

Associations of Neighborhood-level Structural Racism with Neuroimaging and Plasma Biomarkers of Alzheimer’s Disease and Related Dementias

Sudarshan Krishnamurthy¹, Lingyi Lu², Iris Leng², Suzanne Craft, PhD¹, Samuel N. Lockhart, PhD¹, Timothy Hughes¹
¹Department of Internal Medicine – Section on Gerontology and Geriatric Medicine; ²Department of Biostatistics and Data Science, Winston-Salem, NC USA

Background

- Racialized disparities in ADRD have been attributed to the disparate distribution of the social and structural determinants of health (SSDoH) that affect risk
- Distribution of determinants is upheld by the “totality of ways in which societies foster racialized discrimination through mutually reinforcing inequitable systems, that in turn reinforce discriminatory beliefs, values, and distribution of resources” or structural racism
- Objective: To investigate the relationship between neighborhood-level structural racism, using the SREI, and neuroimaging and plasma biomarkers associated with ADRD among community-dwelling older adults**

Methods

- Cross-sectional associations between SREI and ADRD-associated biomarkers among participants in the Wake Forest (WF) Alzheimer’s Disease Research Center (ADRC) Healthy Brain Study
- SREI assigned by FIPS codes from addresses collected at baseline visits
- 3T brain MRI sequences T1, T2-FLAIR, and arterial spin labeling processed to generate gray matter mean cerebral blood flow (CBF) and CBF spatial coefficient of variation, brain volumes, and white matter hyperintensity (WMH) volumes

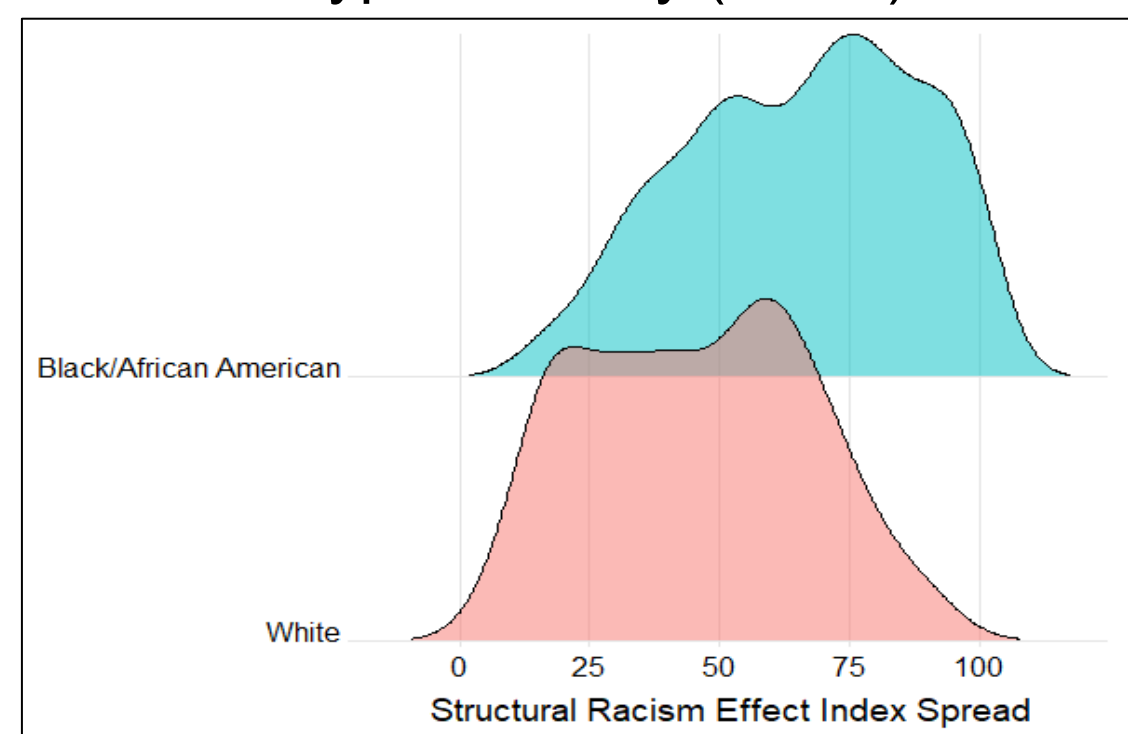


Figure 1. Distribution and spread of SREI percentile rank scores within the WF ADRC Healthy Brain Study (HBS) cohort, stratified by participant race of White and Black or African American.

Results

	White	Black/African American
Characteristic	(N=540)	(N=161)
Age		
Mean (SD)	70.7 (8.08)	68.1 (7.89)
Sex		
Male	206 (38.1%)	31 (19.3%)
Female	334 (61.9%)	130 (80.7%)
Education		
Mean (SD)	15.9 (2.50)	15.3 (2.55)
Estimated Glomerular Filtration Rate		
Mean (SD)	78.9 (14.7)	72.9 (16.1)
Missing	187 (34.6%)	54 (33.5%)
Structural Racism Effect Index		
Mean (SD)	45.5 (21.5)	65.9 (22.2)
Missing	10 (1.9%)	2 (1.2%)
Cortical Thickness		
Mean (SD)	2.74 (0.165)	2.75 (0.161)
Missing	33 (6.1%)	24 (14.9%)
WMH Volume		
Mean (SD)	-1.41 (1.14)	-1.65 (1.16)
Missing	33 (6.1%)	24 (14.9%)
GM – CBF		
Mean (SD)	35.6 (7.80)	38.2 (7.63)
Missing	84 (15.6%)	39 (24.2%)
sCoV of GM – CBF		
Mean (SD)	56.8 (14.4)	55.3 (14.4)
Missing	49 (9.1%)	27 (16.8%)
Plasma GFAP		
Mean (SD)	4.84 (0.503)	4.72 (0.575)
Missing	53 (9.8%)	49 (30.4%)
Plasma NfL		
Mean (SD)	2.78 (0.493)	2.48 (0.543)
Missing	53 (9.8%)	50 (31.1%)
Plasma Amyloid-β 42/40 Ratio		
Mean (SD)	0.0520 (0.0103)	0.0555 (0.0111)
Missing	53 (9.8%)	49 (30.4%)
Plasma p-Tau 181		
Mean (SD)	1.17 (0.485)	1.07 (0.516)
Missing	50 (9.3%)	49 (30.4%)

Table 1. Baseline characteristics for WF ADRC HBS participants, by participant race of Black or African American and White. Abbreviations: eGFR – estimated glomerular filtration rate; GFAP – Glial Fibrillary Acidic Protein; NfL – Neurofilament Light Chain; p-Tau – Phosphorylated Tau.

Outcome	Race	β-estimate	95% (lower)	95% CI (higher)	p-value
Cortical Thickness	Black or African American	-0.0008	-0.0020	0.0004	0.2100
	White	-0.0005	-0.0011	0.0002	0.1580
White Matter Hyperintensity Volume	Black or African American	0.0036	-0.0051	0.0122	0.4149
	White	0.0023	-0.0017	0.0063	0.2553
Grey Matter – Cerebral Blood Flow	Black or African American	-0.0557	-0.1150	0.0036	0.0655
	White	0.0028	-0.0277	0.0333	0.8581
Spatial Coefficient of Variation	Black or African American	0.1224	0.0176	0.2271	0.0224
	White	-0.0145	-0.0653	0.0364	0.5763

Outcome	Race	β-estimate	95% (lower)	95% CI (higher)	p-value
Plasma GFAP	Black or African American	0.0022	-0.0028	0.0071	0.3888
	White	-0.0016	-0.0040	0.0008	0.1777
Plasma NfL	Black or African American	0.0021	-0.0018	0.0059	0.2914
	White	0.0012	-0.0010	0.0034	0.2842
Plasma Amyloid-β 42/40 Ratio	Black or African American	<0.0001	-0.0001	0.0001	0.8749
	White	<0.0001	<0.0001	0.0001	0.7604
Plasma p-Tau 181	Black or African American	0.0022	-0.0027	0.0071	0.3756
	White	-0.0004	-0.0029	0.0021	0.7607

Tables 2 and 3. Associations of SREI percentile rank scores with ADRD-associated neuroimaging (above) and plasma biomarkers, stratified by participant race of Black or African American and White. Primary model adjusts for demographics (age, sex, and education) and estimated glomerular filtration rate (for plasma biomarkers only). A natural base logarithm transformation was applied to values of Plasma GFAP, NfL, and p-Tau 181 to address skewness. Abbreviations: GFAP – Glial Fibrillary Acidic Protein, NfL – Neurofilament Light Chain, pTau – phosphorylated Tau. **Bolded** values indicate statistical significance.

Conclusions

- Higher levels of structural racism may be associated with abnormalities in cerebrovascular perfusion among Black participants
- Further studies of life-course exposure to structural racism in relation to upstream risk factors and longitudinal ADRD outcomes are necessary

- Reparative measures directed at the mutually reinforcing systems of structural racism at the neighborhood-level may help improve cerebrovascular health and ADRD outcomes

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