Neighborhood disadvantage and prostate tumor aggressiveness among African American and European American men

Joseph Boyle[1,2], Jessica Yau[3], Jimmie L. Slade[4], Derrick A. Butts[5], Jessica Wimbush[6], Jong Y. Park[7], Arif Hussain[8-10], Eberechukwu Onukwugha[10,11], Cheryl L. Knott[10,12], David C. Wheeler[1,2*], Kathryn Hughes Barry[10,13*]

[1]Department of Biostatistics, Virginia Commonwealth University, Richmond, VA, [2]Massey Comprehensive Cancer Center, Richmond, VA, [3]Department of Cellular and Molecular Biomedical Science, University of Maryland School of Medicine, Baltimore, MD, [4]Community Ministry of Prince George's County, Upper Marlboro, MD, [5]Prostate Health Matters, Washington, DC, [6]University of Maryland Greenebaum Comprehensive Cancer Center Tumor Registry, Baltimore, MD, [7]Department of Cancer Epidemiology, H. Lee Moffitt Cancer Center, Tampa, FL, [8]Department of Medicine, University of Maryland School of Medicine, Baltimore, MD, [9]Baltimore Veterans Affairs Medical Center, Baltimore, MD, [10]Program in Oncology, University of Maryland Greenebaum Comprehensive Cancer Center, Baltimore, MD, [11]Department of Practice, Sciences, and Health Outcomes Research, University of Maryland School of Pharmacy, Baltimore, MD, [12]Department of Behavioral and Community Health, University of Maryland, College Park, College Park, MD, [13]Department of Epidemiology and Public Health, University of Maryland School of Medicine, Baltimore, MD; *shared senior authorship

UNIVERSITY of MARYLAND SCHOOL OF MEDICINE

VCU School of Population Health

Introduction:

Background

- African American men experience prostate cancer incidence and mortality rates that are 1.7 and 2.1 times those of European American men
- African American men are more likely to develop aggressive prostate cancers that are more commonly fatal, but reasons not fully understood
- Neighborhood disadvantage, which is more likely to affect African American individuals, may play an important role for aggressive prostate cancer and related disparities
- There has been limited study of the interaction of neighborhood disadvantage and race with aggressive prostate cancer

Hypotheses

- We hypothesized that neighborhood disadvantage would be positively associated with an increased likelihood of developing aggressive prostate cancer
- We hypothesized that neighborhood disadvantage would interact with race, with stronger associations for African American than European American men

Methods:

Study Population

- African American and European American men diagnosed with prostate cancer between 2004-2021 and treated at University of Maryland Greenebaum Comprehensive Cancer Center (UMGCCC)
- Binary definition of aggressive prostate cancer: 1 if total Gleason score >= 8 or Gleason pattern 4+3; 0 if total Gleason score <=6 or pattern 3+4; used pathological information when available, clinical otherwise

Metrics of neighborhood disadvantage

- Used four metrics for neighborhood disadvantage: Area Deprivation Index (ADI, n=1335), Neighborhood Deprivation Index (NDI, n=1305) using validated Bayesian index model, Racial Isolation Index (RI, n=985), and historical redlining (n=1458)
- Assigned neighborhood disadvantage metrics according to census tract containing patient's residence at diagnosis

Statistical analysis

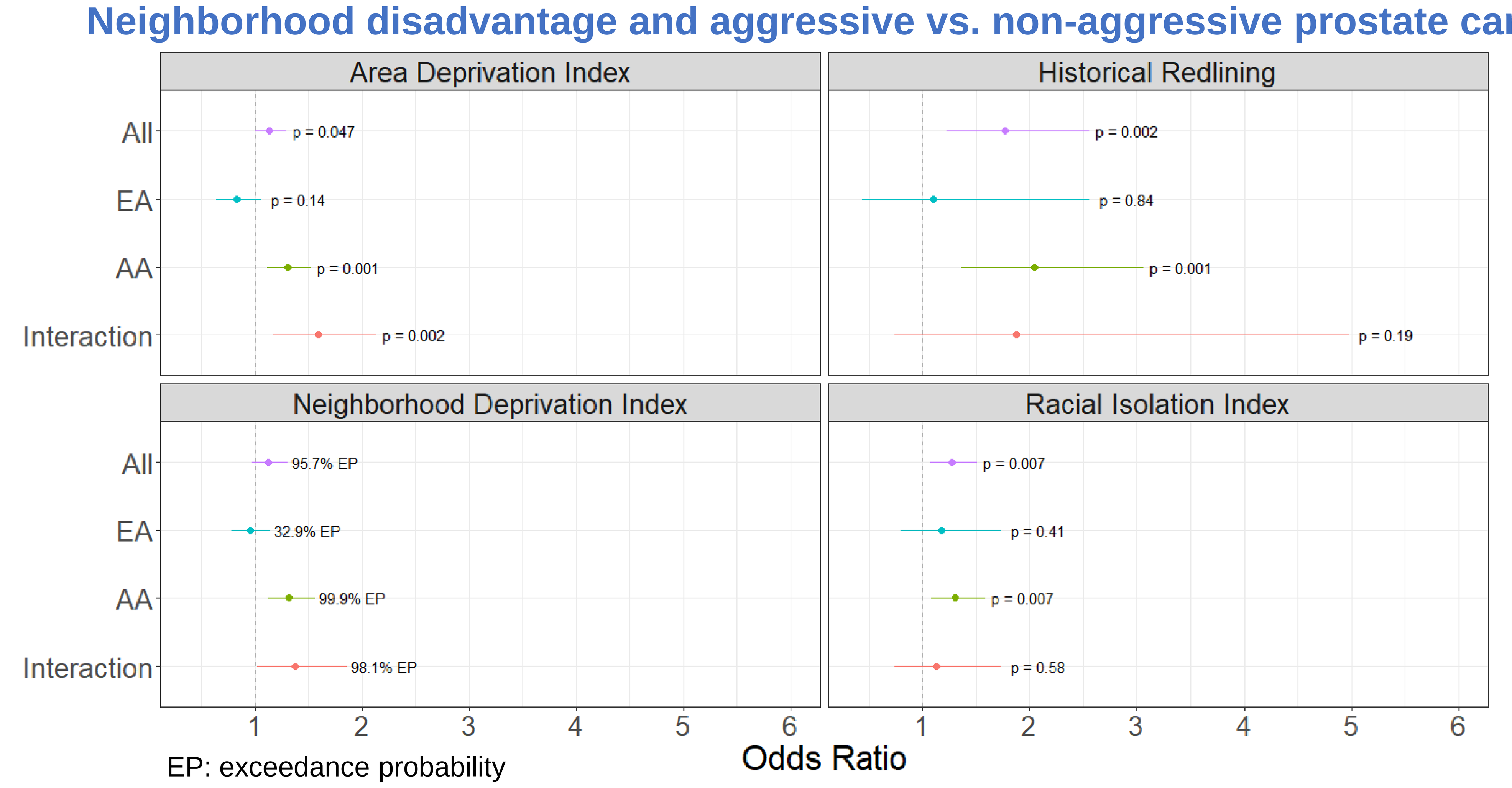
- Fit logistic regression models for aggressive prostate cancer outcome and each neighborhood disadvantage metric separately
- Adjusted for race, age at diagnosis, year of diagnosis
- Fit models among (1) all men, (2) only European American, (3) only African American, (4) all men with interaction of metric & race
- Performed several sensitivity analyses: quantizing neighborhood disadvantage metrics, also adjusting for primary payer at diagnosis, and only using clinical information

Results:

Sample characteristics

Variable	N (%)/Median [IQR]	Variable	N (%)/Median [IQR]
Race		Nodal Involvement	
African American	760 (52)	N0	1,021 (70)
European American	698 (48)	N1	69 (5)
Age at Diagnosis	63 [58, 69]	Unknown	368 (25)
Year of Diagnosis		Primary Payer at Diagnosis	
2004-2009	529 (36)	Medicare	517 (35)
2010-2017	565 (39)	Medicaid	127 (9)
2018-2021	364 (25)	Military/VA/TRICARE	186 (13)
Tumor Stage		Private Insurance	547 (37)
1	127 (9)	Unspecified/Unknown	81 (6)
2	812 (56)	Prostate Tumor Aggressiveness	
3	181 (12)	Aggressive	566 (39)
4	115 (8)	Non-aggressive	892 (61)
Unknown	223 (15)		

Neighborhood disadvantage and aggressive vs. non-aggressive prostate cancer

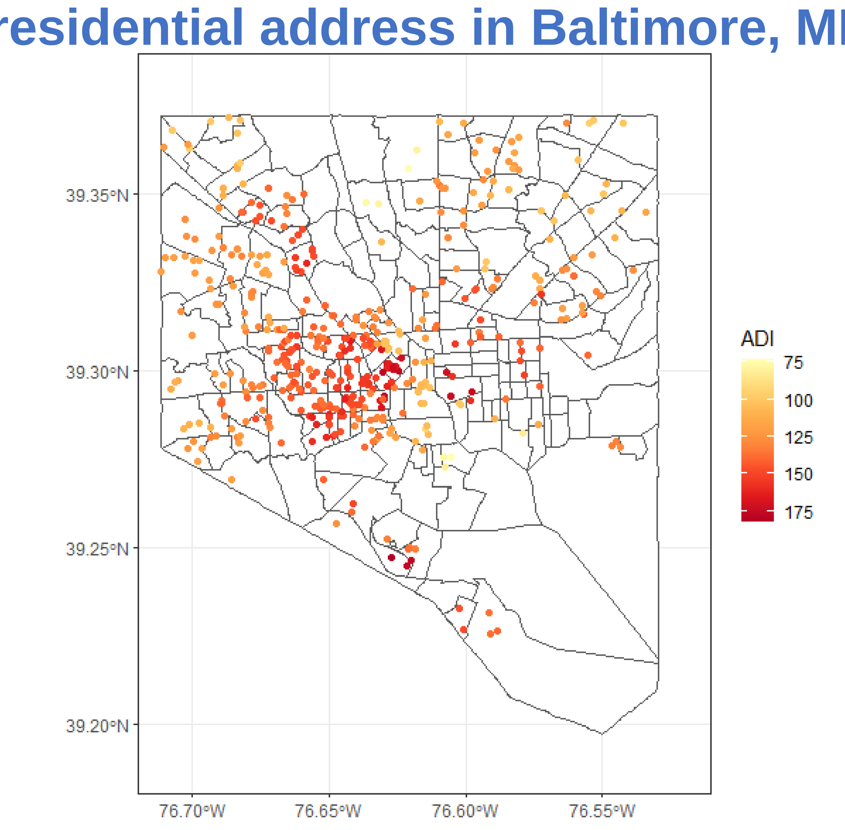


EP: exceedance probability

Summary of findings

- African American men were more likely than European American men to experience neighborhood disadvantage for all four metrics
- In adjusted models, all four metrics were significantly and positively associated with aggressive prostate cancer overall and among African American men
- In NDI model among African American men, % in poverty and % households with no vehicle had largest importance weights with aggressive prostate cancer
- Significant interaction with race for ADI and NDI, such that effects of these metrics were stronger for African American than for European American men
- Results were robust to sensitivity analyses, including additional adjustment for primary payer at diagnosis

Values of ADI for sample with residential address in Baltimore, MD



Strengths and Limitations:

Strengths

- Used a large (N=1458) and diverse sample of European American and African American men with prostate cancer
- Used several measures to conceptualize neighborhood disadvantage, including NDI with Bayesian index model to estimate importance of index components re aggressive prostate cancer
- Performed several sensitivity analyses to ensure findings were robust to neighborhood disadvantage metric construction, potential confounders, and source of Gleason grade information

Limitations

- Proxied participants' neighborhood environment using their address at diagnosis
- Proxied participants' individual socioeconomic status using primary payer in absence of more specific data

Discussion:

- Estimated associations between neighborhood disadvantage and aggressive prostate cancer in men treated for prostate cancer at UMGCCC
- Identified significant associations between all neighborhood disadvantage metrics and aggressive prostate cancer, with significantly stronger associations for AA than EA men for ADI and NDI
- Our study is one of first to formally test interactions between neighborhood disadvantage and race for aggressive prostate cancer and to report associations between racial segregation and historical redlining and aggressive prostate cancer
- These results can stimulate future research regarding neighborhood disadvantage and prostate cancer, encourage geographically targeted screening, and may help inform interventions

Funding:

- UMGCCC American Cancer Society Institutional Research Grant – IRG-18-160-16
- NCI K07 CA230182 and 3K07CA230182-05S1
- NCI Cancer Center Support Grant P30CA134274
- Maryland Dept of Health's Cigarette Restitution Fund – CH-649-CRF