

ARIC Manuscript Proposal #4218

PC Reviewed: 3/14/23
SC Reviewed: _____

Status: _____
Status: _____

Priority: 2
Priority: _____

1.a. Full Title: Changes in Physical Performance across Race and Region among Black and White Older Adults: the Atherosclerosis Risk in Communities (ARIC) Study

b. Abbreviated Title (Length 26 characters): Race-Region SPPB Change

2. Writing Group members: B. Gwen Windham MD MHS,¹ William Windham BS,¹ Hunter C. Sylvester,¹ Anna Kucharska-Newton PhD, MPH,² Priya Palta PhD, MHS² Laura Skow PhD,⁴ A. Richey Sharrett MD PhD⁴, Thomas H. Mosely PhD¹, Michael E. Griswold PhD¹

Affiliations: ¹University of Mississippi Medical Center, Memory Impairment and Neurodegenerative Dementia Center, Jackson, MS 39216. ²University of North Carolina at Chapel Hill, Department of Epidemiology. ³Johns Hopkins Bloomberg School of Public Health, Department of Epidemiology, Baltimore, MD

I, the first author, confirm that all the coauthors have given their approval for this manuscript proposal. _BGW_ **[please confirm with your initials electronically or in writing]**

First author: B. Gwen Windham

Address: 2500 N. State St; Jackson, MS 39216

Email: gwindham@umc.edu

ARIC author to be contacted if there are questions about the manuscript and the first author does not respond or cannot be located (this must be an ARIC investigator).

Name: Michael Griswold, PhD

Address: mgriswold@umc.edu

Phone: 601-984-5645

E-mail: gwindham@umc.edu

3. Timeline:

Abstract GSA annual meeting 11/2023

Submit Manuscript for ARIC Review within 12 months

4. Rationale:

Studies suggest an inequity in mobility disability and impaired physical performance measures among Black compared to White and Hispanic people(1-3) and potentially greater declines among women and Black adults.(4) Black and Hispanic Medicare beneficiaries have higher rates of unfavorable transitions in self-care abilities and mobility limitations (stages defined as fully able, successful accommodation, difficulty/assistance) and death, with lower probabilities of remaining in the successful accommodation stage than non-Hispanic White respondents.(5) The reasons for such differences remain unclear, but Black people in the United States bear a disproportionate burden of cardiovascular disease and cardiovascular risk factors,

including hypertension, diabetes and obesity,(6) which are also risk factors for poor physical function. Both midlife and late life cardiovascular risk factors have been associated with poorer physical function in late life, particularly diabetes and obesity.(7-9) The extent to which individual risk factors or clusters of risk factors contribute to inequities in physical function is unknown. For example, higher rates of obesity, diabetes, and hypertension in Black persons could individually or collectively contribute to the disproportional burden of functional disabilities among Black adults. Understanding contributions of individual or clusters of risk factors could be useful in public health screening and interventions to promote healthy aging.

When examining racial differences, race often represents many social, geographical, and cultural influences; socioeconomic status has been shown to partially explain racial inequities in mobility and functional measures.(1) Regional differences in self-reported mobility disability are also apparent in the US, with greater rates in the southern US among both Black and White residents. For example, data from the Centers for Disease Control Behavioral Risk Factor Surveillance System estimate the prevalence of subjective mobility disability at 13.9% (95% CI 10.3 - 18.5) compared to 7.1% (95% CI 6.6 - 7.6) among White residents in Minnesota. These estimates are similar in New York (White: 7.5% (95% CI 6.9 - 8.2); Black: 14.7% (12.7, 17.0)).(10) However, the racial disparity is less pronounced in Southern states, suggesting regional influences contribute to mobility disability across racial groups. For example, an estimated 14.6% (95% CI 13.3 - 15.9) of White residents and 19.6% of Black residents (95% CI 17.9, 21.5) in Mississippi have subjective mobility disability. (10) Longitudinal studies with objective functional measures in underrepresented groups of people capable of characterizing trajectories of functional change in later life and associated risk factors by race, region, and sex are sparse.

5. Main Hypothesis/Study Questions:

The current study seeks to describe potential racial disparities in physical function, particularly in the change in physical function over time and expand characterizations of more specific race-region changes in late-life physical function and endurance among older Black and White adults from four US communities.

6. Design and analysis (study design, inclusion/exclusion, outcome and other variables of interest with specific reference to the time of their collection, summary of data analysis, and any anticipated methodologic limitations or challenges if present).

We will use visit 5 as the baseline for the current study, when physical performance measures were introduced in the ARIC cohort, and all subsequent visits with physical performance measures through visit 9. Measures included usual pace gait on a 4-meter course, five repeated chair stands, three balance tasks, and grip strength. At the sixth exam, endurance was assessed with the 2-minute walk (2MW). All participants who underwent a functional assessment will be included in this analysis. We will exclude participants in the primary analysis with self-reported race other than Black or White due to small numbers (n=13), and those with extreme values including those with a BMI greater than or equal to 70 (n = 1) or less than 18.5 (n = 62) at Visit 5. We will conduct a sensitivity analysis including Asian and Indian participants.

Outcomes

The primary outcome will be the Short Physical Performance Battery (SPPB, scored 0-12), which is derived as a sum from performance on the usual pace walk, 5 repeated chair stands, and 3 balance tasks as previously described,(11, 12) cross-sectionally at visit 5 and change in SPPB through visit 9. We will also examine each SPPB component separately in secondary analyses.

Exposures

Black and White race will be the primary exposures. We will examine race-site as an exposure, but we recognize this analysis will be largely exploratory due to the small sample sizes of Black participants at Washington County and Minneapolis.

Covariates

Covariates known to be associated with physical performance measures and with race or that are considered biologically relevant to physical performance will be examined as potential confounders, including age, BMI, systolic and diastolic blood pressure, anti-hypertensive medication use, diabetes, heart disease, heart failure, smoking status, and education. In addition, we will include measures of socioeconomic status (SES) as potential confounders or mediators. SES information obtained during study visit 5 included education level (obtained at visit 1), combined family income, and area deprivation index (ADI, national rank) which will be considered as independent confounders or mediators.(16) Age, race, education level, sex, and smoking status were self-reported at visit 1. Education will be categorized as <12 years; 12 years/12-year equivalent/vocational training; any college. Self-reported smoking and alcohol will be dichotomized (current or never/former). Diabetes will be defined as a fasting glucose of ≥ 126 mg/dL, nonfasting glucose of ≥ 200 mg/dL or taking glucose-lowering medications. Hypertension will be defined as a systolic blood pressure of ≥ 140 mm Hg, a diastolic blood pressure of ≥ 90 mm Hg, or use of anti-hypertensive medications. BMI levels ≥ 30 kg/m². We will use adjudicated diagnoses of heart disease, heart failure, dementia, and stroke.

Statistical Analysis

Baseline frequency characteristics will be compared using t-tests and Chi-square tests for continuous and categorical variables respectively. Parameters will be estimated with Generalized Estimating Equations (GEE) using log-links and negative binomial distributions for SPPB (0-12) and its subcomponents of balance (0-4), chair stands (0-4) and gait (0-4) outcomes; a gamma distribution will be used for continuous gait speed (m/s) due to the gait speed distribution. Time (scaled to 10 years), a Black race indicator and the interaction between these terms will be used to define expected trajectories. Race-center models will replace the Black indicator with the 5-level categorical race-center. Exchangeable correlation structures with Huber-White robust standard errors will be used.

Marginalized standardization will be used to examine absolute and relative comparisons for expected trajectories in all models. Sensitivity analyses will include (1) GEE with Gaussian and negative binomial distributions using independent and unstructured correlation matrices, (2) generalized linear mixed models with random intercepts and random slopes and (3) shared parameter models (SPM) incorporating dismobility and mortality events for extended missing data analyses. Robust variance estimates will be used in all sensitivity analyses.

Anticipated methodologic limitations or challenges: There are few Black participants at sites other than Jackson, particularly for Washington County (n=14) and Minneapolis (n=9). If results are similar for Black participants across sites, we will examine combining for Black versus White analyses. Interpretations of data with small samples will consider the limitations of small samples in race-regional analyses, recognizing we will not be able to draw firm conclusions. People with poorer function and greater declines in physical function are more likely to be missing. The analyses will include examinations of characteristics among those who attend and do not attend the follow-up exams.

7.a. Will the data be used for non-ARIC analysis or by a for-profit organization in this manuscript? ____ Yes ☒ No

b. If Yes, is the author aware that the current derived consent file ICTDER05 must be used to exclude persons with a value RES_OTH and/or RES_DNA = "ARIC only" and/or "Not for Profit" ? ____ Yes ____ No

(The file ICTDER has been distributed to ARIC PIs, and contains the responses to consent updates related to stored sample use for research.)

8.a. Will the DNA data be used in this manuscript? ____ Yes ☒ No

8.b. If yes, is the author aware that either DNA data distributed by the Coordinating Center must be used, or the current derived consent file ICTDER05 must be used to exclude those with value RES_DNA = "No use/storage DNA"? ____ Yes ____ No

9. The lead author of this manuscript proposal has reviewed the list of existing ARIC Study manuscript proposals and has found no overlap between this proposal and previously approved manuscript proposals either published or still in active status. ARIC Investigators have access to the publications lists under the Study Members Area of the web site at: <http://www.csc.unc.edu/aric/mantrack/maintain/search/dtSearch.html>

☒ Yes ____ No

1. MP 3913 Laura Skow, Jennifer Schrack, A. Richey Sharrett, et al. Associations between Mid-life Physical Activity and Late-life Physical Function Changes in the Atherosclerosis Risk in Communities (ARIC) Study
2. MP 3223 KG Parker, K Walker, X Zhu, et al. The relationship between systemic inflammation in mid- to late-life and late-life mobility: The ARIC Study
3. MP 3470 BG Windham, J Henegan, AKucharska-Newton, P Palta, et al. Defining and Measuring Physical Resilience in a Longitudinal Cohort: the ARIC Study.
4. MP 3543 L Skow, R Sharrett, R Gottesman, et al. Mid-life Vascular Risk Factors & Latelife Physical Function Decline

10. What are the most related manuscript proposals in ARIC (authors are encouraged to contact lead authors of these proposals for comments on the new proposal or collaboration)?

11.a. Is this manuscript proposal associated with any ARIC ancillary studies or use any ancillary study data? ____ Yes ____ No

11.b. If yes, is the proposal

- ☒ **A. primarily the result of an ancillary study (list number* 2008.06 ARIC NCS)**
☐ **B. primarily based on ARIC data with ancillary data playing a minor role (usually control variables; list number(s)* _____)**

*ancillary studies are listed by number <https://sites.csc.unc.edu/aric/approved-ancillary-studies>

12a. Manuscript preparation is expected to be completed in one to three years. If a manuscript is not submitted for ARIC review at the end of the 3-years from the date of the approval, the manuscript proposal will expire.

12b. The NIH instituted a Public Access Policy in April, 2008 which ensures that the public has access to the published results of NIH funded research. It is **your responsibility to upload manuscripts to PubMed Central** whenever the journal does not and be in compliance with this policy. Four files about the public access policy from <http://publicaccess.nih.gov/> are posted in <http://www.csc.unc.edu/aric/index.php>, under Publications, Policies & Forms. http://publicaccess.nih.gov/submit_process_journals.htm shows you which journals automatically upload articles to PubMed central.

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