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## The Social Context of Cardiovascular Disease: Challenges and Opportunities for the Jackson Heart Study

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### Abstract

African Americans have higher rates of cardiovascular disease (CVD) than Whites and the racial gap in heart disease is widening over time. There are especially striking patterns of the earlier onset of disease, greater severity of illness and large racial differences in CVD even when Blacks and Whites are compared at the same level of economic status. This paper outlines critical research opportunities for the Jackson Heart Study to advance the science base for understanding and effectively addressing racial disparities in CVD. These include: 1) the study of CVD by using a life course perspective; 2) comprehensively characterizing social stressors; 3) expanding our analysis of how racism affects health; 4) explicating variation in the levels and impact of risk factors; 5) advancing our understanding of the contribution of genetics to CVD; 6) understanding resilience and its effects on CVD; and 7) identifying how economic crises can shape CVD risk.

### Keywords

Cardiovascular Disease; Risk Profile; Disparities; CVD Mortality; Research; Jackson Heart Study

### Introduction

National data indicate that African Americans (or Blacks) have an age-adjusted risk of heart disease mortality that was 30% higher than that of Whites in 2007.<sup>1</sup> Age-adjusted data are useful indices for comparison but are not measures of actual risk,<sup>1</sup> such that they often understate the magnitude of disparities in health for the Black population.<sup>2</sup> Age-specific mortality rates in Table 1 reveal that both African American men and women have death rates from heart disease in early adulthood that are about at least twice as large as those of Whites.<sup>3,4</sup> For example, African American women aged 25–34 have a death rate from heart disease that is three times higher than that of their White peers and it remains more than twice as high as that of Whites through age 64.

Disparities in heart disease mortality are particularly pronounced in Mississippi, home to the Jackson Heart Study. In 2007, the mortality rate for coronary heart disease was 270.9 per

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100,000 – the highest in the United States.<sup>5</sup> A CDC report on the distribution of heart disease mortality by county in Mississippi during 1996–2000 revealed that there was no overlap in the distribution of heart disease mortality between Black and White women. The highest rate of heart disease among White women (553–591 per 100,000 population) was lower than the lowest rate of heart disease among African American women (594–646 per 100,000 population).<sup>6</sup>

A racial disparity in heart disease is not new but the available evidence indicates that it is widening. Between 1990 and 2005, in national data, the Black-White difference in age-adjusted heart disease mortality widened.<sup>7</sup> Placing this pattern of heart disease disparity in the context of racial disparities across 14 other indicators, Orsi and colleagues concluded that, “overall, progress toward...eliminating health disparities ...remains bleak” despite many years of effort to reduce them. Other national data that provide a longer term view reach similar conclusions. Data from 1950 to 2007 show that, in 1950, Blacks and Whites were nearly equal for rates of heart disease mortality.<sup>1</sup> Yet, by 2007, although death rates had declined for both groups, a gap between the groups was evident because heart disease death rates had declined more rapidly for Whites than for Blacks. In contrast, while Blacks had higher stroke mortality than whites in 2007, the rates for both groups had declined over time with the racial gap narrower in 2007 than it was in 1950.<sup>1</sup>

## Challenging Characteristics of Heart Disease

There are two aspects of the racial disparity in heart disease that highlight the magnitude of the challenge for African Americans in the United States. First, consistent with multiple other health outcomes, African Americans not only have higher rates of heart disease morbidity but they also have a markedly earlier onset of illness, greater severity of disease and poorer survival.<sup>8</sup> For example, analyses of 20-year follow-up data of young adults in the CARDIA study show that incident heart failure before 50 years of age was 20 times more common in Blacks than Whites; with the average age of onset for African Americans being 39 years.<sup>9</sup> NHANES data also show that hypertension occurs at younger ages in Blacks than Whites.<sup>10</sup> This highlights the importance of attending to and addressing disparities across the entire continuum of cardiovascular disease with the recognition that some of the determinants of the onset of illness may differ from the determinants of its course.

Large and pervasive racial differences in the onset and course of CVD reflect, in part, the persistence of inequalities in socioeconomic status (SES). Table 2 indicates the complexity of racial differences in SES in 2007.<sup>11,12</sup> Educational attainment varies markedly by race and ethnicity with 29% of Whites having a college degree or more education compared to 19% of Blacks and 13% of Hispanics. For every dollar of income that Whites earned in the United States, Blacks earned 65 cents and Hispanics earned 74 cents. Wealth is another indicator of SES. It is a measure of the value of everything a household owns minus any debts. Racial gaps in wealth are larger than those for income, with both Blacks and Latinos having only six cents for every dollar of wealth that Whites had. Home equity is a major component of wealth for the average American household. There are large racial differences in home ownership with only about a half of Black and Hispanic households owning their homes compared to three quarters of White households. If home equity is excluded from the

calculation of wealth and only non-home wealth is considered, African Americans and Latinos have only one penny for every dollar of financial wealth that Whites have. Strikingly, one third of Black and Latino households have zero or negative wealth compared to 15% of White households.<sup>12</sup>

Second, although these large racial differences in SES contribute to disparities in CVD and other health outcomes, race continues to matter for health, even when we compare African Americans and Whites at the same level of SES. Table 3 considers the complex relationship among race, SES and heart disease mortality.<sup>13</sup> It shows that for Blacks and Whites, males and females, there is a graded association between education and heart disease mortality with each higher level of education generally associated with a lower overall death rate. However, for both males and females, at every level of education Blacks have higher heart disease death rates than Whites. Moreover, the residual effect of race is consistently larger among college graduates than among Blacks and Whites who have not finished high school. And although the overall death rates for heart disease declined between 1993 and 2001 for both racial groups, the declines are most marked for men and for persons with higher levels of education. In spite of declining mortality, the persistence of an elevated heart disease mortality risk for Black males and females at all education levels is striking.

Another example of the persistence of racial disparities in health at equivalent SES levels is found in a study comparing a cohort of all-Black graduates from Meharry Medical School with a cohort of all-White medical graduates from Johns Hopkins University. Baseline data were collected during 1958–1965. Follow-up data after 23–25 years found that Black physicians, compared to their White counterparts, were more likely to have: 1) a higher risk of cardiovascular disease (RR = 1.65); 2) earlier onset of disease; 3) incidence rates of diabetes and hypertension that were twice as high; 4) a higher incidence of coronary artery disease (1.4 times); and 5) higher case fatality (52% vs 9%).<sup>14</sup> These striking patterns clearly demonstrate race and SES are not interchangeable. Race and SES are related but distinctive systems of stratification that may each reflect particular exposures that have consequences for health.

One reason for the persistence of racial differences in health, after SES is adjusted for is the non-equivalence of SES indicators across race. Research reveals that among US populations, the minority poor are poorer than the White poor. National data reveal, for example, that compared to Whites, Blacks and Hispanics receive less income at the same levels of education, have less wealth at equivalent levels of income, and have less purchasing power because the cost of goods and services are higher in the places where they live.<sup>15</sup> A large national survey found that Blacks, compared to Whites, were more likely to experience multiple indicators of economic hardship including: inability to meet essential expenses; inability to pay full rent or mortgage; inability to pay full utility bill; had utilities shut off; had telephone shut off; evicted from apartment. These racial differences persisted even after statistical adjustment for variables such as income, education, employment status, transfer payments, home ownership, sex, marital status, children, disability, health insurance and residential mobility.<sup>16</sup>

## The Jackson Heart Study: Research Opportunities

There are six major areas of research opportunity that the Jackson Heart Study is well positioned to shed light on regarding the patterns of cardiovascular risks among African Americans. This will require attending to a life course perspective, comprehensively characterizing stressors in the social environment, expanding our understanding of how racism affects cardiovascular disease, understanding variation in the levels and effects of some risk factors, enhancing our knowledge of gene-environment contributions and understanding resilience and protective factors.

### Research Opportunity 1: Undertaking a Life Course Perspective

Research has shown that health is affected not only by an individual's current situation but by SES and other exposures over their life course. We consider two examples that illustrate the importance of this longer-term perspective. In the Pitt County Study, James and colleagues examined the joint contribution of childhood and adult SES to hypertension risk in adulthood.<sup>17</sup> They found that irrespective of adult SES, there are lingering negative health effects of having been low SES in childhood. For example, despite high SES in adulthood, African American men who were low SES in childhood were four times more likely to have hypertension than those who were high SES in childhood. Researchers in the MIDUS study examined the associations between early life adversity and five markers of inflammation in adulthood: C-reactive protein, interleukin-6, fibrinogen, endothelial leukocyte adhesion molecule-1, and soluble intercellular adhesion molecule-1.<sup>18</sup> The measure of early life adversity included stressful events during childhood (such as school failure, parental unemployment, parental substance abuse, expelled/suspended from school and receipt of welfare), relationship with parents and verbal/physical abuse by parents. The study found that early childhood adversity was significantly associated with four of the five markers of adult inflammation for African Americans but not for Whites. Using a life course perspective, the Jackson Heart Study (JHS) can make a significant contribution to assessing the potential impact of early life exposures on adult risk of cardiovascular disease. This will require efforts to develop measures that comprehensively capture the accumulation of risk and resources over the life course.

### Research Opportunity 2: Comprehensive Characterization of Social Stressors

Research over the last several decades has highlighted the importance of measuring stress comprehensively in order to obtain an accurate estimate of its contribution to health.<sup>19</sup> A recent study using a comprehensive but brief measure of stress (acute life events, lifetime traumatic experiences, work, financial, relationship, neighborhood, discrimination and early life stressors) found that African Americans had higher levels than Whites for six of the eight domains of stress.<sup>20</sup> Moreover, there was a dose-response relationship between the number of stress domains and multiple indicators of health status, and the consideration of stress made an incremental contribution, over and above income and education, in explaining racial disparities in health.

The comprehensive characterization of acute and chronic race-related and other stressors and assessing their association with risk across the continuum of coronary heart disease is

another important priority of research. We also need to expand the assessment of stressors to include those that reflect the lived reality of African American life. For example, we need to continue work such as that from the CARDIA study that explored the long-term negative effects of incarceration on incident hypertension and end organ damage.<sup>21</sup> We also need to understand the impact of exposure to community violence and environmental toxins while also developing models that consider the accumulation of these exposures and their potential additive and interactive effects.<sup>8</sup> Research efforts of this kind also have data implications. For the Jackson Heart Study, they confirm the importance of capturing repeated measures of exposure to social and psychosocial stressors over time to adequately monitor the dynamic nature of such exposures over the life course.

### **Research Opportunity 3: Expanding Our Understanding of How Racism Affects Health**

There is growing research attention to the multiple ways in which racism affects health and the Jackson Heart Study has demonstrated a commitment to empirically examining the consequences of racism for coronary heart disease risk.<sup>22–24</sup> While the subjective experience of interpersonal discrimination is one way in which racism can contribute to disease risk, the Jackson Heart Study has an opportunity to explore other pathways by which racism can affect health.<sup>25,26</sup> First, institutional discrimination can influence health by restricting access to high quality education and employment opportunities. Segregation is a prominent example of institutional racism that can shape SES, pathogenic residential exposures and access to quality medical care in multiple ways.<sup>27–29</sup> Second, discrimination can also lead to reduced access to desirable goods and services, including medical care. Third, internalized racism (acceptance of society's negative characterization) can adversely affect health and health-relevant behaviors.<sup>30</sup> Fourth, racism can also create conditions that increase exposure to traditional stressors, such as unemployment.

An important challenge for the Jackson Heart Study is to move beyond analytic approaches that focus on one risk factor at a time and develop more complex models that capture the clustering of racism with multiple other exposures. These models need to capture exposures across multiple domains (social, psychological, physical, chemical, etc.) and assess the possibility of additive and synergistic effects among the many risk factors that drive health outcomes. Some research suggests that psychosocial stressors can interact with physical-chemical stressors to produce synergistic effects.<sup>8</sup>

### **Research Opportunity 4: Understanding Variation in the Levels and Effects of Some Risk Factors Across Sex and Race**

Another major area of research opportunity is to explore how the social environment shapes the levels and impact of various risk factors. At the present time, we do not clearly understand the determinants of some observed patterns. For example, a distinctively high risk profile for African American men, especially middle class males has sometimes been observed. Some research has noted a positive association between SES and some cardiovascular risk factors for Black men.<sup>31</sup> Other research notes a markedly elevated risk for black males compared to other groups. For example, the CARDIA study found that Black men slept 5.1 hours per night, compared to 5.9 hours for Black women, 6.1 for White men, and 6.7 for White women. Even after adjustment for SES and other risk factors, Black

men slept 82 minutes less per night than White women.<sup>32</sup> Understanding the relative contribution of psychosocial factors, health status, and the social and physical environment to racial differences in sleep duration and quality and other disparities for multiple other CVD risk factors is an important research priority.

We also need an enhanced understanding of why some risk behaviors more adversely affect the health of Blacks compared to Whites as is the case for both tobacco and alcohol. For example, alcohol-related mortality is twice as high for Black males and females compared to Whites, even though the use of alcohol, particularly among African American women, is lower than Whites.<sup>33</sup> Other research indicates that Blacks have higher levels of liver damage than Whites at every level of alcohol consumption.<sup>34</sup> In addition, moderate alcohol consumption is not associated with lower cardiovascular disease risks for African Americans, in contrast to a frequently reported pattern in the literature. In the NHANES follow up study (NHEFS), there was no beneficial effect of moderate alcohol consumption on all-cause mortality for Blacks.<sup>35</sup> For Black men and women in the ARIC study, in contrast to the protective effect found for Whites, moderate alcohol consumption was positively related to incident coronary heart disease for African Americans<sup>36</sup> and incident hypertension for Black men.<sup>37</sup> In the CARDIA study, moderate alcohol consumption is positively related to coronary artery calcification for Black men only.<sup>38</sup> Research is needed to shed light on the determinants of these patterns.<sup>8</sup> We are currently unaware of the extent to which these patterns are driven by interactions between alcohol use and unmeasured physical, chemical or psychosocial exposures. It is also possible that at least some of the cardioprotective effects of moderate alcohol use may reflect confounding by the high SES profile and good health practices of moderate drinkers.<sup>39-42</sup>

### **Research Opportunity 5: An Enhanced Understanding of the Role of Genetics in CVD Disparities**

There is a long history of the misuse of genetics in studies of race and health and evidence that some of this persists in contemporary health research.<sup>8</sup> It is unlikely that genes alone will make a major contribution to understanding racial disparities in CVD risks given that variation in genetic susceptibility in human populations is unlikely to be strongly patterned by race.<sup>43</sup> However, in contemporary society, a broad range of social, behavioral, nutritional, psychological, residential, occupational and other variables vary by race. And given that biology is adaptive to environmental conditions, it is important for research to assess potential interactions between the social environment and both innate and acquired biological factors. Residential segregation, one aspect of racism mentioned earlier, highlights the importance of examining gene-environmental interactions. Residential segregation ensures that African Americans live in distinctively different environments from Whites. A study of the 171 largest cities in the United States concluded that there was not even one city where Whites lived under similar environmental conditions to Blacks and that the worst urban context in which Whites resided was considerably better than the average context of Black communities.<sup>44</sup> Highly segregated communities with a high concentration of poverty and other social ills are, in fact, unhealthy communities whose residents are exposed to multiple social, physical and chemical environmental risk factors.

The JHS can play a key role in identifying how the normal adaptive and regulatory systems of African Americans are affected by their harsh residential environments. It can shed light on how biological adaptation to their occupational and residential environments can lead some African Americans to have some biological profiles that are different from other groups and to have some distinctive patterns of interactions between biology and psychosocial factors. The distinctive environments of African Americans in the United States also require that more explicit attention should be given to identifying potential epigenetic effects. Epigenetics refers to changes in the patterns of gene expression in the absence of changes in the nucleotide sequences of the DNA. Differences in gene expression linked to occupancy of distinctive environmental contexts could play an important role in patterns of CVD. There is growing recognition of the potential contribution of epigenetics to CVD risk in Blacks but there are few rigorous empirical analyses.<sup>45</sup> The Jackson Heart Study can fill this void and lead the way to examine gene expression differences across race and the epigenetic drivers of the risk of CVD for the Black population.

### **Research Opportunity 6: Resilience and Its Effects on Cardiovascular Disease**

The Jackson Heart Study is also well-positioned to make contributions to an improved understanding of the contribution of social norms and belief systems that support resilience and provide protection against cardiovascular disease. There are patterns that suggest that important protective factors may be in operation. For example, a review of life expectancy data from 1950 to 2006 shows that African American women (13.6 years) had larger gains in life expectancy than Black men (10.6 years), White men (9.2 years) and White women (8.4 years).<sup>5</sup> Moreover, since 1970, African American women have had longer life expectancy than White men. Black women received larger economic gains from the Civil Rights Movement and related policies than their male counterparts and some evidence suggests that this improvement in economic well-being led to improvements in their health.<sup>46,47</sup>

High levels of religious involvement on the part of African American women may also be a contributor to their relatively good health profile. Research indicates that religious engagement can have positive effects on health via multiple pathways.<sup>48</sup> For example, one national study found that Whites who attended religious services had a life expectancy at age 20 that was 7.5 years longer than those who never attended.<sup>49</sup> For African Americans, the difference in life expectancy was 13.7 years. We also need to understand the role of a broader range of psychological resources that can affect cardiovascular health. A recent study of over 97,000 women in the Women's Health Initiative found that age-adjusted incident heart disease and total mortality increased in a stepwise fashion with decreasing levels of optimism and cynical hostility.<sup>50</sup> These patterns were stronger for Black than White women. These associations persisted after adjustment for baseline risk factors. The Jackson Heart Study can help to identify the ways in which psychosocial resources, including belief systems can reduce cardiovascular risk.

## Research Opportunity 7: Understanding How the Current Economic Recession Can Shape CVD Risk

The Census Bureau reported an increase in poverty in 2010 to 15.1% – the highest rate in 15 years.<sup>51</sup> Currently, one in seven Americans is in poverty, with more than one in four Blacks in poverty. Other data reveal that African Americans have had the largest drop in real income during the current economic recession.<sup>51</sup> In the last 60 years, Black-White differences in health have narrowed and widened with Black-White differences in income. As noted, Civil Rights policies of the 1960s and 1970s narrowed the Black-White economic gap. During this same time period, compared to Whites, Black males and females had larger gains in life expectancy and larger absolute and relative declines in mortality than Whites.<sup>47</sup> Thus the longitudinal data of the Jackson Heart Study provides an unprecedented opportunity to explore the effects of the current economic recession on CVD and its risk factors for African Americans.

### Attend to the Continuum of Disease

An important guiding principle for future research is to attend to the continuum of disease. As noted earlier, social disparities exist not only in the onset of disease but along the entire continuum of illness. And the disparities in the course of disease are sometimes greater than those in disease incidence. Moreover, risk factors for the onset of illness may be different than the determinants of severity and course. These patterns highlight the need for research to identify the determinants of disparities and the optimal intervention strategies at each specific point of the disease continuum. One recent study, using data from the National Medical Expenditure Panel, illustrates the utility of attending to quality of life differences among patients with coronary heart disease.<sup>52</sup> Xie and colleagues found that, even after adjusting for socioeconomic status, coronary disease risk factors and co-morbidities, African Americans with cardiovascular disease were more severely impaired than Whites with cardiovascular disease.<sup>52</sup> We need to better understand the determinants of optimal health-related quality of life and develop interventions to reduce racial differences in the risk and protective factors, the onset, management, progression, quality of life, impairment, and survival of disease.

### Conclusion

The Jackson Heart Study can lead the way in enriching our current understanding of the determinants of CVD risk and building the science base for the targeting of effective interventions. To do so, we must develop a more integrated science to better elucidate how multiple dimensions of the social and physical environment combine additively and/or interactively with each other and with innate and acquired biological factors that accumulate over the life course to affect the onset of illness and the progression of disease.<sup>8</sup> By capturing how these physical, chemical and environmental exposures relate to each other and combine with individual, family, community and societal resources, we may gain a better understanding of the multiple forces that shape health. The agenda is clear; working collaboratively with others, the Jackson Heart Study can accomplish it.



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**Table 1**  
Age-specific heart disease death rates for 2006 for Whites and minority/White ratios

Age	Males					Females				
	Non-Hispanic White (W) Rate <sup>a</sup>	Black/ W Ratio	AmInd/ W Ratio	API/ W Ratio	Hispanic/ W Ratio	Non-Hispanic White (W) Rate <sup>a</sup>	Black/ W Ratio	AmInd/ W Ratio	API/ W Ratio	Hispanic/ W Ratio
25-34	10.3	2.5	0.9	0.6	0.6	4.4	3.0	-	0.4	0.5
35-44	39.8	1.8	1.1	0.4	0.5	15.5	2.6	1.0	0.2	0.5
45-54	124.5	1.9	1.0	0.4	0.6	42.2	2.7	1.0	0.4	0.6
55-64	284.5	1.9	0.9	0.5	0.7	113.2	2.3	1.1	0.4	0.8
65-74	644.3	1.6	0.9	0.5	0.8	329.1	1.8	1.0	0.6	0.8
75-84	1,767.4	1.2	0.7	0.5	0.7	1,135.8	1.3	0.8	0.6	0.8
85+	5,032.8	0.8	0.4	0.6	0.6	4,460.8	0.9	0.4	0.6	0.7

<sup>a</sup>Note: Rates per 100,000 population.

AmInd, American Indian; API, Asian and Pacific Islander.

National Center for Health Statistics, 2009,<sup>3,4</sup>

Socioeconomic status by race and ethnicity, 2007

Table 2

Indicator	Whites (non-Hispanic)	Blacks (non-Hispanic)	Hispanics	Ratios	
				B/W	H/W
College graduate or more, %	29.1	18.5	12.7	.64	.44
Income	52,115	33,916	38,679	.65	.74
Median wealth	143,600	9,300	9,100	.06	.06
Non-home wealth	43,600	500	400	.01	.01
Zero or negative wealth, %	14.5	33.4	33.5	2.30	2.30
Home owner, %	74.8	48.6	49.2	.65	.66

Wolff, 2010<sup>12</sup>; US Census, 2010.<sup>11</sup>

**Table 3**  
Heart disease death rates, age-standardized, for Blacks and Whites, aged 25–64, 1993–2001

Education	1993			2001		
	Blacks	Whites	B/W Ratio	Blacks	Whites	B/W Ratio
<b>Men</b>						
All	245.8	129.3	1.90	194.9	100.7	1.94
<12 years	281.7	228.8	1.23	262.9	214.9	1.22
12 years	305.6	163.9	1.86	258.2	145.2	1.78
13–15 years	161.5	95	1.70	120	73.1	1.64
16+ years	139.3	72.3	1.93	99.2	51.1	1.94
<b>Women</b>						
All	122	44.8	2.72	106.1	37.9	2.80
<12 years	151.4	84.4	1.79	132.9	97.8	1.36
12 years	149	52.5	2.84	142.1	50.1	2.84
13–15 years	76.3	27.5	2.77	73	25.1	2.91
16+ years	73.1	20	3.66	62.8	16.9	3.72

Rates per 100,000; Jemal et al 2008.<sup>13</sup>