

Racial and Ethnic Disparities in the Management of Chronic Coronary Disease



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KEYWORDS

• Chronic coronary disease • Race • Ethnicity • Disparities • Management

KEY POINTS

- Chronic coronary disease (CCD) is common across diverse patient populations.
- Racial and ethnic representation disparities are pervasive in CCD guideline-informing clinical trials.
- Disparities remain in the multifaceted approach toward CCD management including lifestyle approaches, medical management, and cardiac rehabilitation.

INTRODUCTION

Chronic coronary disease (CCD) comprises a continuum of conditions that include obstructive and non-obstructive coronary artery disease (CAD) with or without prior acute coronary syndrome (ACS).¹ It is estimated that there are 20 million individuals in the United States with CCD, and death from coronary heart disease (CHD) remains the leading cause of death worldwide, with significant disparities by race and ethnicity (Table 1). The recent 2023 CCD management guidelines released by the American College of Cardiology/American Heart Association (AHA) highlighted the importance of social determinants of health in the risk and outcomes for CCD.¹

There is a rising incidence in the disease burden of cardiovascular disease with an estimated global prevalence of 1655 per 100,000 population with the United States having a higher prevalence of 2929 per 100,000.² The aging population and increasing prevalence of co-morbidities such as hyperlipidemia, obesity, and diabetes are major factors in the increasing impact of CCD for the future to come.²

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Population Group	Prevalence, CHD, 2017–2020, ≥20 y of Age	Prevalence, MI, 2017–2020, ≥20 y of Age	Prevalence, AP, 2017– 2020, ≥20 y of Age
Both sexes	20,500,000 (7.1%) [95% CI, 6.1%–8.3%]	9,300,000 (3.2%) [95% CI, 2.5%–4.0%]	10,800,000 (3.9%) [95% CI, 3.3%–4.5%]
Males	11,700,000 (8.7%)	6,100,000 (4.5%)	5,600,000 (4.3%)
Females	8,800,000 (5.8%)	3,200,000 (2.1%)	5,200,000 (3.6%)
NH White males	9.40%	4.80%	4.70%
NH White females	5.90%	2.20%	3.50%
NH Black males	6.20%	4.00%	2.70%
NH Black females	6.30%	2.30%	4.10%
Hispanic males	6.80%	3.10%	3.60%
Hispanic females	6.10%	1.90%	4.30%
NH Asian males	5.20%	2.80%	2.70%
NH Asian females	3.90%	0.50%	2.70%

Abbreviation: NH, Non-Hispanic.

Prevalence obtained using age-adjusted estimates of self-reported data.

Data from the 2023 heart disease and Stroke Statistics Report (Tsao CW, et al. *Circulation*. 2023;147(8): e93-e621.) using the National Health and Nutritional Examination Survey (NHANES) dataset.

For most patients with CCD, the primary treatment approaches include intensive lifestyle interventions and optimization of guideline-directed medical therapy (GDMT).^{1,3} Invasive interventions are also used in select patient populations with CCD including those with significant left main disease, 3-vessel CAD with diabetes, heart failure with reduced ejection fraction and those with limiting angina despite GDMT. Outside of these population groups, there have been recent studies showing that revascularization does not improve mortality or morbidity on top of GDMT for patients with CCD, even in the presence of significant ischemia on non-invasive testing.^{4,5}

With the long history of known racial and ethnic inequalities in procedural utilization, treatment strategies and cardiovascular health outcomes for patients with CCD,^{6–8} this review will focus on the racial and ethnic disparities of the multifaceted approach toward CCD management.

TERMINOLOGY

Race and ethnicity

Race and ethnicity are often conflated but they represent separate social constructs. Race refers to a population group of ancestral descent and physical traits whereas ethnicity refers to a population group of similar cultural, linguistic, or religious background.⁹ The racial categories in 2020 US Census include White, Black or African American, Asian, American Indian/Alaska Native, and Native Hawaiian/Other Pacific Islander. The term Hispanic or Latino refers to a heterogeneous group of individuals of any race, ancestry, ethnicity, or combination, who have origins in South America, Central America, Mexico, the Caribbean, or any other Spanish-speaking country or culture.¹⁰ Importantly, race and ethnicity are not biological but instead reflect deeply rooted social constructs that have profound effects on cardiovascular risk and outcomes.¹¹

Population shift and socioeconomic status

There has been a shift in population size and distribution between the 2010 and 2020 US Census with a notable decrease in non-Hispanic White population size/percentage and an increase in the Hispanic/Latinx, Asian, and 2 or More Race population.^{10,12}

There are notable differences by socioeconomic factors by race and ethnicity. On average, non-Hispanic White and Asian populations have higher mean incomes compared to the average American household income of \$69,717 per the 2021 American Community Survey.¹³ Black and American Indian/Alaska Indian populations had the lowest median household incomes at \$46,774 and \$53,149 respectively.¹³

Prevalence of chronic coronary disease by race and ethnicity

The 2023 AHA Heart Disease and Stroke Statistics noted that the prevalence rate of CHD was 7.1% with higher rates in males (8.7%) versus females (5.8%) (see [Table 1](#)).¹⁴ Non-Hispanic White male individuals had the highest rate (9.4%) whereas Asian females had the lowest (3.9%).

DIVERSITY IN CLINICAL TRIALS

There have been numerous landmark trials that have shaped the 2023 AHA CCD Guidelines and prior guidelines to date. This section will highlight the demographics of a few selected trials to better understand the diversity of these randomized controlled trials throughout the years and whether they accurately represented the current population of this country ([Table 2](#)).

One of the earliest landmark trials, the Coronary Artery Surgery Study (CASS) trial in 1983, found that aggressive initial coronary artery bypass graft treatment does not improve outcomes in CCD.¹⁵ However, 98.3% of their enrolled patients were White. Another trial, the Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation (COURAGE) trial in 2007 that found an initial percutaneous coronary intervention (PCI) strategy for CCD did not improve mortality or major adverse cardiovascular events (MACE), also underrepresented non-White population with 85.9% of patients being White.¹⁶ Even more contemporary trials informing management of CCD have had limited racial and ethnic representation. For example, the 2021 Aspirin Dosing: A Patient-Centric Trial Assessing Benefits and Long-Term Effectiveness (ADAPTABLE) trial which compared dosing of 81 mg versus 325 mg of aspirin in patients with established atherosclerotic cardiovascular disease, nearly 80% of the study population identified as White. Similarly in the 2022 Revascularization for Ischemic Ventricular Dysfunction (REVIVED-BCI2) trials which found revascularization via PCI in patients with ischemic left ventricle ejection fraction less than 35% heart failure does not improve mortality or hospitalization rates for heart failure, 90.6% of their enrolled patients were White.^{17,18}

However, there are some trials such as the Bypass Angioplasty Revascularization Investigation 2 Diabetes (BARI-2D) trial in 2009, which investigated whether early revascularization in patients with CCD and type 2 diabetes mellitus (T2DM) improved outcomes and found no significant difference in mortality and MACE, enrolled a population much more representative of the US population, with 16.8% of the study participants identifying as Black and 12.5% identifying as Hispanic.¹⁹ More recently in 2022, the International Study of Comparative Health Effectiveness with Medical and Invasive Approaches (ISCHEMIA) trial in 2022 found no reduction in risk of ischemic cardiovascular events or deaths with an initial invasive strategy in those with stable coronary disease with moderate or severe ischemia.⁴ This trial was more representative of races and ethnicities but had an overrepresentation of Asian patients, accounting for

Table 2
List of selected landmark clinical trials in CCD: demographics

	2020 US Census	CASS (1983)		COURAGE (2007)		BARI-2D (2009) ^a		ADAPTABLE (2021) ^b		REVIVED-BCIS2(2022) ^c		ISCHEMIA (2022) ^d		CLEAR-OUTCOMES (2023)	
	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
White (non-Hispanic)	57.8%	767	98.3%	1963	85.9%	1561	65.9%	11,990	79.5%	634	90.6%	3403	65.7%	12,732	91.1%
Hispanic or Latino	18.7%			126	5.5%	296	12.5%	481	3.2%			763	14.7%	2333	18.3%
Black	12.1%			114	5.0%	398	16.8%	1311	8.7%	6	0.9%	204	3.9%		
Asian	5.9%					114	4.8%	146	1.0%	49	7.0%	1485	28.7%		
American Indian and Alaska Native	0.7%							114	0.8%						
Native Hawaiian and Other Pacific Islander	0.2%														
Other Race	0.5%			82	3.6%			401	2.7%			37	0.7%		
Two or More Race	4.1%							134	0.9%	11	1.6%				
Total		780		2285		2368		15,076		700		5179		13,975	

^a Only 63% of enrolled patients were from the US asian population group includes other races.

^b 6.5% of patients reported "Prefer not to say" regarding race and ethnicity.

^c Study did not distinguish between non-Hispanic and Hispanic White population group. The 11 in mixed race group includes other or not reported.

^d 50 patients did not report race.

Abbreviations: ADAPTABLE, aspirin dosing: a patient-centric trial assessing benefits and long-term effectiveness; BARI 2D, bypass angioplasty revascularization investigation 2 diabetes; CASS, coronary artery surgery study; CLEAR, cholesterol lowering via bempedoic acid [ECT1002], an ACL-inhibiting regimen outcomes trial; COURAGE, clinical outcomes utilizing revascularization and aggressive drug evaluation; ISCHEMIA, International Study of Comparative Health Effectiveness with Medical and Invasive Approaches; REVIVED, revascularization for ischemic ventricular dysfunction trial.

28.7% of the trial population, exceeding the US 2020 census estimate of 5.9% for the Asian population.

The recently reported Cholesterol Lowering via Bempedoic Acid [ECT1002], an ACL-Inhibiting Regimen (CLEAR) Outcomes trial in 2023 randomized statin-intolerant patients to bempedoic acid or placebo enrolled 18.3% Hispanic or Latinx individuals but 91.1% of enrollees were White.²⁰

Increasing clinical trial diversity in practice-informing CCD trials is a priority and will involve concerted efforts from policy makers, study sponsors, and academic partners.

DISPARITIES IN NON-INVASIVE MANAGEMENT

Lifestyle Changes

Lifestyle modification is one of the main pillars of secondary prevention of CCD, especially in reducing co-morbidities such as hypertension and diabetes mellitus. Dietary change is one effective component of lifestyle changes. One widely known diet, the Dietary Approaches to Stop Hypertension (DASH) diet has been shown to reduce blood pressure substantially.²¹ Another diet, the Mediterranean diet, has been shown to be an effective secondary prevention method to reduce incidence of major cardiovascular events.²² However, there are racial and ethnic disparities present in both utilization and adherence to these diets. In 1 study looking at NHANES data from 2001 to 2002, adherence to the DASH diet was associated with higher socioeconomic status and education, and was lower in disadvantaged groups, with non-Hispanic Black population having the lowest adherence.²³ Another study looked at dietary quality trend from 1999 to 2010, using a health score based on the mean consumption of industrially produced *trans*-fat, and found that lower socioeconomic status was associated with worse dietary quality.²⁴

Other studies looking at the impact of food insecurity and food deserts, defined as low-income communities with limited access to healthy food, have found that across a national level, lower income food deserts are associated with increased cardiovascular burden and increased mortality.^{25,26} Furthermore, the prevalence of food insecurity continues to persist, especially in non-Hispanic Black and Hispanic populations.²⁷

Physical activity is another modifier that has been shown to be vital in secondary prevention of CCD. However, there remain disparities in the amount of physical activity seen. One study looked at self-reported leisure-time physical activity from the 2007 California Health Interview Survey and found that all non-White race and ethnicities engaged in less vigorous physical activity compared with the White population.²⁸ Another study looking at low-income Black and White population found that Black population had higher odds of self-reported physical inactivity via the National Health Interview Survey.²⁹

GUIDELINE-DIRECTED MEDICAL THERAPY FOR CHRONIC CORONARY DISEASE

GDMT is the cornerstone for CCD management. However, there are persistent and pronounced racial and ethnic disparities in access and adherence to evidence-based therapies for secondary prevention.

Antiplatelet therapy is one component of CCD GDMT. One study found that Black and Hispanic populations with CCD are less likely to take aspirin compared with White population, even after accounting for sociodemographic components.³⁰ This was corroborated with the Multi-Ethnic Study of Atherosclerosis that found that although there has been an increase in aspirin use since the USPSTF recommendation in 2002, there remains underutilization across non-White race and ethnicities.³¹ In a study utilizing in-home interviews, Black older adults were less likely to use aspirin

or statins compared with White older adults, even after controlling for socioeconomic differences, access to care, and co-morbidities.³²

After acute myocardial infarction, either managed solely with medical therapy or with revascularization, dual antiplatelet therapy is indicated for a period of time afterward. In recent years, newer P2Y12 inhibitors such as ticagrelor or prasugrel have been shown to be superior in efficacy compared to clopidogrel and have been increasingly prescribed since its introduction.^{33–35} However, one retrospective study found that Hispanic ethnicity and lower household income were associated with clopidogrel initiation over these newer agents. Lower adherence rates were also noted in patients of underrepresented races and ethnicities.³⁶ Notably, socioeconomic predictors for clopidogrel use over these newer agents include no insurance, insurance with Medicare or Medicaid.³⁵

Lipid control with medications is another key component of the management of CCD with the aim to achieve reduction in LDL-C levels to reduce risk of MACE. Although historically achieved by statin medications, there has been a rapid development in non-statin agents for LDL-C reduction including ezetimibe, proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors such as alirocumab and evolocumab, as well as newer novel agents such as bempedoic acid. These agents are now increasingly used as adjuncts to statin therapy, especially if patients are on maximally tolerated statin therapy or judged to be high risk. However, there are large differences in utilization of lipid-lowering drugs. Black older adults with CCD were found to be less likely to use statins.³¹ Another cross-sectional study using the Medical Expenditure Panel Survey found Black and Hispanic men alongside all non-White women were less likely to report statin usage compared to White men.³⁷ Poor access to care, due to either lack of insurance or routine location for health, were identified as key factors for lower statin use.³⁸

There are also racial and ethnic disparities in initiating non-statin medications such as ezetimibe or PCSK9 inhibitors in those who are on maximal statin therapy. One study found that Black patients had lower rates of ezetimibe and PCSK9 inhibitor initiation compared to White patients.³⁹ PCSK9 inhibitor initiation was also found to be lower among veterans of a race or ethnicity other than non-Hispanic White.⁴⁰

Use of novel and emerging therapies

With the 2023 CCD guidelines, one important new distinction is the rise of sodium-glucose transport protein 2 inhibitors (SGLT2i) and glucagon-like peptide 1 receptor agonist (GLP-1 RA) in GDMT especially in those with diabetes or heart failure.¹ Already, there is mounting evidence of the potential disparities in utilization of these powerful therapies. One study found that Asian, Black, and Hispanic patients with diabetes had lower rates of GLP-1 agonist use compared to White patients.⁴¹ Another study similarly found that Veterans of several different racial groups and Hispanic Veterans with diabetes were less likely to receive prescription for SGLT2i or GLP-1 RA.⁴² Early initiation of GLP-1 RA or SGLT2i in adults with diabetes following new diagnosis of CVD was low especially among Black or other races and ethnicity.⁴³ With new evidence for the role of GLP-1 in CCD patients without diabetes, efforts are needed to ensure that these therapies are accessible to diverse populations to ensure that all patients can benefit.

CARDIAC REHABILITATION

Cardiac rehabilitation has been a known anchor to optimize secondary prevention of CCD. However, it is important to understand the barriers as well as disparities in participation and access to care.

In one retrospective study, participation in cardiac rehab was lower in Asian, Black, and Hispanic patient populations in comparison to White population. Furthermore, time to cardiac rehab attendance was significantly longer for these patient populations in comparison to White population. This was consistent across all different household incomes levels.⁴⁴ In another study looking more closely at Los Angeles County, non-Hispanic Black people lived further away from a cardiac rehab facility than non-Hispanic White people.⁴⁵

Referral rates for cardiac rehab were also found to be significantly lower for Black, Hispanic and Asian patients, who are 20%, 36%, and 50% less likely respectively in comparison to White patients at time of discharge.⁴⁶ In another observational study looking at cardiac rehab participation rates amongst Medicare patients eligible for cardiac rehab, Black, Hispanic, and Asian patients had participation rates of 13.6%, 13.2%, 16.3%, respectively, compared with 25.8% in non-Hispanic White patients.⁴⁷

DISPARITIES IN INVASIVE MANAGEMENT AND OUTCOMES

There have been numerous studies documenting racial and ethnic disparities in the utilization of revascularization, particularly among Black patients.^{6-8,48,49} However, even in more contemporary studies, racial and ethnic disparities in the treatment of patients presenting with ACS remain. One study, using the National Inpatient Sample database from 2009 to 2018, found that Black patients who undergo PCI for STEMI were less likely to receive drug eluting stents (DES) compared to White patients.⁵⁰ Furthermore, 1 study found that alongside Black ethnicity, lower median household income, lack of private insurance, as well as non-urban and for-profit hospital status, were also independently associated with not undergoing primary PCI on day of admission for AMI.⁵¹ Even lower neighborhood-level income regardless of race, was associated with a lower likelihood of receiving angiography.⁵²

Lower-income patients continue to be less likely to receive an angiogram within a day of admission for STEMI and less likely to be using a DES alongside with slightly worsened mortality rates in STEMI patients.⁵³ Notably, the proportions of revascularization procedures increased from 2003 to 2016 across all races and ethnicities with no disparities noted in incidence of STEMI-related cardiogenic shock.^{54,55} However, differences in management and in-hospital mortality rate in those with AMI complicated by cardiac arrest persists with Black patients and patients of other races and ethnicities having lower use of coronary angiography and PCI, longer time to angiography, and greater use of palliative care consultation compared to white patients.⁵⁶ Patient of other races and ethnicities were also noted to have higher in-hospital mortality rate compared to White patients.⁵⁶ During the COVID-19 pandemic, Black, Asian, and Hispanic populations also had disproportionate rise in deaths caused by heart disease.⁵⁷

ADDRESSING DISPARITIES AND CONCLUSIONS

CCD is increasingly more prevalent, with growing burden on the healthcare system. Individuals from historically marginalized racial and ethnic backgrounds experience a disproportionate burden of CCD risk factors and adverse outcomes. Identifying disparities in the management of CCD can help inform strategies to mitigate them, and these include solutions involving patients, clinicians, health systems, and communities (Fig. 1).

From a clinician's perspective, being cognizant of the additional risk factors and racial and ethnic disparities present in CCD management is a key to guiding patient care. Understanding one's own intrinsic and external biases is also imperative to minimize

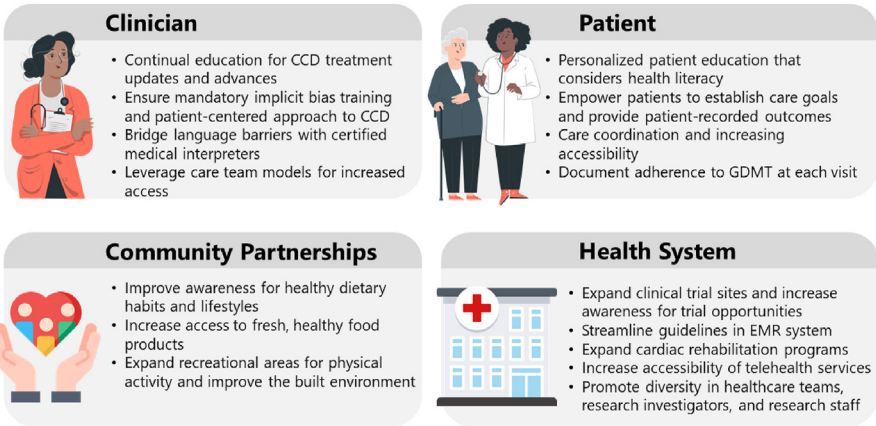


Fig. 1. Strategies to reduce disparities in the management of chronic coronary disease.

disparities in care. Addressing disparities in utilization and adherence to GDMT is essential to improving health in diverse populations. Utilizing auxiliary staff to follow up and improving accessibility to telehealth services can allow for better adherence to GDMT. Creating personalized patient education considering varying health literacy and languages can be utilized to empower patient awareness of CCD. Increasing utilization of certified medical interpreters is the key to bridging language barriers.

At a community level, there are potential opportunities that can be taken to improve lifestyle management of CCD. Increasing access to fresh, healthy food products, especially in food deserts, as well as increasing awareness of healthy dietary habits and physical lifestyles can be avenues of approach for further intervention. Promoting awareness of the Supplemental Nutrition Assistance Program (SNAP) to address food insecurity is the key to improving dietary health disparities.⁵⁸ Expanding recreational areas for physical activity with continued investments in ongoing infrastructure is important to foster a healthier community and reducing burden of CCD.

Furthermore, there are many aspects that can be improved to reduce disparities across the different aspects of CCD at a health system level. From a clinical trial perspective, expanding enrollment and trial sites to better include underrepresented races and ethnicities in underserved populations is key to reflecting the changing demographics of this nation.^{59,60} By doing so provides equity and fairness in opportunities for clinical trials. However, it is important to acknowledge the long-standing history of distrust in the medical system after historical maleficent activities, such as the Tuskegee syphilis study, as well as logistical and socioeconomic barriers to trial sites that may prove to be challenges in bridging the gap in trial enrollment. Additionally, expanding research toward healthier diets that cater toward cultural and dietary habits of Americans could be options toward having accessible and feasible food options for our diverse nation. There have been studies, such as the ¡Viva Bien! that have looked at Mediterranean diet in Hispanic patients but found nonadherence at 12 months due to cultural differences in diet.⁶¹ Promoting diversity in the medical field can help open new perspectives and allow a cultural melting pot of ideas to emerge as a result.

Opportunities are plentiful in streamlining guidelines in the electronic medical records system to encourage prescription and utilization of drugs for secondary prevention of CCD as well as promote automated referrals for cardiac rehab. Further expansion in

cardiac rehabilitation programs as well as allocating additional resources to alleviate the socioeconomic burdens that may arise with ongoing participation.

It is noted that there are components not touched upon in this review including focuses on the impact of social support, mental health, sex, and gender biases that play a compounding role in the racial and ethnic disparities seen.

There is more research in CCD management that needs to be done to better understand the complexity and various factors contributing to racial and ethnic healthcare disparities. Equally important is applying this knowledge and to create solutions for addressing these differences in care and moving toward implementation of these solutions throughout health systems.

CLINICS CARE POINT

- CCD is increasingly prevalent and disproportionately affects historically marginalized populations.
- Racial and ethnic disparities are pervasive in the management and outcomes of CCD.
- Solutions to reduce disparities in CCD should include multiprong interventions that address patient, clinician, and health system factors.

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