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Eliminating Health Disparities: What Can We Learn from the Veterans Health Administration?

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Keywords

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Cardiovascular disease (CVD) mortality has declined by more than 70% in the United States (U.S.) with over a 78% reduction in coronary heart disease (CHD) deaths since 1968.¹ Despite these remarkable improvements, it is well-established that not all populations benefit equally.^{2,3} African Americans have higher all-cause and CVD mortality as well as increased CHD and stroke incidence compared to their white counterparts (Table 1).^{2,4,5}

These differences in mortality and incident cardiovascular events culminate from a complex interplay of multiple elements including biology; socio-demographic factors including socioeconomic status, geography, and site of health care; effects of racial/ethnic discrimination; and health care delivery (system effects, provider level influences, and quality of care).^{6,7} Access to care, site of care, and health care delivery are strongly correlated with outcomes achieved, and variations in these factors can significantly influence health care disparities.⁸ Combining insurance with delivery of comprehensive, clinically appropriate care has been shown to eliminate disparities in cardiovascular procedure utilization.⁹ Systematically improving quality of care is associated with an apparent elimination of health care disparities.¹⁰

In this issue of *Circulation*, Kovesdy et al. report on the relationship between race and mortality and incident cardiovascular events in a cohort of veterans with normal renal function.¹¹ Contrary to findings in the greater population, this report found that among patients enrolled in the U.S. Veterans Health Administration (VHA) system, African Americans experienced a lower incidence of CHD and lower all-cause mortality as compared to white veterans. Consistent with prior literature, the authors found a higher incidence of stroke among African Americans as compared to whites in the VHA cohort.

These findings raise several key questions when viewed in the context of current literature:

1) Does this cohort systematically differ from the general population in ways that would

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explain a divergence in findings related to all-cause mortality and incident CHD? 2) Are there characteristics of the VHA system or care delivery within the system that explain this VHA disparities paradox? 3) Are the findings generalizable and if so, how can they be extrapolated and applied within the VHA and beyond?

What is it about this cohort of U.S. veterans that differs from the greater population?

The cohort examined in this report is derived from a contemporary cohort originally assembled to examine risk factors in patients with incident chronic kidney disease (CKD). It includes over three million veterans of African-American or white race with serum eGFR $60 \text{ ml/min/1.73m}^2$. The authors previously found a lower incidence of CHD events and mortality among African-American as compared to white veterans with CKD in the original cohort.¹² Thus, the authors sought to examine a similar hypothesis among a cohort with normal renal function.

The discrepancy between the findings of this report and current epidemiological data, the VHA disparity paradox, brings into focus two major issues related to the VHA cohort: 1) the potential for selection bias related to socio-demographic and clinical characteristics as well as event ascertainment and 2) race-specific differences in the pathobiology of disease.

Socio-demographic and Clinical Characteristics of the Cohort

Two potential perspectives emerge when considering the influence of selection bias on the paradoxical findings – African Americans in the VHA cohort are healthier than their counterparts in the general population or alternatively whites in the VHA cohort are more ill than the whites in the general population. While the report tends to focus on the former in the proposed explanatory models, if indeed whites in the VHA cohort are more ill, this alternative possibility could confound the VHA disparity paradox. In order to address potential bias due to cohort characteristics, the authors performed a propensity matched analysis to examine differences in the VHA cohort by race as well as an analysis of mortality and incident events in an NHANES comparison cohort.

African Americans in the VHA cohort were younger; more likely to be female, live in areas with high housing stress, low education, persistent poverty, and low employment; and had higher baseline eGFR than whites in the cohort. The propensity analysis including the socio-demographic, clinical, and health care delivery variables available in the dataset did not change findings. However, unmeasured confounding variables such as physical activity and diet still pose potential contributions to selection bias.

Consistent with other population data, the comparison analysis performed with NHANES data found higher adjusted all-cause mortality among African Americans compared to whites in a cohort with similar renal function (HR 1.42; 95% CI 1.09–1.87 vs. HR 0.76; 95% CI 0.75–.077 in the VHA cohort). Both African Americans and whites in the VHA cohort were older and more likely to be male, have hypertension, diabetes, CHD, and CHF as compared to the NHANES cohort. Thus, there is a suggestion that whites in the VHA cohort are indeed more ill than their counterparts in the general population. Mortality

remained higher for African Americans compared to whites in the NHANES sample after stratification by age, gender and poverty. Limitations of the data sets did not allow for age-matching and additional detailed subgroup analyses.

Clinical characteristics of the cohort represent other potential sources of selection bias. A key inclusion criterion for the cohort was normal renal function. Given the high rate of cardiovascular complications among individuals with CKD, exclusion of individuals with CKD may bias the result toward the null. The authors performed a sensitivity analysis of individuals in the parent cohort who developed incident CKD in follow-up and found no racial differences in mortality or incident cardiovascular events. While this comparison is performed on an incident cohort and not a matched cohort with prevalent CKD, the authors have previously performed an analysis of mortality amongst veterans with prevalent CKD during the same time period. The findings were similar – African Americans had lower all-cause mortality and incident CHD events compared to white veterans.¹² It appears that inclusion of patients with normal renal function did not serve as a major source of bias in the results.

Lastly, determination of incident events during the follow up of the VHA cohort is a key element related to potential selection bias. Comprehensive ascertainment of all cardiovascular events requires follow-up care of the cohort of origin within the VHA system. At the outset, the authors did not define the cohort as individuals who solely received their care in the VHA system. Thus, this remains as an important study limitation in the interpretation of findings related to incident CHD and stroke. It is also noteworthy that while differential follow up could affect cardiovascular event ascertainment, it should not affect findings related to all-cause mortality.

Race-specific Differences in the Pathobiology of Disease

Unanswered in the analysis by Kovsedy et al. is the role that biology plays in the perceived attenuation of disparities in the VHA system. The authors state that race-specific differences in hypertension and hypertension control, pathophysiology of CHD, and genetic polymorphisms could serve as possible explanations of the findings. However, the existing literature presents three potential challenges to this proposed explanatory model.

African Americans are known to have a disproportionately high burden of hypertension and related complications. From 2009 to 2012, the age-adjusted prevalence of hypertension was 44.9% and 46.1% among black men and women, respectively; 32.9% and 30.1% among white men and women, respectively.⁴ However, blood pressure control rates of 80–90% are achievable across race/ethnicity in health care systems when rigorous attention to health care access and evidence-based implementation strategies are used.¹³ This report did not include measures of quality of care related to hypertension management or other performance metrics to address the potential contribution of hypertension control to the outcomes of interest. The higher risk of incident stroke may relate to a known higher incidence of hypertension complications in a population with greater burden of disease; however, in this cohort of veterans this principle did not hold true for CHD, a well-known complication of hypertension.

Another inconsistency in this cohort of veterans relates to pathobiology of disease. In the Multi-Ethnic Study of Atherosclerosis, less coronary artery calcification, as assessed by coronary computed tomography angiography, was found among African-American participants as compared to whites.¹⁴ Despite these potential differences, population-based cohort studies such as ARIC report higher rates of incident CHD among African Americans as compared to whites.⁴

Lastly, the relationship between differences in genetic polymorphisms among individuals of European or African descent and disease outcomes has gained increasing attention. Specifically, a more frequent polymorphism in the APOL1 gene has been associated with the increased rate of development of CKD and end-stage renal disease among individuals of African descent.¹⁵ However, the authors acknowledge that their findings of lower mortality in the analysis of VHA cohorts both with and without normal renal function are paradoxical to the hypothesis of race-specific biological mechanisms as an explanation of current results.¹²

Thus, the question remains whether sex-specific biological mechanisms could account for the magnitude of the difference between the results in this study (24% reduction in mortality in African Americans in the VHA system) and the greater population (42% increased mortality among African Americans in NHANES). Another plausible potential explanation relates to the greater influences of the health care system and provider-level factors such as comprehensive access and quality of care.

Are the findings generalizable and if so, how can they be extrapolated and applied within the VHA system and beyond?

Access to care is complex and multi-faceted with contributions at the levels of both the individual (including socio-demographics, geography, and health literacy) and health care system (including referral patterns and quality of care).⁷ Site of care and differences in health care system factors have been associated with measures of care and outcomes for CVD.^{8,10} Furthermore, hospitals focused on overall quality improvement have demonstrated attenuation of previously seen health care disparities.^{10,13} The VHA system has had an intensive focus on quality improvement, and major strides have been made, though recent data reports that there is still more to be done.¹⁶

The authors describe the VHA healthcare system as an open access system for veterans. However, many factors internal to patients, systems, and providers more completely determine access. The authors offer that this open access system is one potential reason for the lower mortality and incidence of CHD for African Americans in the VHA as compared to whites. Several studies have noted a similar VHA disparities paradox where disparities seen in the greater population are not observed within the VHA.^{17,18} This particular analysis did not report measures of the quality of care delivered to further ascertain if open access combined with the quality of the care delivered were relevant determinants for the outcomes achieved. Future research focused on enhancing the understanding of the characteristics of the care delivered for this cohort as compared to the general population would provide

greater insight as to which specific VHA system characteristics translate into improved CHD and mortality outcomes as well as the generalizability and broad applicability.

The report by Kovesdy et al. on racial disparities in mortality and cardiovascular events in the VHA system represents a significant contribution to the literature as one of the few studies that demonstrate an attenuation of cardiovascular health disparities among African Americans. The implications of these findings depend upon the generalizability and ability to extrapolate them more broadly both within the VHA system and beyond. The report lays the foundation for future research that will more deeply probe patient characteristics and patterns of care associated with these outcomes in the VHA. Future research that examines a holistic, multi-faceted understanding of socio-demographic, clinical, and health care system factors, may provide a glimpse into the explanatory model related to the mitigation of health disparities seen in this VHA analysis.

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Table 1

Age-Standardized Rates of All-Cause Mortality, CVD Mortality, Incident CHD, and Incident Stroke by Race

	Non-Hispanic White Males	Non-Hispanic White Females	Non-Hispanic Black Males	Non-Hispanic Black Females
All-Cause Mortality (per 100,000) *	876.8	638.4	1083.3	740.6
CVD Mortality (per 100,000) *	269.3	182.7	354.0	244.6
Incident CHD (per 1,000) †	3.7	2.1	5.9	4.0

* National Vital Statistics Report, Volume 64, Number 2; Final Data for 2013¹. CVD; Cardiovascular Disease.

† Heart disease and stroke statistics – 2015 update: A report from the American Heart Association⁴. CHD; Coronary Heart Disease.

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