, and 29 included data on "any revascularization procedure."

PTCA

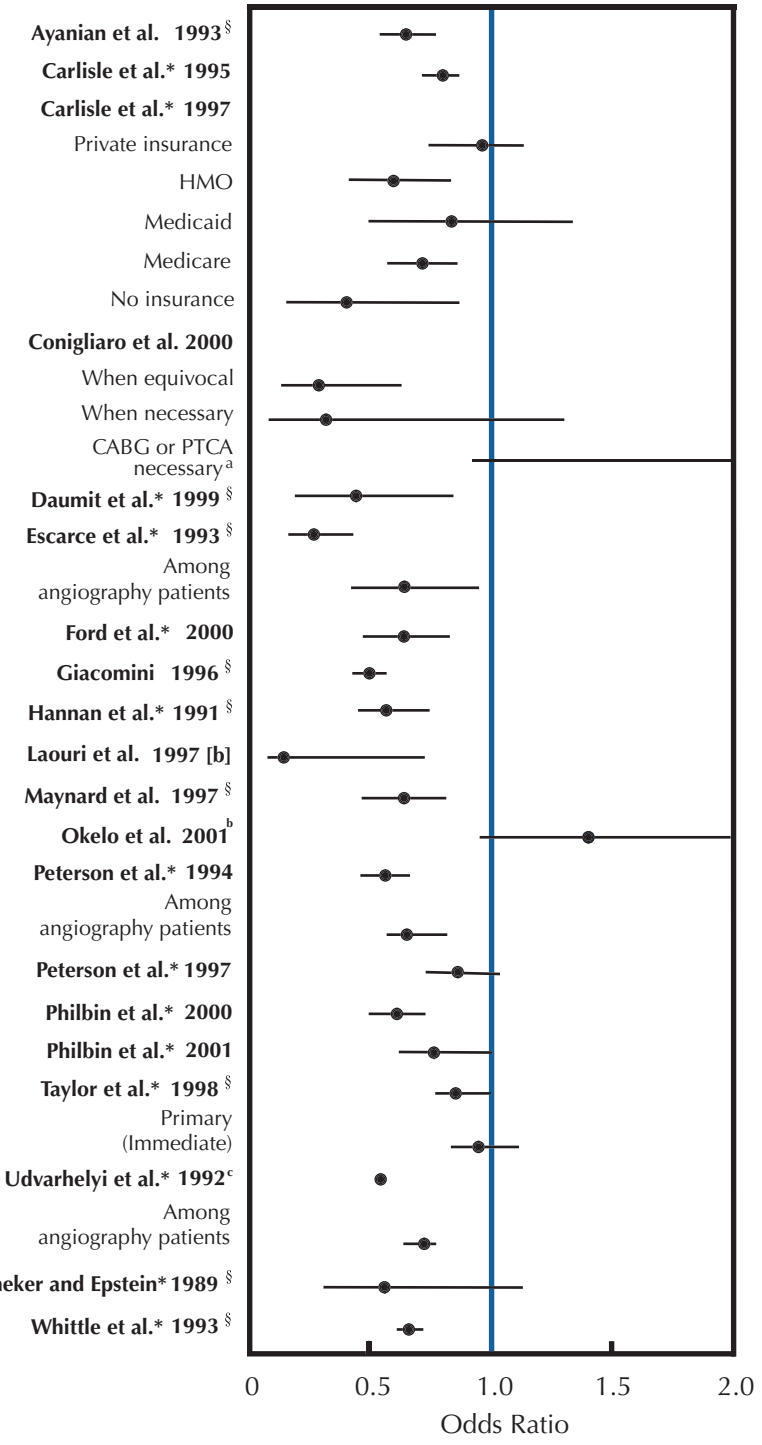
Twenty-three of the 38 studies of PTCA rates were classified as strong. Of the 23, 19 studies found that at least one racial/ethnic minority group was less likely to undergo PTCA than whites, even after adjustments for age, insurance, co-morbidities, and/or disease severity (Figure 5a).

African Americans were less likely than whites to undergo PTCA in 13 of the 20 strong studies that calculated odds ratios to compare PTCA use (the statistically significant ORs ranged from 0.20 to 0.80; Figure 5b).[4]

[4] The studies in which the odds of a PTCA did not statistically differ between African Americans and whites were Okelo et al., 2001; Peterson et al., 1997; Philbin et al., 2001; Taylor et al., 1998; and Wenneker and Epstein, 1989. Carlisle et al., 1997 found a difference among HMO, Medicare and uninsured patients, but not among privately insured or Medicaid patients. Conigliaro et al., 2000 found a difference when PTCA was equivocal, but not when necessary or when CABG or PTCA were necessary.

Figure 5b

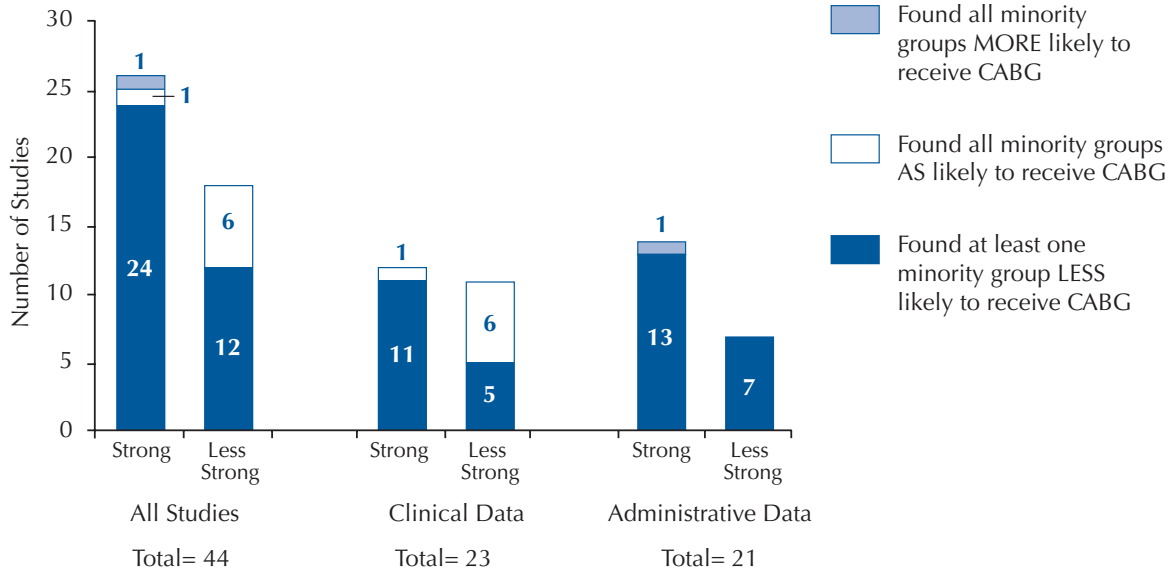
Odds Ratios for Selected Strong Studies: PTCA (African Americans/Whites)



* Study analyzes more than one procedure or treatment and appears in more than one table.
§ Odds ratio findings taken from Kressin and Petersen. *Annals of Internal Medicine,* 2001.
[a] Odds ratio: AA/W 4.50 (0.91-22.29).
[b] Odds ratio: AA/W 1.42 (0.96-2.11).
[c] The authors computed relative risks, which are comparable to odds ratios when the events are rare. Both measure the strength of an association between a factor and an outcome.

NOTE: Studies selected for this figure were all strong studies that used odds ratios for analyzing statistical differences between African Americans and whites. An odds ratio of 1.0 means there is an equal likelihood of receiving the procedure or treatment. An odds ratio of < 1.0 means African Americans are less likely to receive the procedure or treatment.

Figure 6a
Evidence of Racial/Ethnic Differences in Rates: CABG, 1984–2001‡



‡Evidence from studies published 1984–2001. (This figure includes Oberman & Cutter, 1984.)

CABG

Twenty-six of the 44 studies of CABG rates were classified as strong. Of the 26, 24 studies found that at least one racial/ethnic minority group was less likely to undergo CABG than whites, even after adjustments for age, insurance, co-morbidities and/or disease severity (Figure 6a).

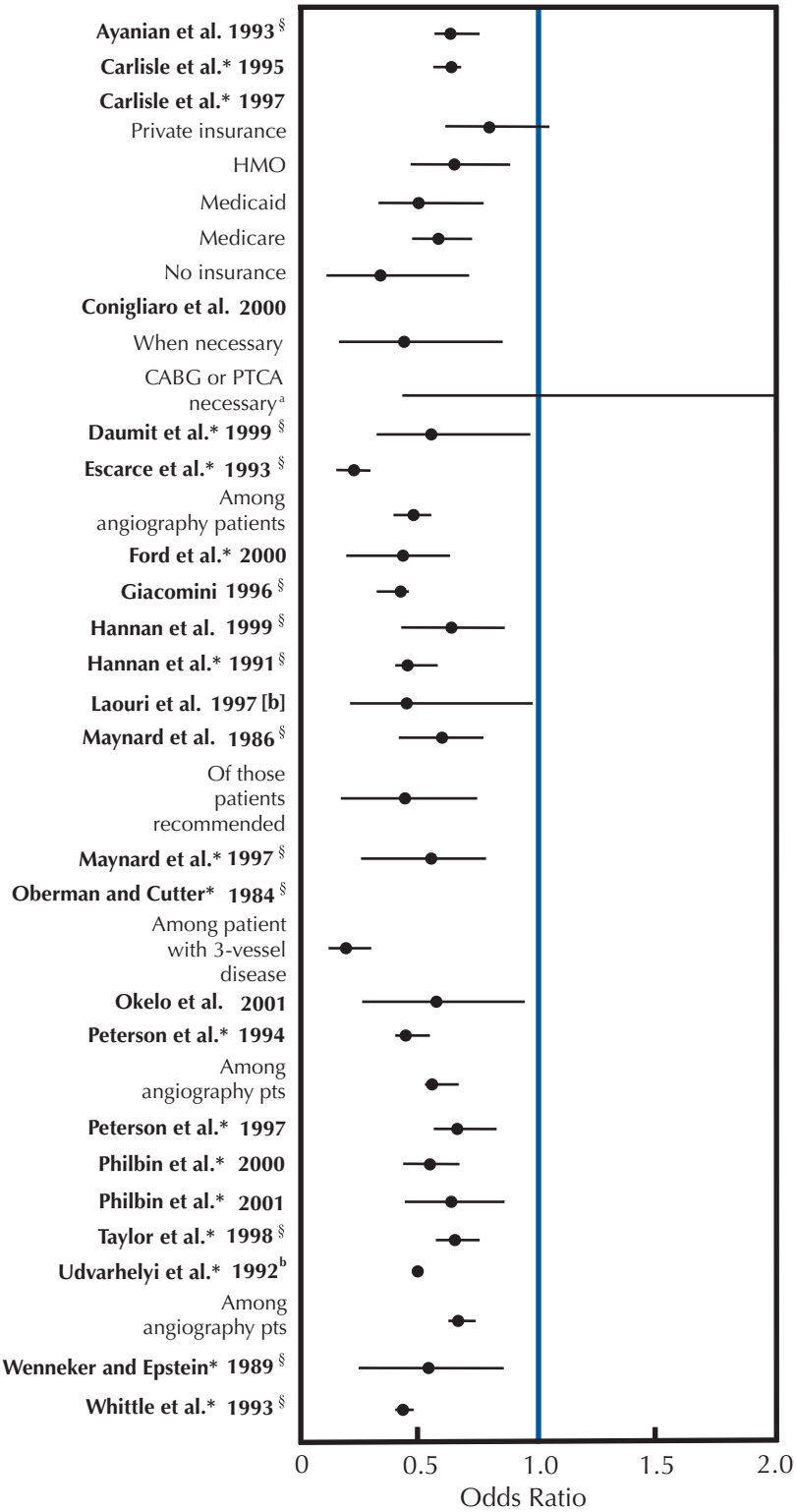
African Americans were less likely than whites to undergo CABG in 21 of the 23 strong studies that calculated odds ratios to compare CABG use (the statistically significant ORs ranged from 0.26 to 0.99; Figure 6b).[5]

Any Revascularization Procedures

The review also included 29 studies that investigated racial/ethnic differences in combined cardiac procedures. Thirteen of the 17 strong studies that investigated various combinations of cardiac catheterization, PTCA, CABG and thrombolytic therapy found African Americans less likely than whites to undergo the procedures under study.

[5] Carlisle et al., 1997 found a difference among HMO, Medicare, Medicaid, and uninsured patients, but not among privately insured patients. Conigliaro et al., 2000 found a difference when CABG was necessary, but not when CABG or PTCA was necessary.

Figure 6b
Odds Ratios for Selected Strong Studies: CABG (African Americans/Whites)



* Study analyzes more than one procedure or treatment and appears in more than one table.

§ Odds ratio findings taken from Kressin and Petersen. Annals of Internal Medicine, 2001.

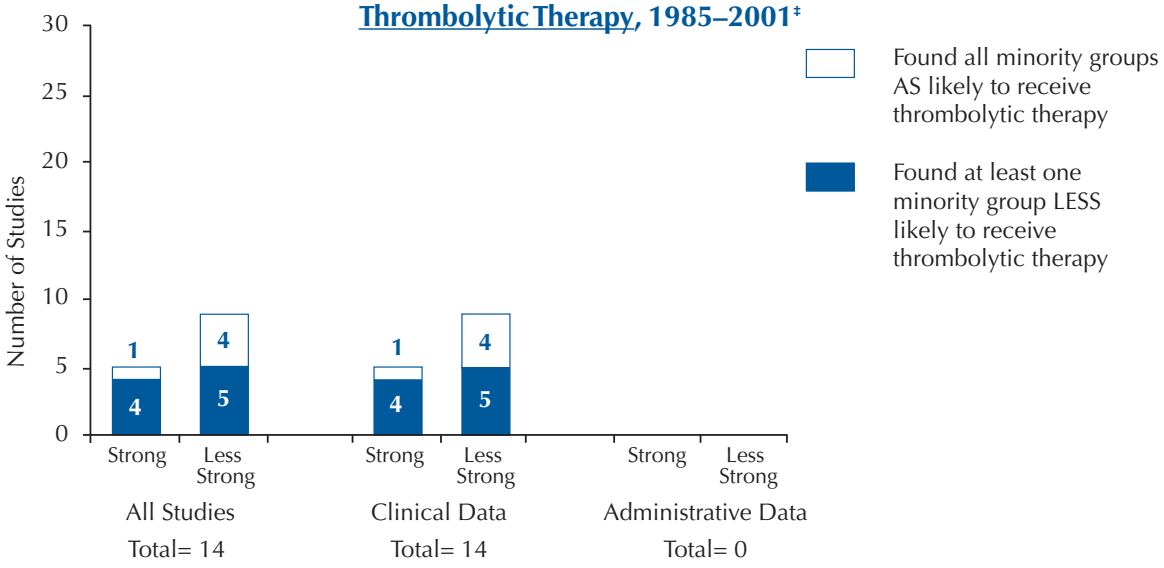
a Odds Ratio: AA/W 2.26 (0.42-12.11).

b The authors computed relative risks, which are comparable to odds ratios when the events are rare. Both measure the strength of an association between a factor and an outcome.

NOTE: Studies selected for this figure were all strong studies that used odds ratios for analyzing statistical differences between African Americans and whites. An odds ratio of 1.0 means there is an equal likelihood of receiving the procedure or treatment. An odds ratio of < 1.0 means African Americans are less likely to receive the procedure or treatment.

Figure 7a

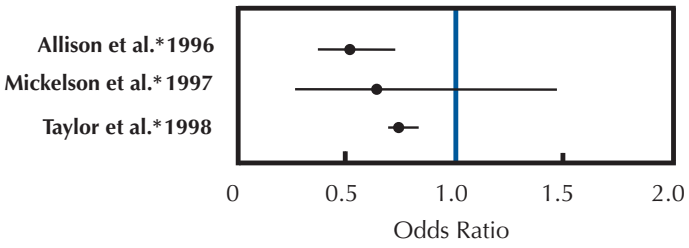
Evidence of Racial/Ethnic Differences in Rates: Thrombolytic Therapy, 1985–2001‡



‡Evidence from studies published 1985–2001.

Figure 7b

Odds Ratios for Selected Strong Studies: Thrombolytic Therapy (African Americans/Whites)



* Study analyzes more than one procedure or treatment and appears in more than one table

NOTE: Studies selected for this figure were all strong studies that used odds ratios for analyzing statistical differences between African Americans and whites. An odds ratio of 1.0 means there is an equal likelihood of receiving the procedure or treatment. An odds ratio of < 1.0 means African Americans are less likely to receive the procedure or treatment.

Thrombolytic Therapy

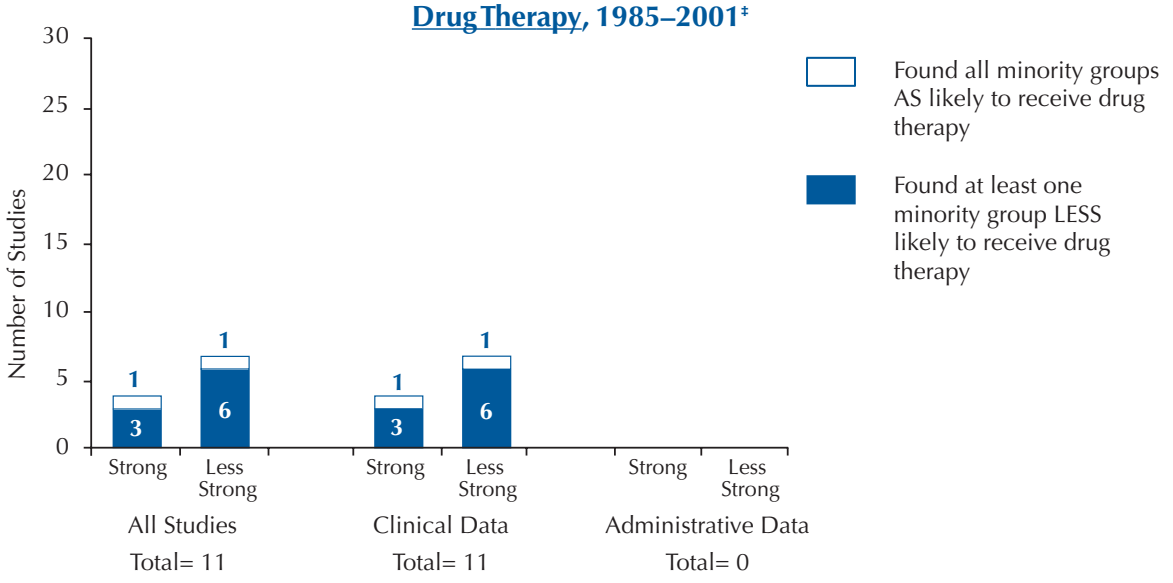
Five of the 14 studies of thrombolytic therapy (see Appendix C.3) were classified as strong. Of the five, four studies found that at least one racial/ethnic minority group was less likely than whites to receive thrombolytic therapy, even after controlling for age, insurance, co-morbidities and/or disease severity (see Figure 7a).

African Americans were less likely than whites to receive thrombolytic therapy in two of the three strong studies that calculated odds ratios to compare procedure use (the statistically significant ORs ranged from 0.51 to 0.76; Figure 7b).[6]

[6] The study in which the odds of thrombolytic therapy did not statistically differ by race was Mickelson et al., 1997.

Figure 8a

Evidence of Racial/ Ethnic Differences in Rates: Drug Therapy, 1985–2001‡



NOTE: The review identified studies analyzing clinical data on one or more of the following drug therapies for treatment and management of cardiac care: ACE inhibitors, antiarrhythmics, anticoagulants, aspirin, ß blockers, calcium channel blockers, Coumadin, digoxin, heparin, lidocaine, lipid lowering drugs, long acting nitrates and nitroglycerin. The most common drug therapies studied were aspirin and ß blockers.

‡Evidence from studies published 1985–2001.

Drug Therapy

Eleven studies included data on the use of one or more of the following drug therapies for treatment and management of cardiac care: ACE inhibitors, antiarrhythmics, anticoagulants, aspirin, ß blockers, calcium channel blockers, Coumadin, digoxin, heparin, lidocaine, lipid lowering drugs, long acting nitrates and nitroglycerin. The most common drug therapies studied were aspirin and ß blockers. Three of the four strong studies found that African Americans were less likely to receive at least one of the following drug therapies: aspirin and ß blockers (on admission and at discharge), Heparin, and Lidocaine (Figure 8a).

Other Cardiac Procedures and Treatments

The review also identified nine studies that report on racial/ethnic differences in procedures or treatments other than those presented in Appendices C.1– C.4 (see Appendix C.5). Five of the studies investigated care for congestive heart failure (CHF), two studies compared heart transplantation rates, and two assessed the care of patients with chest pain.

It is worth noting that there is evidence from two of the three strong studies that African Americans were less likely than whites to get quality care for CHF. However, these two studies essentially measured different phases of care. While one study assessed the care of patients hospitalized for CHF, the other assessed the likelihood of hospitalization for CHF. The first study, therefore, is an indicator of hospital care, while the latter study is largely an indicator of the adequacy of outpatient care.

The Body of Evidence on Latinos, Asians, and Native Americans

Most of the research on racial/ethnic differences in cardiac care has compared African Americans to whites. Of the 81 studies in this review, 21 included data on Latinos, 11 included data on Asians and four included data on Native Americans. The nine strong studies with data on Latinos provided mixed evidence, with half finding Latinos less likely than whites to undergo cardiac procedures and treatments and half finding no difference between Latinos and whites. The five strong studies with data on Asians more consistently suggested that Asians are as likely as whites to undergo cardiac procedures and treatments. Only one strong study included data on Native Americans.

DISCUSSION

Research conducted over the past two decades provides credible evidence of racial/ethnic disparities in cardiac care. Although many of the studies included in this review have limitations inherent in the use of an observational study design, the stronger studies controlled for confounding factors in a manner consistent with general standards of health services research.

African Americans have been more frequently studied than other racial and ethnic minority groups, and evidence that African Americans are less likely than whites to undergo invasive diagnostic tests, revascularization, and thrombolytic therapy is the most consistent. The body of evidence for Latinos, Asians, and Native Americans is limited and less conclusive for the procedures and treatments included in this review.

Evidence that disparities remain after controlling for clinical and socioeconomic factors raises questions for many in the medical community who are concerned that the race/ethnicity of a patient could, in and of itself, be prompting differences in physician behavior. Although bias and discrimination are often cited as factors that may be responsible for health care disparities, that conclusion cannot be drawn from the studies examined in this report. There is an abundance of evidence that racial/ethnic variations in medical care are infinitely more complex (IOM, 2002), as are geographic and gender variations in care.

First, race/ethnicity is intertwined with many dimensions of life in the United States. As such, the association between race/ethnicity and cardiac care may be capturing any number of race-associated factors that will need to be disentangled through more refined measurement tools and the use of sophisticated analytic techniques. Some might argue that even the studies identified as strong did not measure well social factors that may be related to race, such as accessibility of high-tech health care and specialists or patient preferences for invasive procedures. Measuring and analyzing factors such as these are important and challenging elements of a research agenda on disparities.

Second, the influence of race/ethnicity on receipt of cardiac care may vary depending on any number of circumstances. In this review, the existence and strength of an association varied within single studies by insurance coverage (Carlisle et al., 1997), by gender (Daumit and Powe, 2000), and by level of certainty about need (Conigliario et al., 2000). Also, findings observed in specific health care systems (Taylor et al., 1997) or geographic areas (Ayanian et al., 1999) are not necessarily generalizable to other settings. Variations in findings such as these, however, are not reason to dismiss the large body of evidence showing an association between race/ethnicity and cardiac care.

Research to investigate underlying causes, subsequent health outcomes, and effective interventions is an important next step in efforts to reduce racial/ethnic disparities in medical care. In addition, more research is needed to provide

definitive information on the use of cardiac services by Latinos, Asians and Native Americans. However, this research should not delay the uniform application of proven guidelines for optimal cardiac care without regard to race or ethnicity; nor should it delay efforts to address known barriers to health care access, such as lack of insurance coverage.

It is likely that a mix of patient, provider, and health system factors contribute to disparities in care. Some of these factors may be beyond the control of the physician, such as the varying scope of insurance benefits, patient preferences, or the availability of high-tech cardiac equipment in hospitals used most often by people of color. However, other factors may be more directly within the physician's control, such as patient-provider communication, practice location decisions, or biases in the diagnostic or referral process. Physicians, therefore, play an important role in efforts to understand why disparities occur and in implementing strategies that seek to assure the highest quality medical care for every individual.

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ABBREVIATIONS AND ACRONYMS

A: Asian
AA: African American
AL: Alabama
AMI: Acute Myocardial Infarction
CA: California
CABG: Coronary Artery Bypass Grafting
CAD: Coronary Artery Disease
CASS: Coronary Artery Surgery Study
CC: Cardiac Catheterization
CHD: Coronary Heart Disease
CHF: Congestive Heart Failure
DOD: Department of Defense
Dr(s): Doctor(s)
DVA: Department of Veteran's Affairs
ED(s): Emergency Department(s)
EKG or ECG: Electrocardiogram
ESRD: End Stage Renal Disease
HLA: Human Leukocyte Antigens
HMO: Health Maintenance Organization
HR: Hazard Ratio
HTx: Heart Transplantation
ICD-9: International Classification of Diseases
IHD: Ischemic Heart Disease
IL: Illinois
L: Latino
LA: Los Angeles
MA: Massachusetts
MD: Maryland
MI: Myocardial Infarction
MN: Minnesota
MO: Missouri
MS: Mississippi
NA: Native American
NACI: New Approaches in Coronary Interventions Registry
NC: North Carolina
NJ: New Jersey
NS: Not Significant
NY: New York
OH: Ohio
OR: Odds Ratio*
PA: Pennsylvania
PR: Prevalence Ratio
Pt(s): Patient(s)
PTCA: Percutaneous Transluminal Coronary Angioplasty
QMI: Q-wave Myocardial Infarction
SES: Socioeconomic status
SG: Data analyzed for summary racial/ethnic groups (e.g., "nonwhites")
SHEP: Systolic Hypertension in the Elderly Program
TX: Texas
VAMC: Veteran's Affairs Medical Centers
VHD: Valvular Heart Disease
W: White
WA: Washington

*An odds ratio is a comparative measure of the strength of an association between an exposure or treatment and an outcome event (e.g., a diagnostic test) for two population groups. It is calculated by dividing the odds of the event occurring in one population group by the odds of that event occurring in another group. In this report, the odds ratio measures the relative odds that a racial/ethnic minority population group will undergo a procedure or treatment compared with the odds for a white population group. See Appendix B.6 for a more detailed explanation of odds. [Odds ratio definition adapted from the glossary of the Institute of Medicine report *Care Without Coverage: Too Little, Too Late*. National Academy Press, 2002.]

APPENDIX A

AT-A-GLANCE FINDINGS OF ALL STUDIES

Author	Year	Study Design												Study Findings						
		Study population							Key Variables Assessed					Did Study Find A Racial/Ethnic Difference in Rates?[b]						
		Description	W	AA	L	A	NA	SG	Insurance	SES	Health Status	Heart Disease Severity	Rating[a]	CC	PTCA	CABG	Any Revascularization	Thrombolytic Therapy	Drug Therapy	Other
Alexander et al.	1999	All 90,316 pts admitted to all CA hospitals except VAMC or DOD with CHF. 1991-1992	x	x	x	x			x		x		Strong (admin)							Yes
Allison et al.	1996	4,052 Medicare pts with AMI in AL	x	x					x		x	x	Strong (clinical)					Yes	No	
Ayanian et al.	1993	27,485 Medicare pts aged 65-74 post angiography	x	x					x		x		Strong (admin)		Yes	Yes	Yes			
Ayanian et al.	1999	2,175 Medicare pts with CHF in IL, NY, PA		x				x	x	x	x	x	Strong (clinical)							Yes
Barnhart et al.	2000	797 pts who underwent coronary angiography for the first time, primarily for the evaluation of IHD	x	x	x						x		Less strong (clinical)				Yes			
Bearden et al.	1994	432 cases of CHD among 4,736 subjects in SHEP study	x	x						x	x		Less strong (clinical)				No			
Bell and Hudson	2001	379 pts from 2 county EDs in NC	x	x					x		x		Less strong (clinical)	Yes						Yes
Blustein et al.	1995	5,857 pts with diagnosis of AMI, <65 years old, non-Medicare, California	x	x	x	x	x	x	x			x	Less strong (admin)				Yes			
Borzak et al.	1999	1,948 pts admitted with AMI to single coronary unit in MI	x	x							x		Less strong (clinical)					No	Yes	
Bourassa et al.	1993	6,273 pts with heart failure and/or left ventricular dysfunction enrolled in the SOLVD registry	x	x							x	x	Less strong (clinical)							Yes[†]
Canto et al.	1998	275,046 pts in National Registry of MI	x		x	x	x	x	x		x	x	Strong (clinical)	No	No	No		Yes	Yes	
Canto et al.	2000	26,575 Medicare pts with AMI who met eligibility criteria for reperfusion therapy, 65-80	x	x					x		x	x	Strong (clinical)				Yes			
Carlisle et al.	1995	131,408 discharged from L.A. county hospitals	x	x	x	x			x	x	x		Strong (admin)	Yes	Yes	Yes				
Carlisle et al.	1997	104,952 L.A. County residents with possible CAD	x	x	x	x			x		x		Strong (admin)	Yes	Yes	Yes				
Carlisle et al.	1999	356 Los Angeles ED pts with new on-set chest pain not due to MI	x	x	x	x		x	x	x	x	x	Less strong (clinical)	No						
Chen et al.	2001	39,715 Medicare pts hospitalized for AMI	x	x					x	x	x	x	Strong (clinical)	Yes						
Conigliaro et al.	2000	666 male pts from 6 DVA medical centers who had undergone left heart CC, admitted for AMI or unstable angina	x	x					x		x	x	Strong (clinical)		Yes	Yes				
Daumit and Powe	2001	4,987 pts who gained Medicare insurance after ESRD diagnosis	x	x					x	x	x	x	Strong (clinical)				Yes			

APPENDIX A

Author	Year	Study Design											Study Findings						
		Study population							Key Variables Assessed					Did Study Find A Racial/Ethnic Difference in Rates?[b]						
		Description	W	AA	L	A	NA	SG	Insurance	SES	Health Status	Heart Disease Severity	Rating[a]	CC	PTCA	CABG	Any Revascul-arization	Throm-bolytic Therapy	Drug Therapy	Other
Daumit et al.	1999	4,987 adult pts with new on-set ESRD from 303 dialysis facilities	x	x					x	x	x	x	Strong (clinical)	Yes	Yes	Yes	Yes			
Davis et al.	2001	176 pts with AMI on EKG when thrombolysis was first treatment	x	x									Less strong (clinical)					No		
Eggers and Greenberg	2000	All Medicare beneficiaries hospitalized in 1998	x	x	x	x	x		x				Less strong (admin)	Yes	Yes	Yes				
Escarce et al.	1993	1,204,022 Medicare pts	x	x					x				Strong (admin)	Yes	Yes	Yes				
Ferguson et al.	1997	1,406 male pts from VAMC with cardiovascular disease	x	x					x				Less strong (clinical)	Yes	Yes	Yes	Yes			
Ferguson et al.	1998	200 men, Roundebush VA Medical Center, Indianapolis, ID	x	x					x		x	x	Strong (clinical)	Yes						
Ford et al.	1989	All pts ages 35-74 with discharge of AMI from U.S. hospitals, 1974-84	x	x				x					Less strong (admin)	Yes		Yes				
Ford et al.	2000	10,705 Medicare pts with confirmed AMI from CA non-federal acute care hospital	x	x	x				x		x	x	Strong (clinical)	Yes	Yes	Yes				
Franks et al.	1993	226,634 Medicare pts discharged with diagnosis of AMI	x	x					x	x	x	x	Strong (admin)	Yes			Yes			
Gatsonis et al.	1995	218,427 Medicare patients with "fresh" AMI	x	x				x	x		x		Strong (admin)	Yes						
Giacomini	1996	66,084 PTCA recipients and 52,401 CABG recipients from all CA hospitals, 1989-1990	x	x	x	x			x		x	x	Strong (admin)		Yes	Yes				No
Giles et al.	1995	10,348 pts discharged from hospital with primary diagnosis of AMI	x	x					x				Less strong (admin)	Yes	Yes	Yes				
Gillum et al. [a]	1997	11,406 with no history of CHD	x	x						x	x		Less strong (admin)	No			No			
Gillum et al. [b]	1997	Greater than 400 hospitals from 50 states with at least a 6 bed facility	x	x									Less strong (admin)	Yes	Yes	Yes				
Gittelsohn et al.	1991	MD pts admitted to acute care hospitals	x	x						x			Less strong (admin)		Yes	Yes				
Goff et al.	1994	1,228 Texas county pts admitted for definite/possible MI, PTCA or aortocoronary bypass surgery	x		x						x	x	Less strong (clinical)		Yes	No		Yes	Yes	
Goff et al.	1995	1,199 pts hospitalized for MI	x		x						x	x	Less strong (clinical)					Yes		
Goldberg et al.	1992	Medicare pts with ICD-9 Classification	x	x					x				Less strong (admin)			Yes				

At-A-Glance Findings of All Studies

APPENDIX A

Author	Year	Study Design												Study Findings						
		Study population							Key Variables Assessed					Did Study Find A Racial/Ethnic Difference in Rates?[b]						
		Description	W	AA	L	A	NA	SG	Insurance	SES	Health Status	Heart Disease Severity	Rating[a]	CC	PTCA	CABG	Any Revascul-arization	Throm-bolytic Therapy	Drug Therapy	Other
Gornick et al.	1996	26.3 million Medicare pts	x	x						x			Strong (admin)		Yes	Yes				
Gregory et al.	1999	13,690 pts in NJ with a primary diagnosis of AMI	x	x					x		x	x	Strong (admin)	Yes			Yes			
Griffiths et al.	1999	46 female pts with MI at tertiary care facility in NC	x	x									Less strong (clinical)		No	No				
Hannan et al.	1991	61,849 pts hospitalized with CAD in NY	x	x				x	x	x	x	x	Strong (admin)	Yes	Yes	Yes				
Hannan et al.	1999	1,261 postangiography pts in 8 NY hospitals	x	x	x				x			x	Strong (clinical)			Yes				
Herholz et al.	1996	982 pts hospitalized for definite or possible MI for CHD	x		x						x		Less strong (clinical)						Yes	
Johnson et al.	1993	3,031 pts with chest pain at ED not due to local trauma or abnormalities at 2 hospitals (OH, MA)	x	x								x	Less strong (clinical)	No		Yes				Yes
Laouri et al. [a]	1997	352 pts at 4 teaching hospitals (3 private, 1 public) who had a positive stress test and met criteria for angiography	x	x	x	x						x	Strong (clinical)	No						
Laouri et al. [b]	1997	671 L.A. pts post-angiography (4 private, 2 public)	x	x							x	x	Strong (clinical)		Yes	Yes	No			
Leape et al.	1999	631 NY post-coronary angiography pts who met RAND criteria	x	x	x				x	x	x	x	Strong (clinical)				No			
Manhapra et al.	2000	498 pts with first MI	x	x								x	Less strong (clinical)					Yes		
Marks et al.	2000	4,279 pts undergoing coronary interventions in the NACI registry	x	x							x	x	Less strong (clinical)			No				
Maynard et al.	1986	13,307 pts without previous surgery who were candidates for bypass surgery after undergoing angiography in CASS	x	x						x		x	Strong (clinical)			Yes				
Maynard et al.	1991	12,534 pts with a discharge diagnosis of AMI that presented with complaints of chest pain in 19 hospitals in WA	x	x							x		Less strong (clinical)	No	Yes	Yes		No		
Maynard et al.	1997	11,254 pts with a discharge diagnosis of AMI from 19 hospitals in one county in WA	x	x					x	x	x	x	Strong (clinical)	No	Yes	Yes	Yes	No		
McBean et al.	1994	Medicare pts with hospitalization for PTCA, CABG, or diagnosis of IHD	x	x					x				Less strong (admin)		Yes	Yes				

APPENDIX A

At-A-Glance Findings of All Studies

Author	Year	Study Design												Study Findings						
		Study population							Key Variables Assessed					Did Study Find A Racial/Ethnic Difference in Rates?[b]						
		Description	W	AA	L	A	NA	SG	Insurance	SES	Health Status	Heart Disease Severity	Rating[a]	CC	PTCA	CABG	Any Revascul-arization	Throm-bolytic Therapy	Drug Therapy	Other
Mickelson et al.	1997	1,703 pts in a VAMC in TX with MI and chest pain, or shortness of breath preceding ECG abnormalities	x	x	x				x		x	x	Strong (clinical)	No				Yes	Yes	
Mirvis et al.	1994	30,300 pts with CAD and 1,335 pts with valvular disease discharged from 172 VAMC	x	x					x		x		Strong (admin)	Yes			Yes			
Ness and Aronow	1999	1,802 pts at an academic primary care outpatient geriatric practice in NY, April 1998 – December 1998	x	x	x	x							Less strong (clinical)				Yes			
Oberman and Cutter	1984	6,594 consecutive pts who underwent arteriography or CABG at university hospital in AL	x	x						x	x	x	Strong (clinical)			Yes				
Oka et al.	1996	3,016 hospitalized pts. with discharge for definite or possible MI, incident or recurrent infarction during 1986 – 1992	x		x						x	x	Less strong (clinical)	No			Yes	No		
Okelo et al.	2001	882 Veteran pts with one or more CC, between 1993 and 1995	x	x					x		x	x	Strong (clinical)		No	Yes				
Park et al.	1997	336 consecutive patients who underwent orthotopic heart transplantation, March 1983 – July 1994	x	x									Less strong (clinical)							Yes
Peniston et al.	2000	1,460 male veterans post-CC, November 1986 – November 1992	x	x					x		x	x	Strong (clinical)				No			
Peterson et al.	1994	33,641 male veterans with a primary or secondary diagnosis of AMI	x	x					x	x	x	x	Strong (admin)	Yes	Yes	Yes	Yes			
Peterson et al.	1997	12,402 suspected heart diseased pts with documented CHD on CC	x	x					x		x	x	Strong (clinical)		No	Yes	Yes			
Philbin and DiSalvo	45,894 1998 CHF	patients with	x	x							x		Less strong (admin)	Yes			No			Yes
Philbin et al.	2000	28,698 patients with AMI	x	x					x	x	x		Strong (admin)	Yes	Yes	Yes	Yes			
Philbin et al.	2001	11,579 patients with primary diagnosis of AMI	x	x					x	x	x		Strong (admin)	Yes	Yes	Yes	Yes			
Ramsey et al.	1997	1,228 pts hospitalized for definite or possible MI in one county in TX	x		x						x	x	Less strong (clinical)	No	Yes	No				
Rathore et al.	2000	169,079 Medicare pts >65 years of age with	x	x					x	x		x	Strong (clinical)				Yes		Yes	

At-A-Glance Findings of All Studies

APPENDIX A

Author	Year	Study Design												Study Findings						
		Study population							Key Variables Assessed					Did Study Find A Racial/Ethnic Difference in Rates?[b]						
		Description	W	AA	L	A	NA	SG	Insurance	SES	Health Status	Heart Disease Severity	Rating[a]	CC	PTCA	CABG	Any Revascul-arization	Throm-bolytic Therapy	Drug Therapy	Other
Scirica et al.	1999	2,948 pts with unstable angina	x					x	x		x	x	Less strong (clinical)	Yes	No	No			Yes	
Sedlis et al.	1997	1,796 veterans post-CC	x	x					x		x		Less strong (clinical)		No	Yes	Yes			
Stone et al.	1996	3,318 pts with unstable angina or non-Q-wave MI		x				x					Less strong (clinical)	Yes			Yes		Yes Yes†	
Summers et al.	2001	166 pts with enzyme documented myocardial infarction	x	x									Less strong (clinical)				Yes			
Syed et al.	2000	395 pts with a first MI	x	x							x		Less strong (clinical)		No		Yes	Yes	Yes†	
Taylor et al.	1997	1,441 pts from 125 U.S. military care facilities with diagnosis of AMI	x	x	x	x	x	x	x		x	x	Strong (clinical)	No			No			
Taylor et al.	1998	275,046 pts with AMI	x	x					x		x	x	Strong (clinical)	Yes	Yes	Yes		Yes	Yes Yes†	
Tunis et al.	1993	7,080 procedures likely related to peripheral arterial disease among Maryland pts aged 25 or older	x	x					x		x		Strong (admin)		Yes	Yes†				
Udvarhelyi et al.	1992	218,427 Medicare patients with AMI	x	x					x		x		Strong (admin)	Yes	Yes	Yes				
Watson et al.	2001	838 pts with AMI in 1 of 5 mid-Michigan community hospitals	x	x					x		x	x	Less strong (clinical)	No	No	No				
Weitzman et al.	1997	5,462 hospitalized pts with MI aged 35-74 in NC, MS, MD and MN	x	x							x	x	Less strong (clinical)	Yes	Yes	Yes		Yes		
Wenneker and Epstein	1989	109,575 pts age 30-89 admitted to MA hospitals for circulatory disease or chest pain	x	x					x	x	x		Strong (admin)	Yes	No	Yes				
Whittle et al.	1993	428,300 male veterans over 30 years old with a primary diagnosis of cardiovascular disease or chest pain	x	x					x	x	x		Strong (admin)	Yes	Yes	Yes				
Wolinsky et al.	1997	7,286 Medicare pts age 70+ hospitalized for CHF	x	x					x		x		Strong (admin)							Yes†

KEY:

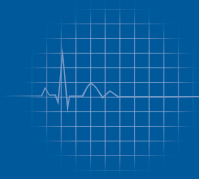
[a] To interpret ratings, see Criteria for Evaluating the Strength of Individual Studies, page 4.

[b] Does a difference exist for at least one of the racial/ethnic minority groups in at least one of the procedures or treatments?

YES = Difference found; at least one racial/ethnic minority group less likely than whites to have procedure or treatment (in the case of CHF, higher rates of hospitalizations indicate lower access to appropriate care).

YES† = Difference found; racial/ethnic minority group more likely than whites to have procedure or treatment (in the case of CHF, lower rates of hospitalizations indicate higher access to appropriate care).

NO = No difference found; racial/ethnic minority group as likely as whites to have procedure or treatment.



APPENDIX B

REVIEW STRATEGY

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APPENDIX B.2

Detailed Search Strategy

The research team searched the MEDLINE database to find studies conducted primarily in the United States and published in peer-reviewed journals during the period from January 1985 to October 2001. The year 1985 was chosen to coincide with the release of the Report of the DHHS Secretary's Task Force on Black and Minority Health. The searches consisted of the following keywords or MeSH terms: ethnic groups {includes aborigines, Arabs, Asian Americans, Blacks, Eskimos, Gypsies, Hispanic Americans, Indians (North, South, and Central American), Jews and Whites} or racial stock {Negroid race, Mongolian and Caucasoid} and coronary procedures; or ethnic or racial disparity(ies) and coronary procedures. Specific searches were conducted for racial/ethnic differences in cardiac care among Hispanic Americans, Blacks, Asian Americans and Native Americans. Subsequent literature searches were particular to cardiac procedures, such as *coronary artery bypass grafting, coronary angiography, coronary thrombosis, coronary reperfusion, coronary revascularization, percutaneous transluminal coronary angioplasty or drug therapies {i.e., calcium channel blockers, beta blockers and aspirin therapy}.* A final search was then conducted specific to cardiac conditions and racial differences, using essential terms such as *myocardial infarction, chest pain or unstable angina, and myocardial ischemia.* The intent of the literature search was to retrieve all studies related to ethnic/racial differences in access and quality of care for invasive, diagnostic or therapeutic coronary care. The MEDLINE search was supplemented with previously published bibliographic sources from related review articles.

Criteria for Study Inclusion/Exclusion

Inclusion Criteria

1. Studies conducted primarily in the U.S.
2. Studies that indicate a primary purpose of investigating racial and ethnic differences in cardiac care
3. Studies that report original (independent) findings (vs. reviews, editorials, commentaries)
4. Studies that present actual quantitative and comparative data (allowing the reader to independently assess findings)
5. Studies that identify specific racial and ethnic groups for comparison to whites or among racial/ethnic groups

Exclusion Criteria

1. Studies that provide data on only ONE racial/ethnic group under study
2. Literature reviews
3. Clinical trials to determine response to a new therapy
4. Studies presenting theoretical models about how race conceivably could affect treatment decision

APPENDIX B.4

Explanatory Studies

Blustein J and Weitzman BC. (1995). Access to Hospitals with High-Technology Cardiac Services: How Is Race Important? *American Journal of Public Health.* 85(3):345–351.

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Sample Data Abstraction Form

1. Author/pub. yr.	
2. Data yr(s)	
3. Procedure/treatment	CC PTCA CABG Other
4. Procedure/treatment (description)	
5. Were racial differences in care the primary question under study?	Yes ____ No ____
6. Primary Study Objective	
7. Racial/Ethnic Groups Studied	W AA L A NA
8. How race/ethnicity defined/measured	
9. Description of Study Population (including sample size)	
10. Data Source:	Administrative Identify: _____ (name & type, e.g., claims) Clinical Identify: _____ Primary (newly collected) ____ Secondary ____
11. Study Design (e.g., prospective/ retrospective/ cross-sectional matching, sample selection)	
12. Main Variables Assessed	
13. Covariables	____ age ____ gender ____ insurance ____ geographic area ____ income ____ education ____ occupation & status ____ summary SES measure ____ health status ____ severity of heart condition ____ high tech services available ____ patient preferences others: _____
14. Potential Biases (didn't control for __ or didn't adequately control for___)	
15. Analytical Method (describe)	
16. Summary Findings	
17. R/E Difference Observed	Yes No
18. Plausibility of Findings	Good Fair Poor
19. Alternative Explanation(s)	
20. Strength of Evidence	Excellent Good Fair Poor
21. Generalizability	Excellent Good Fair Poor
22. Comments:	

Reviewer Institution: KFF / MSM

APPENDIX B.6

Definition of Odds and Odds Ratio

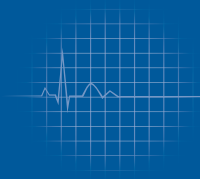
What is an Odds Ratio (OR)? An odds ratio is a comparative measure of the strength of an association between an exposure or treatment and an outcome event (e.g., a diagnostic test) for two population groups. It is calculated by dividing the odds of the event occurring in one population group by the odds of that event occurring in another group. In this report, the odds ratio measures the relative odds that a racial/ethnic minority population group will undergo a procedure or treatment compared with the odds for a white population group.

How do you calculate the odds of an event occurring? The odds of an outcome event are calculated by dividing the number of individuals who have the event by the number of individuals who do not. The probability (or risk) of an event occurring is not the same as the odds. However, the risk and odds of an event occurring are similar when an event is rare.

How do you interpret ORs? When the ratio of the odds is 1.0, the two groups are equally as likely for the event to occur. When the ratio of the odds is less than 1.0, the event is less likely to occur in the comparison group than in the baseline reference group. When the ratio of the odds is more than 1.0, the reverse is the case.

Example: If the odds of undergoing cardiac catheterization (CC) are 1:1 for a group of African Americans (i.e., one of every two African Americans, or 50%, are catheterized) and the odds are 6:1 for a group of Whites (i.e., six of every seven whites, or 85.7% are catheterized), the odds ratio for African Americans compared to Whites is 0.16 (1:1/6:1). This means that blacks are 16 percent as likely (or 84 percent less likely) as whites to undergo CC.

[Odds ratio definition adapted from the glossary of the Institute of Medicine report *Care Without Coverage: Too Little, Too Late*. National Academy Press, 2002.]



APPENDIX C

DETAILED STUDY FINDINGS ORGANIZED BY PROCEDURE OR TREATMENT

Table 1. Diagnostic Procedures (Cardiac Catheterization & Angiography)
Clinical Data - Strong Studies

Author	Year	Short Title	Study Design													Study Findings	
			Study Population							Key Variables Assessed						Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Canto et al.*	1998	Presenting Characteristics, Treatment Patterns, and Clinical Outcomes	275,046 pts in National Registry of MI	x		x	x	x	x	x	x	x		x	x	No	L/W: 0.94 (0.82-1.08); A/W: 0.98 (0.82-1.16); NA/W: 0.95 (0.61 - 1.50)
Chen et al.*	2001	Racial Differences in the Use of Cardiac Catheterization	39,715 Medicare pts hospitalized for AMI	x	x					x	x	x	x	x	x	Yes	PERCENT RATE OF CC USE: W Dr.: W pt. 45.7% vs. AA pt. 32.9% (p<0.001); AA Dr.: W pt. 53.4% vs. AA pt.: 36.5% (p = 0.04)
Daumit et al.*	1999	Use of Cardiovascular Procedures among Black Persons	4,987 adult pts with new on-set ESRD from 303 dialysis facilities	x	x					x	x	x	x	x	x	Yes	AA/W 0.71 (0.56-0.90) §
Ferguson et al.	1998	Racial Differences in Cardiac Catheterization Use	200 men, Roundebush VA Medical Center, Indianapolis, ID	x	x					x	x	x		x	x	Yes	Received CC AA/W: 0.23 (0.12-0.46) Offered CC AA/W: 0.35 (0.19-0.64) Refused CC AA/W: 6.32 (0.96-41.5) Not offered CC AA/W: 7.88 (4.18-14.83) Inappropriate CC AA/W: 0.71 (0.07-7.04) §
Ford et al.*	2000	Racial and Ethnic Differences in the Use of Cardiovascular	10,705 Medicare pts with confirmed AMI from CA non-federal acute care hospital	x	x	x				x	x	x		x	x	Yes	AA/W: 0.62 (0.50 - 0.76) L/W: 0.82 (0.68 - 0.98)
Laouri et al.[a]	1997	Under use of coronary angiography: application	352 pts at 4 teaching hospitals (3 private, 1 public) who had a positive stress test and met criteria for angiography	x	x	x	x			x	x				x	No	3 months after exercise stress test: AA/W: 1.05 (0.54-2.06) L/W: 1.07 (0.58-1.96) A/W: 1.01 (0.45-2.25) 12 months after stress test: AA/W: 1.24 (0.64-2.40) L/W: 1.54 (0.84-2.80) A/W: 0.91 (0.41-2.01)
Maynard et al.*	1997	Long-term implications of racial differences in the use	11,254 pts with a discharge diagnosis of AMI from 19 hospitals in one county in WA	x	x					x	x	x	x	x	x	No	UNADJUSTED AA/W: 0.85 (0.70-1.04) §
Mickelson et al.*	1997	Acute Myocardial Infarction: Clinical Characteristics	1,703 pts in a VAMC in TX with MI and chest pain, or shortness of breath preceding ECG abnormalities	x	x	x				x		x		x	x	No	AA/W: 0.59 (0.35-1.02) L/W: 0.76 (0.35-1.67)
Taylor et al.*	1997	Can Characteristics of a Health Care System	1,441 pts from 125 U.S. military care facilities with AMI	x	x	x	x	x	x	x	x	x		x	x	No	Nonwhite/W: 0.84 (0.57-1.25) Counseled for future CC Non-white/W: 0.56 (0.34-0.84) §
Taylor et al.*	1998	Management and outcomes for black patients with acute	275,046 pts with AMI	x	x					x	x	x		x	x	Yes	AA/W: 0.85 (0.77-0.95) §

Table 1. Diagnostic Procedures (Cardiac Catheterization & Angiography)

Clinical Data - Less Strong Studies

Author	Year	Short Title	Study Design													Study Findings	
			Study Population							Key Variables Assessed						Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Bell and Hudson*	2001	Equity in the diagnosis of chest pain:	379 pts from 2 county EDs in NC	x	x					x	x	x		x		Yes	W/AA: 2.83 (1.78 - 4.49)
Carlisle et al.	1999	Underuse and Overuse of Diagnostic Testing for Coronary	356 pts L.A. Eds with new on-set chest pain not due to MI	x	x	x	x		x	x	x	x	x	x	x	No	Underuse when appropriate: AA/W: 0.53 (0.24-1.21) L/W: 0.63 (0.24-1.64) A/W: 2.41(0.30-19.26) §
Ferguson et al.*	1997	Examination of racial differences in management of cardiovascular	1,406 male pts from VAMC with cardiovascular disease	x	x						x	x				Yes	UNADJUSTED CVD OR = AA/W: 0.37 (0.24-0.58)
Johnson et al.*	1993	Effect of Race on the Presentation and Management of Patients	3031 pts with chest pain at ED not due to local trauma or abnormalities at 2 hospitals (OH, MA)	x	x					x	x				x	No	AA/W: 0.86 (0.64-1.20)
Maynard et al.*	1991	Characteristics of Black Patients Admitted to Coronary	12,534 pts with a discharge diagnosis of AMI that presented with complaints of chest pain in 19 hospitals in WA	x	x					x	x			x		No	No significant differences; data not provided §
Oka et al.*	1996	Differences in treatment of acute myocardial infarction	3,016 hospitalized pts. with discharge for definite or possible MI, incident or recurrent infarction during 1986 - 1992	x		x				x	x			x	x	No	L/W: not significant (data not given)
Ramsey et al.*	1997	Sex and Ethnic Differences in Use of Myocardial Revascularization	1,228 pts hospitalized for definite or possible MI in one county in TX	x		x				x	x			x	x	No	L: receive CC 18% less often than W (L=Mexican American only) (p = 0.11)
Scirica et al.*	1999	Racial Differences in the Management of Unstable Angina	2,948 pts with unstable angina	x					x	x	x	x		x	x	Yes	Among appropriate pts: Nonwhite/white: 0.50 §
Stone et al.*	1996	Influence of Race, Sex and Age on Management	3,318 pts with unstable angina or non-Q-wave MI		x				x	x	x					Yes	Risk ratio: AA/Nonblacks: 0.65 (0.58-0.72)
Watson et al.	2001	Do Race and Gender Influence the Use of Invasive	838 pts with AMI in 1 of 5 mid-Michigan community hospitals	x	x					x	x	x		x	x	No	AA men: 0.79 (0.41 - 1.50) AA women: 1.14 (0.53 - 2.45)
Weitzman et al.*	1997	Gender, racial, and geographic differences in the performance	5,462 hospitalized pts with MI aged 35-74 in NC, MS, MD and MN	x	x					x	x			x	x	Yes	Teaching hospital: AA/W: 0.60 (0.40-1.0) Non-teaching hospital: AA/W: 0.70 (0.50-1.1)

Table 1. Diagnostic Procedures (Cardiac Catheterization & Angiography)

Administrative Data - Strong Studies

Author	Year	Short Title	Study Design													Study Findings	
			Study Population							Key Variables Assessed						Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Carlisle et al.*	1995	Racial and Ethnic Differences in the Use of Invasive Cardiac	131,408 discharged from L.A. county hospitals	x	x	x	x			x	x	x	x	x		Yes	L/W: 0.90 (0.85-0.95); AA/W: 0.94 (0.89-1.00); A/W: 1.03 (0.95-1.11)
Carlisle et al.*	1997	Racial and ethnic disparities in the use of cardiovascular	104,952 L.A. County residents with possible CAD	x	x	x	x			x	x	x		x		Yes	Private Insurance: AA/W: 0.99 (0.85-1.14) L/W: 0.44 (0.82-1.07) A/W: 1.01 (0.84-1.22) HMO: AA/W: 0.80 (0.67-0.96) L/W: 0.78 (0.64-0.96) A/W: 0.80 (0.61-1.05) Medicaid: AA/W: 0.84 (0.67-1.06) L/W: 0.86 (0.71-1.05) A/W: 1.38 (1.07-1.78) Medicare: AA/W: 0.91 (0.82-1.01) L/W: 0.88 (0.79-0.98) A/W: 0.94 (0.78-1.14) No Insurance: AA/W: 0.51 (0.36-0.71) L/W: 0.50 (0.38-0.66) A/W: 0.82 (0.57-1.19)
Escarce et al.*	1993	Racial differences in the elderly's use of medical	1,204,022 Medicare pts	x	x					x	x	x				Yes	Overall: AA/W 0.51 (0.46-0.56) Among stress test pts: 0.68 (0.58-0.81) Among angiography pts: data not available §
Franks et al.*	1993	Racial Differences in the Use of Invasive Coronary	226,634 Medicare pts discharged with diagnosis of AMI	x	x					x	x	x	x	x	x	Yes	AA/W men: 0.50 (0.48-0.56) AA/W women: 0.67 (0.63-0.71) §
Gatsonis et al.	1995	Variations in the Utilization of Coronary Angiography	218,427 Medicare patients with "fresh" AMI	x	x				x	x	x	x		x		Yes	Data for all 50 states. Mississippi with a low of Black/Nonblack: 0.41 (0.30-0.54), Kansas with a high of Black/Nonblack: 0.94 (0.55-1.29)
Gregory et al.*	1999	Impact of Availability of Hospital-Based Invasive Cardiac	13,690 pts in NJ with a primary diagnosis of AMI	x	x					x	x	x		x	x	Yes	<65: AA/W: 0.74 (0.61-0.90) >65: AA/W: 0.68 (0.56-0.83)
Hannan et al.*	1991	Interracial Access to Selected Cardiac Procedures	61,849 pts hospitalized with CAD in NY	x	x				x	x	x	x	x	x	x	Yes	AA/W: 0.80 (0.48-0.74) §
Mirvis et al.*	1994	Variation in Utilization of Cardiac Procedures in the Department	30,300 pts with CAD and 1,335 pts with valvular disease discharged from 172 VAMC	x	x					x	x	x		x		Yes	Among CAD AA/W: 0.75 (0.70-0.81) Among VHD pts: AA/W: 0.56 (0.40-0.80) §
Peterson et al.*	1994	Racial Variation in Cardiac Procedure Use	33,641 male veterans with AMI	x	x					x	x	x	x	x	x	Yes	AA/W: 0.67 (0.62-0.72)
Philbin et al.*	2000	Socioeconomic Status Is an Important Determinant	28,698 patients with AMI	x	x					x	x	x	x	x		Yes	AA/W: 0.58 (0.52-0.65)
Philbin et al.*	2001	Underuse of Invasive Procedures Among Medicaid	11,579 patients with primary diagnosis of AMI	x	x					x	x	x	x	x		Yes	AA/W: 0.74 (0.63- 0.86)
Udvarhelyi et al.*	1992	Acute Myocardial Infarction in the Medicare Population	218,427 Medicare patients with AMI	x	x					x	x	x		x		Yes	Relative risk: AA/W: 0.72
Wenneker and Epstein*	1989	Racial Inequalities in the Use of Procedures for Patients	109,575 pts age 30-89 admitted to MA hospitals for circulatory disease or chest pain	x	x					x	x	x	x	x		Yes	AA/W: 0.78 (0.64-0.93) §
Whittle et al.*	1993	Racial Differences In the Use of Invasive Cardiovascular	428,300 male veterans over 30 years old with a primary diagnosis of cardiovascular disease or chest pain	x	x					x	x	x	x	x		Yes	AA/W: 0.72 (0.70-0.75) §

Table 1. Diagnostic Procedures (Cardiac Catheterization & Angiography)

Administrative Data - Less Strong Studies

Author	Year	Short Title	Study Design													Study Findings	
			Study Population								Key Variables Assessed					Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Eggers and Greenberg*	2000	Racial and ethnic differences in hospitalization rates	All Medicare beneficiaries hospitalized in 1998	x	x	x	x	x				x				Yes	AA/W: 0.79, L/W: 0.98, A/W: 0.60, NA/W: 0.88
Ford et al.*	1989	Coronary Arteriography and Coronary Bypass Survey	All pts ages 35-74 with discharge of AMI from U.S. hospitals, 1974-84	x	x				x							Yes	AA/W men: 0.53 AA/W women: 0.81
Giles et al.*	1995	Race and Sex Differences in Rates of Cardiac	10,348 pts discharged from hospital with primary diagnosis of AMI	x	x					x	x	x				Yes	AA men/W men: 0.67 (0.51-0.87) W women/W men: 0.72 (0.63-0.83) AA women/W men: 0.50 (0.37-0.68)
Gillum et al.[a]*	1997	Coronary Heart Disease Incidence and Survival	11,406 with no history of CHD	x	x					x	x		x	x		No	AA/W: 0.53 (0.21 - 1.34)
Gillum et al.[b]*	1997	Coronary Revascularization and Cardiac Catheterization in the US	Greater than 400 hospitals from 50 states with at least a 6 bed facility	x	x					x						Yes	AGE-ADJUSTED 1980: AA/W: 0.42 1993: AA/W: 0.91
Philbin and DiSalvo*	1998	Influence of Race and Gender on Care Process	45,894 patients with CHF	x	x					x	x			x		Yes	AA women:3.8%, W women: 3.4% P <0.05; AA men 4.8%, W men 4.8%

Table 2. Revascularization Procedures (CABG, PTCA, and Any Revascularization)

Clinical Data - Strong Studies

Author	Year	Short Title	Study Design													Study Findings					
			Study Population							Key Variables Assessed						Did Study Find a Racial/Ethnic Difference in Rates?			Quantitative Findings		
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity	PTCA	CABG	ANY	PTCA	CABG	ANY
Canto et al.*	1998	Presenting Characteristics, Treatment Patterns, and Clinical Outcomes	275,046 pts in National Registry of MI	x		x	x	x	x	x	x	x		x	x	No	No		L/W: 0.95 (0.83-1.10) A/W: 0.82 (0.64-1.04) NA/W: 0.72 (0.50 -1.05)	L/W: 0.97 (0.82-1.16) A/W: 1.23 (0.96-1.57)	
Canto et al.	2000	Relation of Race and Sex to the Use of Reperfusion Therapy	26,575 Medicare pts with AMI who met eligibility criteria for reperfusion therapy, 65-80	x	x					x	x	x		x	x			Yes			AA/W women PR 0.89 (0.81-0.97), AA/W men 0.85 (0.78-0.93 0
Conigliaro et al.	2000	Understanding Racial Variation in the Use of Coronary	666 male pts from 6 DVA medical centers who had undergone left heart CC, admitted for AMI or unstable angina	x	x					x		x		x	x	Yes	Yes		UNADJUSTED When equivocal: AA/W 0.30 (0.14-0.63) When necessary: AA/W 0.34 (0.09-1.31) CABG or PTCA necessary: AA/W 4.50 (0.91-22.29)	When Equivocal: no AA pts underwent CABG in this stratum When necessary: AA/W: 0.42 (0.20-0.86) CABG or PTCA necessary: AA/W 2.26 (0.42-12.11)	
Daumit and Powe	2001	Factors Influencing Access to Cardiovascular Procedures	4,987 pts who gained Medicare Insurance after ESRD diagnosis	x	x					x	x	x	x	x	x			Yes			(ANY = CC, PTCA, and CABG) Pre-ESRD: AA men: 0.32 (0.20-0.49), AA women: 0.30(0.18-0.50) Post-ESRD: AA men: 0.66 (0.47-0.92), AA women: 0.75 (0.53-1.08). Reference group is white men.
Daumit et al.*	1999	Use of Cardiovascular Procedures among Black Persons	4,987 adult pts with new on-set ESRD from 303 dialysis facilities	x	x					x	x	x	x	x	x	Yes	Yes	Yes	AA/W 0.48 (0.26-0.85) §	AA/W 0.56 (0.32-0.98) §	Any revascularization: AA/W 0.55 (0.35-0.84) Any procedure: AA/W 0.71 (0.56-0.88) §
Ford et al.*	2000	Racial and Ethnic Differences in the Use of Cardiovascular	10,705 Medicare pts with confirmed AMI from CA non-federal acute care hospital	x	x	x				x	x	x		x	x	Yes	Yes		AA/W: 0.64 (0.49 - 0.85) L/W 0.58 (0.45 - 0.75)	AA/W: 0.42 (0.27 - 0.64) L/W 0.92 (0.70 - 1.22)	
Hannan et al.	1999	Access to Coronary Artery Bypass Surgery	1,261 postangiography pts in 8 NY hospitals	x	x	x				x	x	x			x		Yes			AA/W: 0.64 (0.47-0.87) L/W: 0.60 (0.43-0.84)	
Laouri et al.[b]	1997	Underuse of coronary revascularization procedures: application	671 L.A. pts post-angiography (4 private, 2 public)	x	x					x	x			x	x	Yes	Yes	No	AA/W: 0.20 (0.06-0.72) L/W: 0.62 (0.19-2.00)	AA/W: 0.49 (0.23-0.99) L/W: 1.41 (0.78-2.54) A/W: 0.97 (0.50-1.88)	AA/W 0.59 (0.19 - 1.84) L/W: 0.95 (0.33- 2.75)

Table 2. Revascularization Procedures (CABG, PTCA, and Any Revascularization)

Clinical Data - Strong Studies (continued)

Author	Year	Short Title	Study Design													Study Findings					
			Study Population							Key Variables Assessed						Did Study Find a Racial/Ethnic Difference in Rates?			Quantitative Findings		
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity	PTCA	CABG	ANY	PTCA	CABG	ANY
Leape et al.	1999	Underuse of Cardiac Procedures: Do Women, Ethnic	631 NY post-coronary angiography pts who met RAND criteria	x	x	x				x	x	x	x	x	x			No			(All hospitals) Received procedure: AA/W: 1.05 L/W: 0.75 Procedure recommended: AA/W: 1.08 L/W: 0.76 (Off-site hospitals) Received procedure: AA/W: 1.98 L/W: 0.50 Procedure recommended: AA/W: 4.13 L/W: 1.05 § (NS)
Maynard et al.	1986	Blacks in the Coronary Artery Surgery Study	13,307 pts without previous surgery who were candidates for bypass surgery after undergoing angiography in CASS	x	x					x	x		x		x		Yes			AA/W: 0.60 (0.45-0.79) Of those patients recommended CABG: AA/W: 0.44 (0.26-0.74) §	
Maynard et al.*	1997	Long-term implications of racial differences in the use	11,254 pts with a discharge diagnosis of AMI from 19 hospitals in one county in WA	x	x					x	x	x	x	x	x	Yes	Yes	Yes	UNADJUSTED AA/W: 0.63 (0.49-0.81) §	UNADJUSTED AA/W: 0.54 (0.37-0.79) §	AA/W: 0.60 (0.45-0.81) §
Oberman and Cutter	1984	Issues in the natural history and treatment of coronary	6,594 consecutive pts who underwent arteriography or CABG at University hospital in AL	x	x					x	x		x	x	x		Yes			Among patients with 3-vessel disease: AA/W: 0.26 (0.19-0.35) §	
Okelo et al.	2001	Race and the Decision to Refer	882 Veteran pts with one or more CC, between 1993 and 1995	x	x					x	x	x		x	x	No	Yes		AA/W: 1.42 (0.96 - 2.11)	AA/W: 0.59 (0.37 - 0.94)	
Peniston et al.*	2000	Severity of Coronary Artery Disease	1,460 male veterans post-CC, November 1986 - November 1992	x	x					x	x	x		x	x			No			% revascularized: 1-vessel disease: AA: 19%, W: 23% (NS) 2-vessel disease: AA: 17%, W: 23% (NS) 3-vessel disease: AA: 22%, W: 22% (NS) left main: AA: 45%, W: 33% (NS)
Peterson et al.*	1997	Racial Variation in the Use of Coronary Revascularization	12,402 suspected heart diseased pts with documented CHD on CC	x	x					x	x	x		x	x	No	Yes	Yes	AA/W: 0.87 (0.73-1.03)	AA/W: 0.68 (0.56-0.82)	AA/W: 0.65 (0.56-0.76)

Table 2. Revascularization Procedures (CABG, PTCA, and Any Revascularization)

Clinical Data - Strong Studies (continued)

Author	Year	Short Title	Study Design												Study Findings					
			Study Population							Key Variables Assessed					Did Study Find a Racial/Ethnic Difference in Rates?			Quantitative Findings		
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity	PTCA	CABG	ANY	PTCA	CABG	ANY
Rathore et al.*	2000	Race, Sex, Poverty, and the Medical Treatment	169,079 Medicare pts > 65 years of age with AMI	x	x					x	x	x	x		x			Yes			(ANY = PTCA and THROM) AA/W RR: 0.84 (0.78 - 0.91) Adjusted Eligible: AA/W: 0.72 (0.68 - 0.75)
Taylor et al.*	1997	Can Characteristics of a Health Care System	1,441 pts from 125 U.S. military care facilities with AMI	x	x	x	x	x	x	x	x	x		x	x			No			Nonwhite/W 0.90 (0.53-1.54) §
Taylor et al.*	1998	Management and outcomes for black patients with acute	275,046 pts with AMI	x	x					x	x	x		x	x	Yes	Yes		Primary (immediate) AA/W: 0.96 (0.84-1.10); Coronary angioplasty AA/W: 0.87 (0.78-0.96) §	AA/W:0.66 (0.58-0.75) §	

Table 2. Revascularization Procedures (CABG, PTCA, and Any Revascularization)

Clinical Data - Less Strong Studies

Author	Year	Short Title	Study Design													Study Findings					
			Study Population							Key Variables Assessed						Did Study Find a Racial/Ethnic Difference in Rates?			Quantitative Findings		
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity	PTCA	CABG	ANY	PTCA	CABG	ANY
Barnhart et al.	2000	Clinical and Nonclinical Correlates of Racial and Ethnic	797 pts who underwent coronary angiography for the first time, primarily for the evaluation of IHD	x	x	x				x	x			x				Yes			AA/W: 0.67 (0.17-2.71) L/W: 0.39 (0.17-0.92)
Bearden et al.	1994	Age, Race, Gender Variation in the Utilization	432 cases of CHD among 4,736 subjects in SHEP study	x	x					x			x	x				No			AA/W: 0.95 (0.37-2.50) §
Ferguson et al.*	1997	Examination of racial differences in management of cardiovascular	1,406 male pts from VAMC with cardiovascular disease	x	x						x	x				Yes	Yes	Yes	UNADJUSTED AA/W: 0.60 (0.25-1.49)	UNADJUSTED AA/W: 0.22 (0.08-0.63)	UNADJUSTED AA/W: 0.32 (0.21-0.50)
Goff et al.*	1994	Greater Case Fatality after Myocardial Infarction	1,228 Texas county pts admitted for definite/possible MI, PTCA or aortocoronary bypass surgery	x		x				x	x			x	x	Yes	No		PERCENT PREVALENCE: L women: 8.1, W women: 15.2, L men: 12.1, W men: 22.7 (L=Mexican American only)	PERCENT PREVELANCE: L women:8.9, W women: 8.1, L men: 13.3, W men: 11.1 (L=Mexican American only)	
Griffiths et al.	1999	Differences in African American and White Women	46 female pts with MI at tertiary care facility in NC	x	x						x					No	No		UNADJUSTED AA: 11%, W: 0% p=0.287	UNADJUSTED AA: 11%, W: 7% p=1.000	
Johnson et al.*	1993	Effect of Race on the Presentation and Management of Patients	3031 pts with chest pain at ED not due to local trauma or abnormalities at 2 hospitals (OH, MA)	x	x					x	x				x		Yes			AA/W: 0.24 (0.08-0.71)	
Marks et al.*	2000	Race, baseline characteristics, and clinical outcomes	4,279 pts undergoing coronary interventions in the NACI registry	x	x					x	x			x	x		No			UNADJUSTED Emergency CABG: W 1.9%, AA 1.5%. Any CABG: W 3.4%, AA 3.5%. (NS)	
Maynard et al.*	1991	Characteristics of Black Patients Admitted to Coronary	12,534 pts with a discharge diagnosis of AMI that presented with complaints of chest pain in 19 hospitals in WA	x	x					x	x			x		Yes	Yes		UNADJUSTED AA/W: 0.50 (0.28-0.91) §	UNADJUSTED AA/W: 0.39 (0.16-0.93) §	
Ness and Aronow	1999	Prevalence of coronary artery disease, ischemic	1,802 pts at an academic primary care outpatient geriatric practice in NY, April 1998 - December 1998	x	x	x	x											Yes			AA/W: 0.14 (0.07-0.31) AA/L: 0.24 (0.09-0.23) §

Table 2. Revascularization Procedures (CABG, PTCA, and Any Revascularization)

Clinical Data - Less Strong Studies (continued)

Author	Year	Short Title	Study Design													Study Findings					
			Study Population							Key Variables Assessed						Did Study Find a Racial/Ethnic Difference in Rates?			Quantitative Findings		
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity	PTCA	CABG	ANY	PTCA	CABG	ANY
Oka et al.*	1996	Differences in treatment of acute myocardial infarction	3,016 hospitalized pts. with discharge for definite or possible MI, incident or recurrent infarction during 1986 - 1992	x		x				x	x			x	x			Yes			L/W: 0.45 (0.27-0.76)
Ramsey et al.*	1997	Sex and Ethnic Differences in Use of Myocardial Revascularization	1,228 pts hospitalized for definite or possible MI in one county in TX	x		x				x	x			x	x	Yes	No		Among CC patients: L/W: 0.65 (0.43-0.99) (L=Mexican American only)	Among CC patients: L/W: 0.99 (0.59-1.65) (L=Mexican American only)	
Scirica et al.*	1999	Racial Differences in the Management of Unstable Angina	2,948 pts with unstable angina	x					x	x	x	x		x	x	No	No		Among appropriate pts: Nonwhite/white: 0.92 §	Among appropriate pts: Nonwhite/white: 1.13 §	
Sedlis et al.	1997	Racial differences in performance of invasive cardiac	1,796 veterans post-CC	x	x					x	x	x		x		No	Yes	Yes	PTCA recommended: AA/W: 0.90 (0.66-1.23) PTCA refused: AA/W: 0.83 (0.10-7.01) §	Surgery recommended: AA/W: 0.59 (0.46-0.75) Surgery refused: AA/W: 2.51 (1.61-3.90) §	Procedure recommended: AA/W: 0.67 (0.52-0.86) Procedure refused: AA/W: 2.03 (1.32-3.11) §
Stone et al.*	1996	Influence of Race, Sex and Age on Management	3,318 pts with unstable angina or non-Q-wave MI		x				x	x	x							Yes			Risk ratio: AA/Nonblacks 0.44 (0.37-0.52)
Summers et al.	2001	Association of Atypical Chest Pain Presentations	166 pts with enzyme documented myocardial infarction	x	x					x	x							Yes			UNADJUSTED Reperfusion therapies: AA/W: 31% vs. 48%
Syed et al.	2000	Effect of Delay on Racial Differences in Thrombolysis	395 pts with a first MI	x	x					x	x			x		No		Yes	Primary PTCA: AA: 6%, W: 8% p=.53		Initial Reperfusion (Primary PTCA or Thrombolysis)= AA: 51%, W: 72% p=.001
Watson et al.	2001	Do Race and Gender Influence the Use of Invasive	838 pts with AMI in 1 of 5 mid-Michigan community hospitals	x	x					x	x	x		x	x	No	No		Among CC patients: AA men: 0.61 (0.29 1.28),AA women: 0.40 (0.14 - 1.13)	Among CC patients: AA men: 0.36 (0.12 - 1.06), AA women: 0.37 (0.11 - 1.28)	
Weitzman et al.*	1997	Gender, racial, and geographic differences in the performance	5,462 hospitalized pts with MI aged 35-74 in NC, MS, MD and MN	x	x					x	x			x	x	Yes	Yes		Teaching hospital: AA/W: 0.4 (0.20-0.60) Non-teaching hospital: AA/W: 0.5 (0.30-0.70)	Teaching hospital: AA/W: 0.4 (0.20-0.90) Non-teaching hospital: AA/W: 0.3 (0.20-0.60)	

Table 2. Revascularization Procedures (CABG, PTCA, and Any Revascularization)

Administrative Data - Strong Studies

Author	Year	Short Title	Study Design													Study Findings					
			Study Population							Key Variables Assessed						Did Study Find a Racial/Ethnic Difference in Rates?			Quantitative Findings		
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity	PTCA	CABG	ANY	PTCA	CABG	ANY
Ayanian et al.	1993	Racial Differences in the Use of Revascularization Procedures	27,485 Medicare pts aged 65-74 post angiography	x	x					x	x	x		x		Yes	Yes	Yes	AA/W: 0.64 (0.53-0.77) §	AA/W: 0.64 (0.56-0.75) §	AA/W: 0.56 (0.49-0.64) §
Carlisle et al.*	1995	Racial and Ethnic Differences in the Use of Invasive Cardiac	131,408 discharged from L.A. county hospitals	x	x	x	x			x	x	x	x	x		Yes	Yes		L/W: 0.99 (0.90-1.09) AA/W: 0.80 (0.72-0.88) A/W: 0.89 (0.79-1.01)	L/W: 0.87 (0.79-0.94) AA/W: 0.62 (0.56-0.69) A/W: 1.03 (0.92-1.15)	
Carlisle et al.*	1997	Racial and ethnic disparities in the use of cardiovascular	104,952 L.A. County residents with possible CAD	x	x	x	x			x	x	x		x		Yes	Yes		Private Insurance: AA/W: 0.99 (0.75-1.18) L/W: 0.89 (0.72-1.11) A/W: 0.92 (0.71-1.19) HMO: AA/W: 0.60 (0.42-0.82) L/W: 0.78 (0.56-1.07) A/W: 0.73 (0.49-1.08) Medicaid: AA/W: 0.82 (0.50-1.35) L/W: 1.19 (0.79-1.81) A/W: 1.03 (0.60-1.76) Medicare: AA/W: 0.71 (0.58-0.86) L/W: 1.01 (0.83-1.22) A/W: 0.85 (0.64-1.15) No Insurance: AA/W: 0.40 (0.18-0.88) L/W: 0.90 (0.53-1.53) A/W: 0.68 (0.36-1.29)	Private Insurance: AA/W: 0.80 (0.61-1.04) L/W: 1.09 (0.88-1.36) A/W: 0.99 (0.75-1.29) HMO: AA/W: 0.65 (0.48-0.89) L/W: 0.90 (0.66-1.22) A/W: 1.16 (0.80-1.68) Medicaid: AA/W: 0.50 (0.33-0.77) L/W: 0.80 (0.59-1.09) A/W: 1.22 (0.85-1.77) Medicare: AA/W: 0.59 (0.49-0.72) L/W: 0.79 (0.67-0.94) A/W 0.82 (0.62-1.08) No Insurance: AA/W: 0.33 (0.15-0.71) L/W: 0.93 (0.61-1.42) AA/W: 1.15 (0.69-1.90)	
Escarce et al.*	1993	Racial differences in the elderly's use of medical	1,204,022 Medicare pts	x	x					x	x	x				Yes	Yes		Overall: AA/W 0.32 (0.23-0.45) Among stress test pts: AA/W 0.53 (0.32-0.86) Among angiography pts: AA/W 0.68 (0.46-0.98) §	Overall: AA/W 0.27 (0.22-0.33) Among stress test pts: AA/W 0.36 (0.24-0.53) Among angiography pts: AA/W 0.50 (0.40-0.62) §	
Franks et al.*	1993	Racial Differences in the Use of Invasive Coronary	226,634 Medicare pts discharged with diagnosis of AMI	x	x					x	x	x	x	x	x			Yes			AA/W men: 0.56 (0.50-0.63) AA/W women: 0.59 (0.50-0.63) §
Giacomini*	1996	Gender and ethnic differences in hospital-based procedure	66,084 PTCA recipients and 52,401 CABG recipients from all CA hospitals, 1989-1990	x	x	x	x			x	x	x		x	x	Yes	Yes		AA/W: 0.50 (0.45-0.56) L/W: 0.58 (0.45-0.64) A/W: 0.77 (0.68-0.87) §	AA/W: 0.41 (0.36-0.48) L/W: 0.67 (0.60-0.74) A/W: 0.92 (0.80-1.06) §	
Gornick et al.	1996	Effects of race and income on mortality and use	26.3 million Medicare pts	x	x					x	x		x			Yes	Yes		Rate ratio: AA/W: 0.51 (± 0.007; $p<0.001$)	Rate ratio: AA/W: 0.43 (± 0.007; $p<0.001$)	

Table 2. Revascularization Procedures (CABG, PTCA, and Any Revascularization)

Administrative Data - Strong Studies (continued)

Author	Year	Short Title	Study Design													Study Findings					
			Study Population							Key Variables Assessed						Did Study Find a Racial/Ethnic Difference in Rates?			Quantitative Findings		
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity	PTCA	CABG	ANY	PTCA	CABG	ANY
Gregory et al.*	1999	Impact of Availability of Hospital-Based Invasive Cardiac	13,690 pts in NJ with a primary diagnosis of AMI	x	x					x	x	x		x	x			Yes			<65: AA/W: 0.63 (0.52-0.76) >65: AA/W: 0.69 (0.54-0.86) Among angiography pts: <65: AA/W: 0.67 (0.54-0.84) >65: AA/W: 0.82 (0.61-1.12)
Hannan et al.*	1991	Interracial Access to Selected Cardiac Procedures	61,849 pts hospitalized with CAD in NY	x	x				x	x	x	x	x	x	x	Yes	Yes		AA/W: 0.59 (0.74-0.87) §	AA/W: 0.49 (0.41-0.57) §	
Mirvis et al.*	1994	Variation in Utilization of Cardiac Procedures in the Department	30,300 pts with CAD and 1,335 pts with valvular disease discharged from 172 VAMC	x	x					x	x	x		x				Yes			'Surgery': AA/W: 0.65 (0.59-0.72) Among VHD pts: AA/W: 0.67 (0.46-0.98) §
Peterson et al.*	1994	Racial Variation in Cardiac Procedure Use	33,641 male veterans with AMI	x	x					x	x	x	x	x	x	Yes	Yes	Yes	AA/W: 0.58 (0.48-0.66) Among angiography pts: AA/W 0.69 (0.58-0.82)	AA/W: 0.46 (0.40-0.53) Among angiography pts: AA/W: 0.59 (0.51-0.69)	AA/W: 0.46 (0.41-0.52)
Philbin et al.*	2000	Socioeconomic Status Is an Important Determinant	28,698 patients with AMI	x	x					x	x	x	x	x		Yes	Yes	Yes	AA/W: 0.61 (0.50-0.73)	AA/W: 0.54 (0.43-0.68)	AA/W: 0.53 (0.45-0.62)
Philbin et al.*	2001	Underuse of Invasive Procedures Among Medicaid	11,579 patients with primary diagnosis of AMI	x	x					x	x	x	x	x		Yes	Yes	Yes	AA/W: 0.79 (0.62- 1.00)	AA/W: 0.62 (0.45-0.85)	AA/W: 0.68 (0.55-0.84)
Tunis et al.	1993	Variation in the Utilization of Procedures for Treatment of Peripheral	7,080 procedures likely related to peripheral arterial disease among Maryland pts ages 25 or older	x	x					x	x	x		x		Yes	Yes†		AGE ADJUSTED Relative risk: AA/W: 0.78 (0.66-0.91)	AGE ADJUSTED Relative risk: AA/W: 1.39 (1.30-1.49)	
Udvarhelyi et al.*	1992	Acute Myocardial Infarction in the Medicare Population	218,427 Medicare patients with AMI	x	x					x	x	x		x		Yes	Yes		Relative risk: AA/W: 0.52 Among angiography pts: AA/W: 0.71 (0.64-0.78)	Relative risk: AA/W: 0.50 Among angiography pts: AA/W: 0.68 (0.63-0.74)	
Wenneker and Epstein*	1989	Racial Inequalities in the Use of Procedures for Patients	109,575 pts age 30-89 admitted to MA hospitals for circulatory disease or chest pain	x	x					x	x	x	x	x		No	Yes		AA/W: 0.59 (0.39-1.25) §	AA/W: 0.53 (0.36-0.77) §	
Whittle et al.*	1993	Racial Differences In the Use of Invasive Cardiovascular	428,300 male veterans over 30 years old with a primary diagnosis of cardiovascular disease or chest pain	x	x					x	x	x	x	x		Yes	Yes		AA/W: 0.67 (0.61-0.72) §	AA/W: 0.45 (0.42-0.48) §	

Table 2. Revascularization Procedures (CABG, PTCA, and Any Revascularization)

Administrative Data - Less Strong Studies

Author	Year	Short Title	Study Design													Study Findings					
			Study Population							Key Variables Assessed						Did Study Find a Racial/Ethnic Difference in Rates?			Quantitative Findings		
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity	PTCA	CABG	ANY	PTCA	CABG	ANY
Blustein et al.	1995	Sequential Events Contributing to Variations on Cardiac	5,857 pts with diagnosis of AMI, < 65 years old, non-Medicare, California	x	x	x	x	x	x	x		x			x			Yes			Minority/W: 0.56 §
Eggers and Greenberg*	2000	Racial and ethnic differences in hospitalization rates	All Medicare beneficiaries hospitalized in 1998	x	x	x	x	x				x				Yes	Yes		AA: 0.54,L: 0.88, A: 0.62, NA: 0.77	AA: 0.47, L: 0.80, A: 0.63, NA: 0.81	
Ford et al.*	1989	Coronary Arteriography and Coronary Bypass Survey	All pts ages 35-74 with discharge of AMI from U.S. hospitals, 1974-84	x	x				x								Yes			AA/W men: 0.35 AA/W women: 0.48	
Giles et al.*	1995	Race and Sex Differences in Rates of Cardiac	10,348 pts discharged from hospital with primary diagnosis of AMI	x	x					x	x	x				Yes	Yes		AA men/W men: 0.68 (0.45-1.02) W women/W men: 0.94 (0.77-1.14) AA women/W men: 0.42 (0.23-0.76)	AA men/W men: 0.63 (0.44-0.90) W women/ W men: 0.65 (0.54-0.78) AA women/W men: 0.37 (0.22-0.62)	
Gillum et al. [a]*	1997	Coronary Heart Disease Incidence and Survival	11,406 with no history of CHD	x	x					x	x		x	x				No			AA/W: 0.15 (0.02 - 1.05)
Gillum et al. [b]*	1997	Coronary Revascularization and Cardiac Catheterization in the US	Greater than 400 hospitals from 50 states with at least a 6 bed facility	x	x					x						Yes	Yes		AGE-ADJUSTED 1993: AA/W: 0.57	AGE-ADJUSTED 1980-85: AA/W: 0.23; 1986: AA/W: 0.38; 1993: AA/W: 0.43	
Gittelsohn et al.	1991	Income, race and surgery in Maryland	MD pts admitted to acute care hospitals	x	x					x	x		x			Yes	Yes		AA/W men: 0.52 P< 0.01	AA/W men: 0.45 P< 0.01	
Goldberg et al.	1992	Racial and Community Factors Influencing Coronary	Medicare pts with ICD-9 Classification	x	x					x	x	x					Yes			AA/W: 0.28 §	
McBean et al.*	1994	Continuing Differences in the Rates of Percutaneous Transluminal	Medicare pts with hospitalization for PTCA, CABG, or diagnosis of IHD	x	x					x	x	x				Yes	Yes		AGE-ADJUSTED Rates by gender, 1986-1990 AA/W: 0.50 - 0.65 §	AGE-ADJUSTED Rates by gender, 1986-1990 AA/W: 0.46 - 0.60 §	
Philbin and DiSalvo*	1998	Influence of Race and Gender on Care Process	45,894 patients with CHF	x	x					x	x			x				No			AA women: 0.2%, AA men: 0.2%, W women: 0.3%, W men:0.4% p<0.05

Table 3. Thrombolytic Therapy
Clinical Data - Strong Studies

Author	Year	Short Title	Study Design													Study Findings	
			Study Population							Key Variables Assessed						Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Allison et al.*	1996	Racial Differences in the Medical Treatment of Elderly	4,052 Medicare pts with AMI in AL	x	x					x	x	x		x	x	Yes	AA/W:0.51 (0.38-0.73)
Canto et al.*	1998	Presenting Characteristics, Treatment Patterns, and Clinical Outcomes	275,046 pts in National Registry of MI	x		x	x	x	x	x	x	x		x	x	Yes	L/W: 0.97 (0.86 - 1.09) A/W: 0.84(0.72-0.99) NA/W: 1.18 (0.90 - 1.54)
Maynard et al.*	1997	Long-term implications of racial differences in the use	11,254 pts with a discharge diagnosis of AMI from 19 hospitals in one county in WA	x	x					x	x	x	x	x	x	No	UNADJUSTED AA: 21%, W: 22% (NS)
Mickelson et al.*	1997	Acute Myocardial Infarction: Clinical Characteristics	1,703 pts in a VAMC in TX with MI and chest pain, or shortness of breath preceding ECG abnormalities	x	x	x				x		x		x	x	Yes	AA/W: 0.64 (0.28-1.49) L/W: 0.29 (0.10-0.85)
Taylor et al.*	1998	Management and outcomes for black patients with acute	275,046 pts with AMI	x	x					x	x	x		x	x	Yes	AA/W: 0.76 (0.70 - 0.82)

Table 3. Thrombolytic Therapy

Clinical Data - Less Strong Studies

Author	Year	Short Title	Study Design													Study Findings	
			Study Population							Key Variables Assessed						Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Borzak et al.*	1999	Lower thrombolytic use for African Americans	1,948 pts admitted with AMI to single coronary unit in MI	x	x					x	x			x		No	AA/W: 0.90 p=0.18
Davis et al.	2001	Delays in Thrombolytic Therapy for Acute Myocardial	176 pts with AMI on EKG when thrombolysis was first treatment	x	x					x	x					No	AVERAGE TIMES Door to EKG: AA 7 min, W 8 min (p=0.48) EKG to THROM: AA 29 min, W 34 min (p=0.69) Door to THROM: AA 36 min, W 41 min (p=0.46)
Goff et al.*	1994	Greater Case Fatality after Myocardial Infarction	1,228 Texas county pts admitted for definite/possible MI,, PTCA or baortocoronary ypass surgery	x		x				x	x			x	x	Yes	PERCENT PREVELANCE: L women: 4.8%, W women: 13.3% L men: 13.0%, W men: 19.3% (L=Mexican American only)
Goff et al.	1995	A Population Based Assessment of the Use and Effectiveness	1,199 pts hospitalized for MI	x		x				x	x			x	x	Yes	L/W: 0.57(0.36 - 0.91) (L=Mexican American only)
Manhapra et al.	2000	Electrocardiographic presentation of blacks with first myocardial infarction	498 pts with first MI	x	x					x	x			x	x	Yes	Relative risk: AA/W: 0.73 (0.55 - 0.97)
Maynard et al.*	1991	Characteristics of Black Patients Admitted to Coronary	12,534 pts with a discharge diagnosis of AMI that presented with complaints of chest pain in 19 hospitals in WA	x	x					x	x			x		No	UNADJUSTED AA: 20%, W: 20%
Oka et al.*	1996	Differences in treatment of acute myocardial infarction	3,016 hospitalized pts. with discharge for definite or possible MI, incident or recurrent infarction during 1986 - 1992	x		x				x	x			x	x	No	NS in multivariate analysis (data not presented)
Syed et al.	2000	Effect of Delay on Racial Differences in Thrombolysis	395 pts with a first MI	x	x					x	x			x		Yes	Relative risk of NOT receiving thrombolysis: AA/W: 1.49 (1.08-2.06)
Weitzman et al.*	1997	Gender, racial, and geographic differences in the performance	5,462 hospitalized pts with MI aged 35-74 in NC, MS, MD and MN	x	x					x	x			x	x	Yes	Teaching hospital: AA/W: 0.5(0.3-0.8) Non-teaching hospital: AA/W: 0.5(0.3-0.7)

Table 4. Drug Therapy
Clinical Data - Strong Studies

Author	Year	Short Title	Study Design													Study Findings	
			Study Population							Key Variables Assessed						Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Allison et al.*	1996	Racial Differences in the Medical Treatment of Elderly	4,052 Medicare pts with AMI in AL	x	x					x	x	x		x	x	No	Beta blockers: AA/W: 1.18 (0.91-1.53) Aspirin: AA/W: 1.0 (0.81-1.24)
Mickelson et al.*	1997	Acute Myocardial Infarction: Clinical Characteristics	1,703 pts in a VAMC in TX with MI and chest pain, or shortness of breath preceding ECG abnormalities	x	x	x				x		x		x	x	Yes	UNADJUSTED Aspirin: AA: 88%, W: 95%, L :85% Beta blockers: AA: 49%, W: 51%, L: 71%
Rathore et al.*	2000	Race, Sex, Poverty, and the Medical Treatment	169,079 Medicare pts > 65 years of age with AMI	x	x					x	x	x	x		x	Yes	ON ADMISSION Adjusted relative risk ratio: Aspirin: AA/W: 0.97 (0.96 - 0.99) Beta Blockers: AA/W: 0.94 (0.88 - 1.00) Discharge Aspirin 1.00 (0.98 - 1.02)
Taylor et al.*	1998	Management and outcomes for black patients with acute	275,046 pts with AMI	x	x					x	x	x		x	x	Yes Yes†	Within 24 hrs of arrival: Aspirin: W 76%, AA 74% (p<0.001) Heparin: W 78% AA 74% (p<0.001) Beta-blocker W 46%, AA 44% (p<0.001) Calcium-blocker: W 19%, AA 24% (p<0.001) Lidocaine W 17%, AA 15% (p<0.001) At discharge: Aspirin: W 75%, AA 72% (p<0.001) Beta-blocker: W 46%, AA 45% (p=0.006) Calcium blocker: W 27%, AA 32% (p<0.001) Nitrates: W 53%, AA 56% (p<0.001) ACE inhibitor: W 28%, AA 32% (p<0.001)

Table 4. Drug Therapy

Clinical Data - Less Strong Studies

Author	Year	Short Title	Study Design													Study Findings	
			Study Population							Key Variables Assessed						Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Borzak et al.*	1999	Lower thrombolytic use for African Americans	1,948 pts admitted with AMI to single coronary unit in MI	x	x					x	x			x		Yes	Before admission: Aspirin AA 33%, W 43% p=0.003 Beta-blocker: AA 18%, W 23% p=0.007 Calcium blocker: AA 27%, W 23% p=0.002 Oral nitrate: AA 31%, W 32% p=0.62 Digoxin: 17%, W 14% p=.07 ACE inhibitor: AA 26%, W 20% p=0.2 Diuretic: 38%, W 28% p<0.001 Insulin: AA 18%, W 10% p<0.001 Emergency and coronary intensive care Aspirin: AA 86%, W 87% p=0.67 Beta-blocker: AA 53%, W 60% p=0.002 Heparin: AA 83%, W 83% p=0.87 Calcium blocker: AA 17%, W 14% p=0.16
Canto et al.*	1998	Presenting Characteristics, Treatment Patterns, and Clinical Outcomes	275,046 pts in National Registry of MI	x		x	x	x	x	x	x	x		x	x	Yes	UNADJUSTED Beta blockers: Nonblacks/W: 0.86 (0.82 - 0.90)
Goff et al.*	1994	Greater Case Fatality after Myocardial Infarction	1,228 Texas county pts admitted for definite/possible MI, PTCA or aortocoronary bypass surgery	x		x				x	x			x	x	Yes	UNADJUSTED PERCENT PREVELANCE: Aspirin: L women: 36.9%, W women:45.7%, L men: 49.6%, W men: 52% Beta blockers: L women:17.3%, W women: 24.8%, L men:25.1%, W men: 30.1% Calcium blockers: L women: 60.9%, W women: 63.3%, L men: 57.5%, W men: 62.3% (NS) Anticoagulants: L women 45.4%, W women 53.8%, L men 54.6%, W men 63.3% (L=Mexican American only)
Herholz et al.	1996	Women and Mexican Americans Receive Fewer	982 pts hospitalized for definite or possible MI for CHD	x		x				x	x			x		Yes	Betablockers L/W: 0.71 (0.50-1.00) Antiarrhythmics L/W: 0.39 (0.26-0.59) Anticoagulants L/W: 0.42 (0.24-0.73) Lipid-lowering drugs L/W: 0.46 (0.24-0.87) (L=Mexican American only)

Table 4. Drug Therapy

Clinical Data - Less Strong Studies (continued)

Author	Year	Short Title	Study Design													Study Findings	
			Study Population							Key Variables Assessed						Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Scirica et al.*	1999	Racial Differences in the Management of Unstable Angina	2,948 pts with unstable angina	x					x	x	x	x		x	x	Yes	Heparin: Nonwhite: 60%, W: 68% (p=0.05). Aspirin, Beta blockers, calcium channel blockers and nitrates NS.
Stone et al.*	1996	Influence of Race, Sex and Age on Management	3,318 pts with unstable angina or non-Q-wave MI		x				x	x	x					Yes Yes†	Specific ORs not given. A significant difference found for in-hospital treatment for: Beta Blockers, Nitroglycerin, and Heparin. At discharge a significant difference was found for Beta Blockers and Aspirin. Significant difference where minorities were more likely to receive drug therapy at discharge were found for Nitrates and calcium channel blockers. No significant difference found for in-hospital treatment for Calcium channel blockers and Aspirin.
Syed et al.	2000	Effect of Delay on Racial Differences in Thrombolysis	395 pts with a first MI	x	x					x	x			x		Yes†	No difference was found for in-hospital treatment of Aspirin, Beta blockers, diuretics, ACE inhibitors, Digoxin, Nitrates. Minorities were found more likely to receive in-hospital treatment with Calcium channel blockers AA 15%, W 8% p=.03

Table 5. Other Cardiac Procedures and Treatments

Clinical Data - Strong Studies

Author	Year	Short Title	Study Design													Study Findings	
			Study Population							Key Variables Assessed						Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Ayanian et al.	1999	Quality of Care by Race and	2,175 Medicare pts with CHF in IL, NY, PA		x				x	x	x	x	x	x	x	Yes	Overall implicit quality: Gender for Congestive Blacks/Nonblacks: -0.15 (p<.05) Overall explicit quality: Blacks/Nonblacks: -0.16 (p<.05)

Clinical Data - Less Strong Studies

Author	Year	Short Title	Study Design													Study Findings	
			Study Population							Key Variables Assessed						Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Bell and Hudson*	2001	Equity in the diagnosis of chest pain:	379 pts from 2 county EDs in NC	x	x					x	x	x		x		Yes	EKG: W/AA: 0.59 (0.37 - 0.93)
Bourassa et al.*	1993	Natural History and Patterns of Current Practice	6,273 pts with heart failure and/or left ventricular dysfunction enrolled in the SOLVD registry	x	x					x	x			x	x	Yes†	Hospitalization: W/AA:1.33, p<.0001
Johnson et al.*	1993	Effect of race on the presentation and management of patients	3031 pts with chest pain at ED not due to local trauma or abnormalities at 2 hospitals (OH, MA)	x	x					x	x				x	Yes	Hospitalization: AA/W: 0.69 (0.56-0.84) Triage to CC unit after admission: AA/W: 0.81 (0.65-1.0)
Park et al.*	1997	The Impact of Race and HLA Matching on Long-Term Survival	336 consecutive patients who underwent orthotopic heart transplantation, March 1983 - July 1994	x	x						x					Yes	Class I HLA matching Poorly matched: AA: 64%, W: 46% Moderately matched: AA:34%, W: 53% Well-matched: AA:0%, W:1% (p = 0.03) Class II HLA matching Poorly matched: AA: 78%, W: 63% Moderately matched: AA: 18%, W: 35% Poorly matched: AA: 4%, W: 2% (p= 0.04)

Table 5. Other Cardiac Procedures and Treatments

Administrative Data - Strong Studies

Author	Year	Short Title	Study Design													Study Findings	
			Study Population							Key Variables Assessed						Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Alexander et al.	1999	Congestive Heart Failure Hospitalizations and Survival	90,316 pts admitted to all CA hospitals, except VAMC or DOD, with CHF 1991-1992.	x	x	x	x			x	x	x		x		Yes	CHF hospitalization rates: Relative risk for episodes of hospitalization: AA women: 1.7, AA men: 2.2, L women: 0.9, L men: 1.04, A women: 0.8, A men: 0.6 Relative risk for individuals w/ > 1 episode of hospital: AA women: 1.6, AA men: 2.1, L women: 0.8, L men: 0.9, A women: 0.8, A men: 0.6
Giacomini*	1996	Gender and ethnic differences in hospital-based procedure	66,084 PTCA recipients and 52,401 CABG recipients from all CA hospitals, 1989-1990	x	x	x	x			x	x	x		x	x	No	Heart transplantation: W/AA: 1.18 (0.63-2.22), W/L: 0.70 (0.34-1.43), W/A: 1.12 (0.47-2.70)
Wolinsky et al.	1997	The Risk of Hospitalization for Congestive Heart Failure	7,286 Medicare pts age 70+ hospitalized for CHF	x	x					x	x	x		x		Yes†	CHF hospitalization hazard ratios as compared to white women: W men: 1.83 p<0.001, AA men: 1.15 (NS), AA women: 0.92 (NS)

Administrative Data - Less Strong Studies

Author	Year	Short Title	Study Design													Study Findings	
			Study Population							Key Variables Assessed						Did Study Find a Racial/ Ethnic Difference in Rates?	Quantitative Findings
			Description	W	AA	L	A	NA	SG	Age	Sex	Insurance	SES	Health Status	Heart Disease Severity		
Philbin and DiSalvo*	1998	Influence of Race and Gender on Care Process	45,894 patients with CHF	x	x					x	x			x		Yes	Length of stay: AA: 10.4 days, W: 9.3 days Hospital Charges: AA: $13,711, W: $11,074 Readmission: AA/W:1.30 (1.22 - 1.39)

KEY

Symbols:

* Study analyzes more than one procedure or treatment and appears in more than one table

§ Odds ratio findings taken from Kressin and Petersen. Annals of Internal Medicine, 2001.

Code:

YES = Difference found; racial/ethnic minority group less likely than whites to have procedure or treatment (In the case of CHF, higher rates of hospitalizations indicate lower access to appropriate care).

YES† = Difference found; racial/ethnic minority group more likely than whites to have procedure or treatment (In the case of CHF, lower rates of hospitalizations indicate higher access to appropriate care).

NO = No difference found; racial/ethnic minority group as likely as whites to have procedure or treatment.

Abbreviations:

A = Asian
AA = African American
AL = Alabama
AMI = Acute Myocardial Infarction
ANY = PTCA and/or CABG unless otherwise noted
CA = California
CABG = Coronary Artery Bypass Grafting
CAD = Coronary Artery Disease
CASS = Coronary Artery Surgery Study
CC = Cardiac Catheterization
CHD = Coronary Heart Disease
CHF = Congestive Heart Failure
DOD = Department of Defense
Dr(s) = Doctor(s)
DVA = Department of Veteran's Affairs
EDs or ED = Emergency Departments
EKG or ECG = Electrocardiogram
ESRD = End Stage Renal Disease
HLA = Human Leukocyte Antigens
HMO = Health Maintenance Organization
HR = Hazard Ratio
HTx = Heart Transplantation
ICD-9 = International Classification of Diseases
IHD = Ischemic Heart Disease
IL = Illinois
L = Latino
L.A. = Los Angeles
MA = Massachusetts
MD = Maryland
MI = Myocardial Infarction
MN = Minnesota
MO = Missouri
MS = Mississippi
NA = Native American
NACI = New Approaches in Coronary Interventions Registry
NC = North Carolina
NJ = New Jersey
NS = Not Significant
NY = New York
OH = Ohio
OR = Odds Ratio*
PA = Pennsylvania
PR = Prevalence Ratio
Pt(s) = Patient(s)
PTCA = Percutaneous Transluminal Coronary Angioplasty
QMI = Q-wave Myocardial Infarction
SG = Data analyzed for summary racial/ethnic groups (e.g. "nonwhites")
SES = Socioeconomic status
SHEP = Systolic Hypertension in the Elderly Program
TX = Texas
VAMC = Veteran's Affairs Medical Centers
VHD = Valvular Heart Disease
W = White
WA = Washington
US = United States

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*An odds ratio is a comparative measure of the strength of an association between an exposure or treatment and an outcome event (e.g., a diagnostic test) for two population groups. It is calculated by dividing the odds of the event occurring in one population group by the odds of that event occurring in another group. In this report, the odds ratio measures the relative odds that a racial/ethnic minority population group will undergo a procedure or treatment compared with the odds for a white population group. See Appendix B.6 for explanation of odds. [Definition adapted from the glossary of the Institute of Medicine report *Care Without Coverage: Too Little, Too Late.* National Academy Press, 2002.]

APPENDIX D

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This report is one component of an initiative to raise physician awareness about racial and ethnic disparities in medical care. The initial focus is on cardiac care because heart disease is the leading cause of death among racial/ethnic groups in the United Sates and because there is substantial research on disparities in this area. Since the completion of this report, the Robert Wood Johnson Foundation has joined The Henry J. Kaiser Family Foundation in this project, making it a joint effort of the two Foundations. A number of national organizations have joined both Foundations in this effort, including:

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