SUPPLEMENTAL MATERIAL

Social and Psychosocial Determinants of Racial and Ethnic Differences in Cardiovascular Health in the United States Population

Supplemental Table S1. Definitions of cardiovascular health factors and behaviors

	Poor (0 points)	**Intermediate (1 point)**	**Ideal (2 points)**
Smoking	Current smoker	Quit smoking within the past 12 months	Quit smoking >12 months ago, or never smoker
Dietary quality components: • ≥4.5 cups of fruits or vegetables per day • ≥2 servings of fish per week • <1500 mg/dL sodium daily • <450 kcal per week of sugar-sweetened beverages • ≥3 servings of whole grains daily	0-1 components met	2-3 components met	4-5 components met
Leisure-time physical activity	No activity	1-149 minutes of moderate-vigorous activity in a typical week	≥150 minutes of moderate-vigorous activity in a typical week
Body weight, by body mass index (BMI)	BMI ≥30 kg/m^2	BMI 25-29.9 kg/m^2	<25 kg/m^2 (ideal)
Blood pressure, by systolic blood pressure (SBP) and diastolic blood pressure (DBP)	SBP ≥140mmHg or DBP ≥90 mmHg	SBP 120-139 mmHg and DBP 80-89 mmHg, or treated to SBP<140 mmHg and DBP<90 mmHg	SBP<120 and DBP<80 mmHg
Blood cholesterol	Total cholesterol ≥240 mg/dL	Total cholesterol 200-239 mg/dL or treated to below 200 mg/dL	Total cholesterol <200 mg/dL not on treatment
Blood glucose, based on full sample (since fasting glucose only available on a subsample)	Self-report diagnosis of diabetes	Self-report diagnosis of borderline diabetes	No self-report of diabetes

Supplemental Table S2. Linear regression coefficients for the associations of individual-level factors with cardiovascular health among race and ethnicity and sex groups

	Male				Female			
	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Asian	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic Asian
Age	-0.03*	-0.06*	-0.05*	-0.03*	-0.05*	-0.06*	-0.07*	-0.05*
Education:								
Less than high school	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
High school graduate	0.44*	0.22	0.06	0.18	0.09	0.42*	0.21	0.06
Some college or AA	0.47*	0.41*	0.43*	0.25	0.61*	0.40*	0.59*	-0.23
College graduate or above	1.53*	0.65*	1.03*	1.01*	1.62*	1.24*	1.17*	0.42*
Household income:								
$0 - $44,999	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
$45,000 - $99,999	0.04	0.19	0.24*	-0.23*	0.11	0.15	0.05	-0.03
$100,000 and over	0.18	0.10	0.61*	0.08	0.59*	0.47*	0.45	0.17
Had no or marginal food insecurity	0.60*	-0.16	0.25	0.09	0.69*	0.40*	0.28*	0.83*
Marital status:								
Never married	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Divorced, separated, or widowed	-0.43*	-0.35*	-0.63*	-1.01*	-0.12	0.12	0.05	-0.02
Married or living with partner	-0.34*	-0.67*	-0.77*	-0.67*	-0.25	-0.14	0.04	0.00
Health insurance								
No insurance	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Covered by private insurance	0.12	0.37*	0.23	0.45	0.22*	0.26	0.22	0.04
Covered by other insurance	-0.04	0.22	0.21	0.48	0.11	0.14	0.14	0.00
Born in the US	-0.39*	-1.33*	-0.38*	-0.20	-0.71*	-1.04*	-0.68*	0.04
Depression level	-0.54*	-0.60*	-0.28	-0.18	-0.83*	-0.77*	-0.60*	-0.46*

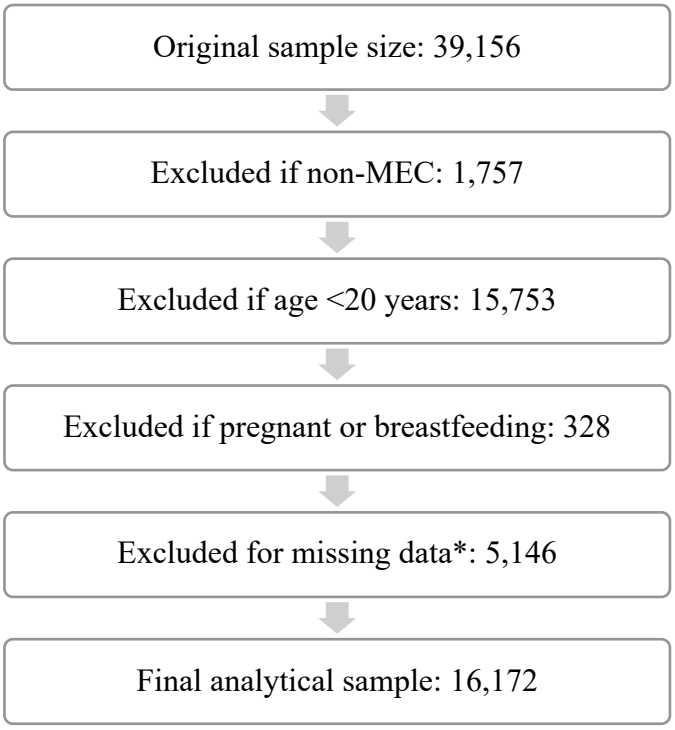
*p<0.05. Fixed effects for year (2011-2012, 2013-2014, 2015-2016, or 2017-2018) not shown.

Supplemental Table S3. Explained component of the Kitagawa-Blinder-Oaxaca decomposition of cardiovascular health differences between racial and ethnic groups, stratified by sex

	NH Black vs. NH White				Hispanic vs. NH White				NH Asian vs. NH White			
	Male		Female		Male		Female		Male		Female	
	Diff. in mean CVH	*SE*	*Diff. in mean CVH*	*SE*	*Diff. in mean CVH*	*SE*	*Diff. in mean CVH*	*SE*	*Diff. in mean CVH*	*SE*	*Diff. in mean CVH*	*SE*
Age	-0.17*	0.03	-0.26*	0.03	-0.28*	0.03	-0.40*	0.04	-0.21*	0.03	-0.27*	0.03
Education	0.23*	0.03	0.17*	0.03	0.36*	0.04	0.35*	0.04	-0.24*	0.04	-0.21*	0.04
Income	0.04	0.03	0.11*	0.02	0.06	0.03	0.10*	0.02	-0.01	0.01	-0.04*	0.02
Food security	0.06*	0.02	0.08*	0.02	0.09*	0.02	0.10*	0.02	-0.03*	0.01	-0.04*	0.01
Marital status	-0.05*	0.02	-0.06*	0.03	-0.01	0.01	-0.01	0.01	-0.03*	0.01	0.00	0.01
Health insurance	0.03	0.02	0.03*	0.02	0.04	0.04	0.05	0.03	0.00	0.00	0.01	0.00
Place of birth	-0.05*	0.02	-0.04*	0.02	-0.18*	0.07	-0.36*	0.07	-0.28	0.15	-0.49*	0.16
Depression	0.01	0.01	0.03*	0.01	0.00	0.01	0.01	0.01	-0.03*	0.01	-0.09*	0.01
Year	0.00	0.01	0.00	0.00	0.00	0.01	-0.00	0.01	0.01	0.01	0.00	0.01

CVH: Cardiovascular health, NH: Non-Hispanic, SE: Standard error. Difference in mean CVH refers to the absolute difference in mean CVH score related to the explained component of racial and ethnic differences in CVH associated with each individual-level factor. *p<0.05. Results correspond to data in Figure 1 and Figure 2.

Supplemental Figure. Participant exclusion and inclusion, NHANES 2011-2018



MEC: NHANES Mobile Examination Center. *Missing data included: race, education, income, food insecurity, marital status, nativity, insurance, diet, body mass index, blood pressure, or glucose. Included race and ethnicity categories were Hispanic, non-Hispanic Asian, non-Hispanic Black, and non-Hispanic White. A total of n=1,966 participants were excluded in the "missing data" exclusion step because their race category was listed as "Other, including Multi-Racial." This category was excluded because of the likely heterogeneity of participants in this group, which limits accurate evaluation of social and psychosocial determinants that contribute to racial and ethnic differences in cardiovascular health.

Supplemental Methods

The Kitagawa-Blinder-Oaxaca decomposition is a statistical technique developed in the economics literature to study the sources of group differences in continuous outcome variables.[35] It was first used to investigate what explained the differences in labor market outcomes, such as the wage gap between gender and race groups, based on regression models in a counterfactual manner.[18,19] The method has been increasingly used in epidemiologic research to evaluate health disparities. We adopted the "twofold" decomposition method widely used in the discrimination literature.[35]

Equations (1) – (3) describe the "decomposition" mathematically, as applied in our analysis. The KBO method decomposes the CVH gap between two groups, e.g., non-Hispanic White male versus non-Hispanic Black male groups, $(\overline{CVH}_W - \overline{CVH}_B)$, into two components: CVH gap due to differences in individual-level factors (denoted by *E* in Equation 2), and CVH gap due to responses to these factors captured by the regression coefficients (denoted by *C* in Equation 3). Let *V* be a vector containing all predictors in the model (age, year fixed effects, education, income, food security, marital status, health insurance, place of birth, and depression) and a constant, and *P* be the coefficients and the intercept. The twofold decomposition hypothesizes that a vector P^* can determine the contribution of the differences in the predictors.

(1) $\overline{CVH}_W - \overline{CVH}_B = \left(\overline{V}_W - \overline{V}_B\right)' P^* + \overline{V}'_W(P_W - P^*) + \overline{V}'_B(P^* - P_B)$, where

(2) $E = \left(\overline{V}_W - \overline{V}_B\right)' P^*$, and

(3) $C = \overline{V}'_W(P_W - P^*) + \overline{V}'_B(P^* - P_B)$

In this case, Equation (2) shows the part of the CVH gap attributed to the differences in the predictors (individual-level factors presented in main Table 1) between non-Hispanic White

and non-Hispanic Black male groups. *E* would reflect a counterfactual comparison of the potential CVH gap if non-Hispanic Black males in our sample had the same distribution of individual-level factors as the non-Hispanic White males. In Equation (3), *C* denotes the CVH gap attributable to differences in regression coefficients (Supplemental Table 2), in other words the effect that remained *unexplained* after accounting for differences in individual factor levels between groups. This unexplained component reflects the potential CVH gap if non-Hispanic Black males had the same regression coefficients as non-Hispanic White male adults, for the association between the individual-level factor and CVH in our model.

The decomposition analysis is performed using the Stata "oaxaca" command, which provides linear predictions.[35] KBO decomposition results may vary depending on the selection of the reference category when categorical variables are involved. We use the normalization option in the "oaxaca" Stata package to overcome this problem.[36] This procedure ensures that the results of the KBO decomposition are independent of the choice of the omitted category, and the results are equal to the simple averages of the results one would obtain from a series of decompositions in which the categories are used one after another as the reference category. Results from the KBO decomposition in the full participant sample are displayed in Figures 1 and 2 and Supplemental Table 3 (explained component), and Table 4 (unexplained component).

Interpretation of the KBO Decomposition

Results from KBO decomposition can be interpreted [1] for the explained component as: "If the distribution/level of factor #1 in group A were equivalent to the distribution/level of factor #1 in the reference group, the mean CVH score in group A would be higher/lower by X amount;" and [2] for the unexplained component as: "If the regression coefficient (i.e., slope of

the regression line) for the association of factor #1 with the mean CVH score in group A were equivalent to the regression coefficient (i.e., slope of the regression line) for the association of factor #1 with the mean CVH score in the reference group, the mean CVH score in group A would be higher/lower by X amount."