

# The Complex Relationship of Race to Outcomes in Heart Failure with Preserved Ejection Fraction



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## ABSTRACT

**BACKGROUND:** An improved understanding of racial differences in the natural history, clinical characteristics, and outcomes of heart failure will have important clinical and public health implications. We assessed how clinical characteristics and outcomes vary across racial groups (whites, blacks, and Asians) in adults with heart failure with preserved ejection fraction.

**METHODS:** We identified all adults with heart failure with preserved ejection fraction between 2005 and 2008 from 4 health systems in the Cardiovascular Research Network using hospital principal discharge and ambulatory visit diagnoses.

**RESULTS:** Among 13,437 adults with confirmed heart failure with preserved ejection fraction, 85.9% were white, 7.6% were black, and 6.5% were Asian. After adjustment for potential confounders and use of cardiovascular therapies, compared with whites, blacks (adjusted hazard ratio [HR], 0.72; 95% confidence interval [CI], 0.62-0.85) and Asians (HR, 0.75; 95% CI, 0.64-0.87) had a lower risk of death from any cause. Compared with whites, blacks had a higher risk of hospitalization for heart failure (HR, 1.48; 95% CI, 1.29-1.68); no difference was observed for Asians compared with whites (HR, 1.01; 95% CI, 0.86-1.18). Compared with whites, no significant differences were detected in risk of hospitalization for any cause for blacks (HR, 1.03; 95% CI, 0.95-1.12) and Asians (HR, 0.93; 95% CI, 0.85-1.02).

**CONCLUSIONS:** In a diverse population with heart failure with preserved ejection fraction, we observed complex relationships between race and important clinical outcomes. More detailed studies of large populations are needed to fully characterize the epidemiologic picture and to elucidate potential pathophysiologic and treatment-response differences that may relate to race.

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**KEYWORDS:** Heart failure; Hospitalization; Mortality; Preserved ejection fraction; Race

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**Authorship:** All authors had access to the data and played a role in writing this manuscript.

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The burden of heart failure varies across different racial groups in the United States,<sup>1</sup> and there are growing concerns about racial and ethnic disparities in the care of patients with heart failure.<sup>2</sup> There is also an increased appreciation of the need to better understand racial differences in the natural history, clinical characteristics, and outcomes of heart failure.<sup>3</sup>

Heart failure represents a heterogeneous syndrome, with different classification schemes based on presumed cause and contributing factors,<sup>4</sup> but current treatment-based approaches to the care of patients with heart failure have relied on stratifying by reduced versus preserved left ventricular ejection fraction. Compared with heart failure with reduced ejection fraction, treatment of heart failure with preserved ejection fraction has been particularly challenging and has focused largely on symptom management, as randomized trials of various therapeutic strategies have not demonstrated consistent benefits for survival or preventing hospitalization.<sup>4</sup> Furthermore, few population-based studies have been undertaken that have focused specifically on patients with heart failure with preserved ejection fraction, and even less is known about the relation of race to outcomes in patients with this condition. White patients present with heart failure with reduced ejection fraction and heart failure with preserved ejection fraction in relatively equal proportions.<sup>5</sup> However, recently published data from the Jackson Heart Study suggest that heart failure with preserved ejection fraction may be the most common form of this clinical syndrome in blacks.<sup>6</sup>

In an effort to fill gaps in knowledge regarding clinical characteristics and outcomes for patients with heart failure with preserved ejection fraction across different racial groups, we conducted a large population-based study within the Cardiovascular Research Network (CVRN).<sup>7,8</sup>

## MATERIALS AND METHODS

### Source Population

The source population included members from 4 participating health plans within the CVRN, which was sponsored by the National Heart, Lung, and Blood Institute.<sup>7</sup> Sites included Kaiser Permanente Northern California, Kaiser Permanente Colorado, Kaiser Permanente Northwest, and Fallon Community Health Plan in central Massachusetts. Participating sites provide care to an ethnically and socioeconomically diverse population across varying clinical practice settings and geographically diverse areas. Each site also has a Virtual Data Warehouse that served as the primary data source for subject identification and characterization in the present

study.<sup>8</sup> The Virtual Data Warehouse is a distributed standardized data resource composed of electronic datasets at each CVRN site, populated with linked demographic, administrative, ambulatory pharmacy, outpatient laboratory test results, and health care use (ambulatory visits and network and non-network hospitalizations with diagnoses and procedures)

data for members receiving care at participating sites. Institutional review boards at participating sites approved the study, and waiver of consent was obtained because of the nature of the study.

### Study Sample and Characterization of Left Ventricular Systolic Function

We first identified all persons aged  $\geq 21$  years with diagnosed heart failure based on having been hospitalized with a principal discharge diagnosis of heart failure or having  $\geq 3$  ambulatory visits coded for heart failure with at least

1 visit being with a cardiologist between January 1, 2005, and December 31, 2008. We used the following *International Classification of Diseases, 9th Edition* (ICD-9) codes to identify patients with heart failure: 398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0, 428.1, 428.20, 428.21, 428.22, 428.23, 428.30, 428.31, 428.32, 428.33, 428.40, 428.41, 428.42, 428.43, and 428.9. Previous studies have shown a positive predictive value of  $>95\%$  for admissions with a primary discharge diagnosis of heart failure based on these codes when compared against chart review and Framingham clinical criteria.<sup>9-11</sup> For the outpatient definition, we required  $\geq 3$  ambulatory visits with associated heart failure diagnoses, with  $\geq 1$  of the visits to a cardiologist to enhance the specificity of this diagnosis.

We ascertained information on quantitative or qualitative assessments of left ventricular systolic function from the results of echocardiograms, radionuclide scintigraphy, other nuclear imaging modalities, and left ventriculography test results available from site-specific databases complemented by manual chart review. We excluded all patients who had mild to severely reduced systolic function and focused only on the group with preserved systolic function. We defined preserved ejection fraction (heart failure with preserved ejection fraction) as a reported left ventricular ejection fraction  $\geq 50\%$  or on the basis of a physician's qualitative assessment of preserved or normal systolic function.

### Race Categorization

We classified patients on the basis of their self-reported race information found in health system databases. We focused

### CLINICAL SIGNIFICANCE

- After adjustment for demographic and clinical characteristics, compared with whites, blacks and Asians with heart failure with preserved ejection fraction have a lower risk of death.
- However, blacks have a higher risk of hospitalization for heart failure compared with both whites and Asians.
- Race and its relationship to clinical outcomes in the care of patients with heart failure with preserved ejection fraction are neither simple nor straightforward.

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