

OLDER AGE AND HEART DISEASE ARE ASSOCIATED WITH A FASTER INCREASE IN ARTS

#12331
#4619

Ana Tomash¹, Khalid Saifulah¹, Md Tahmid Yasar¹, Maude Wagner², Arnold M. Evia², David A. Bennett², Julie A. Schneider², Konstantinos Arfanakis^{1,2}
¹Biomedical Engineering, Illinois Institute of Technology, Chicago, IL ²Rush Alzheimer's Disease Center, Rush University Medical Center, Chicago, IL



INTRODUCTION & METHODS

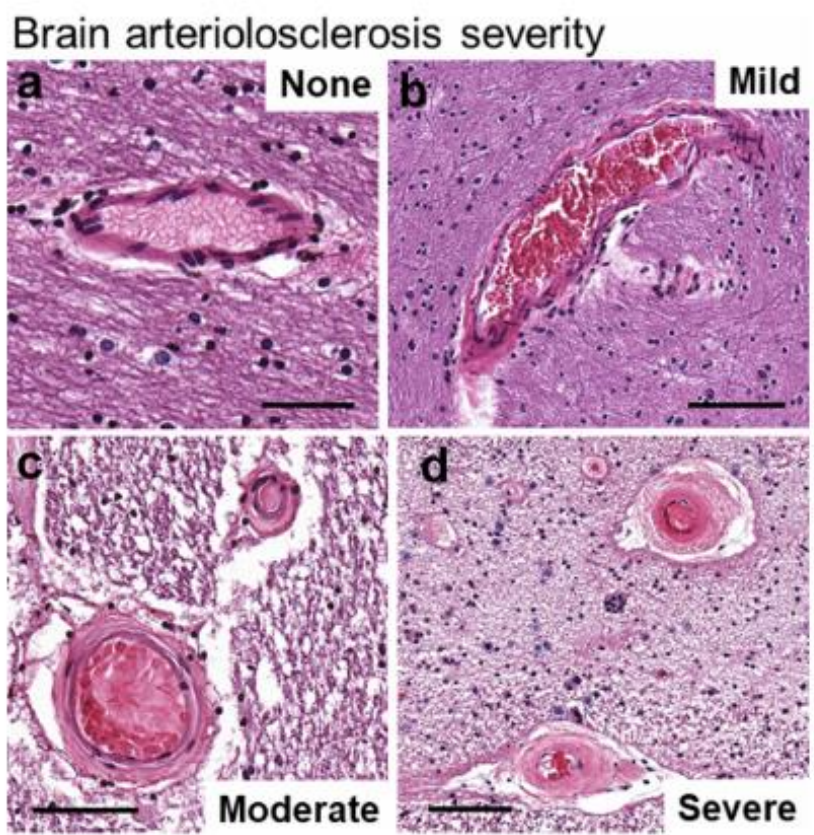


Figure 1: One approach to grading brain arteriolosclerosis pathologic severity is on a semiquantitative scale of “none”, “mild”, “moderate”, or “severe” arteriolosclerosis. (Blevins et. al, 2021)

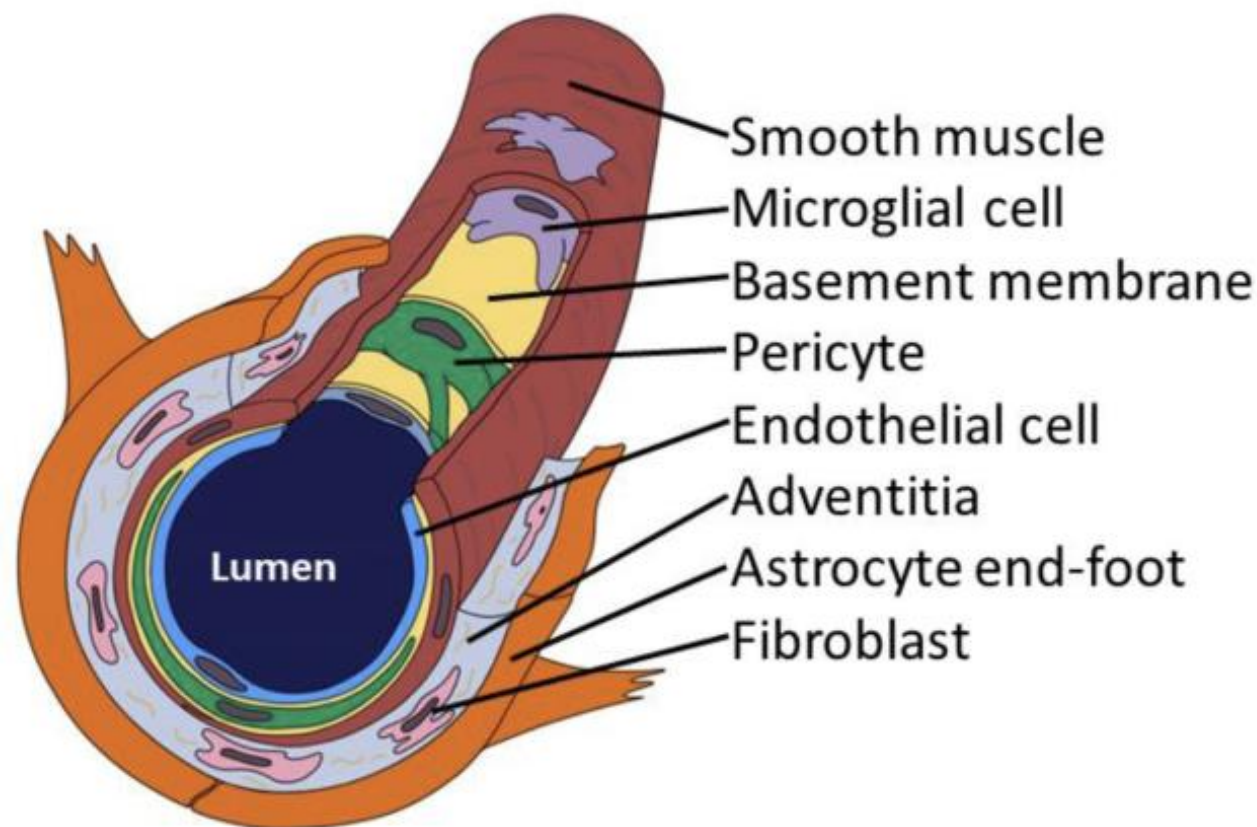


Figure 2: A brain arteriole and constituents of the cerebral arteriolar vascular unit. (Blevins et. al, 2021)

Brain arteriolosclerosis
Common cerebral small vessel pathology
Contributes to cognitive and motor decline

ARTS
Novel MRI marker of cerebral arteriolosclerosis
Higher ARTS indicates greater likelihood of arteriolosclerosis

Objective
Determine whether demographics, vascular risk factors, and vascular diseases are associated with **longitudinal ARTS change** in community dwelling older adults

PARTICIPANTS

Characteristics		
N	684	
Age (years), mean (SD)	78	(7.2)
Male, n (%)	127	(18.6%)
Education (years), mean (SD)	15.9	(3.2)
Cognitive status of dementia, n (%)	3	(0.4%)
ARTS score at baseline, mean (SD)	- 0.08	(0.2)
Heart disease, n (%)	69	(10.1%)

* Fig 3. Data pooled from 5 cohorts (MAP, ROS, MARS, RADRC).

STATISTICAL ANALYSIS

LINEAR MIXED EFFECTS MODEL			
Outcome	Model	Predictors	Inference
Longitudinal ARTS score	Random intercept Random slope Predictor x Time	Age Sex Education Scanner *Predictor x Time	BH-FDR m=11 p < 0.05

*Predictors evaluated: **Blood pressure (SBP, DBP), eGFR, BMI, hypertension, CHF, claudication, smoking, heart disease, stroke**

RESULTS

Figure 4: Individual ARTS trajectories by age

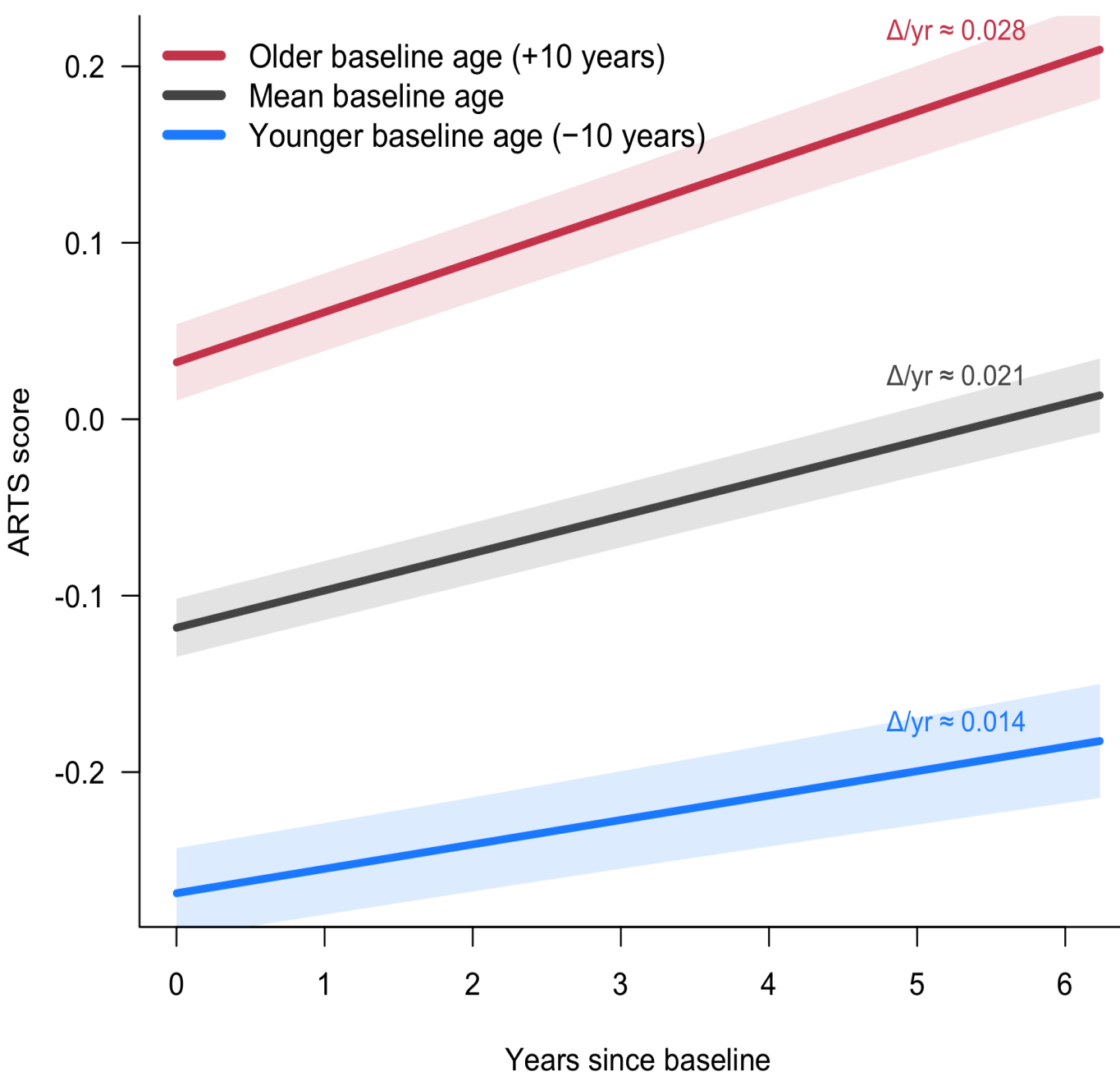
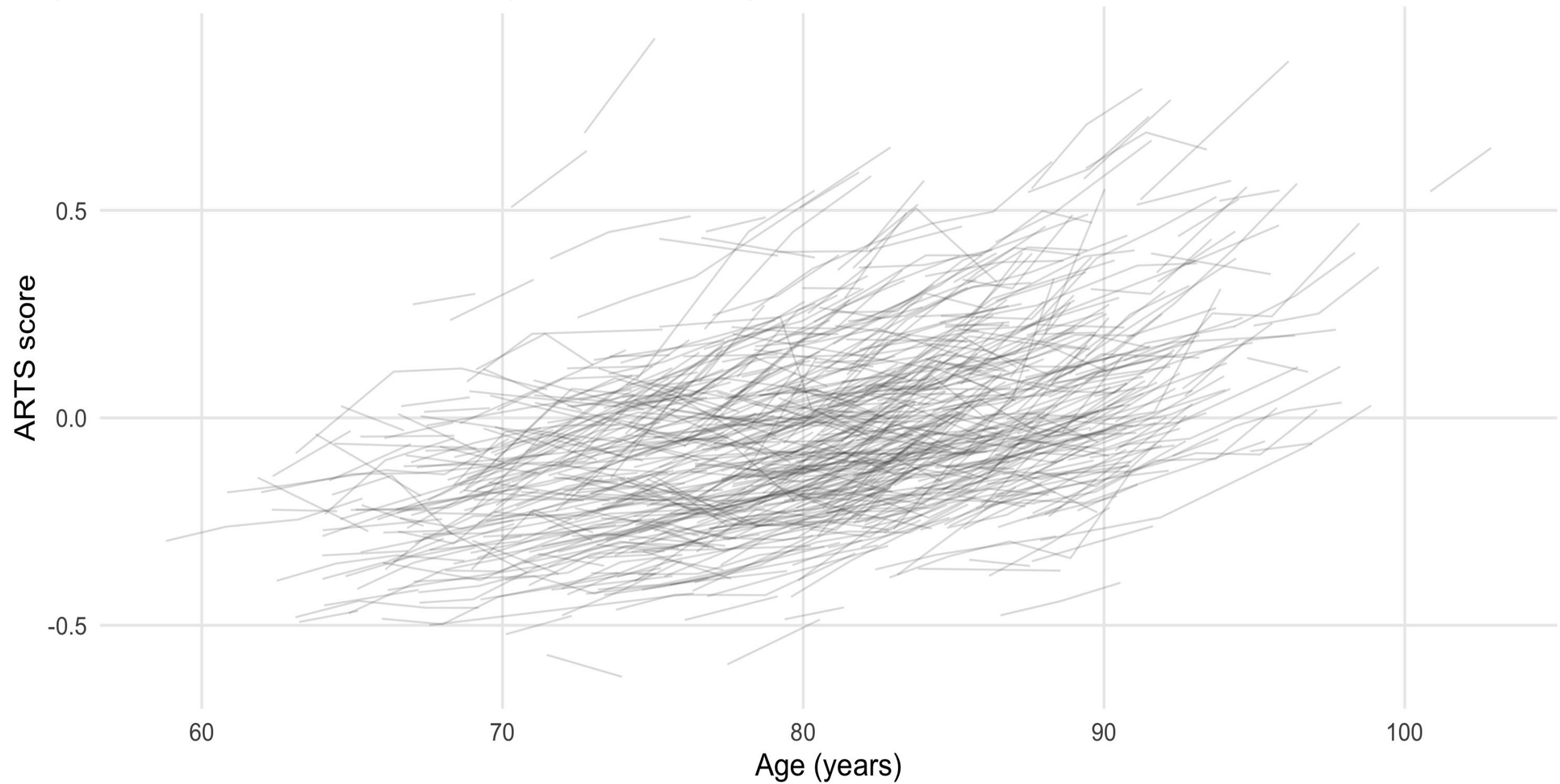


Fig. 5: Mean ARTS trajectories by age at baseline.

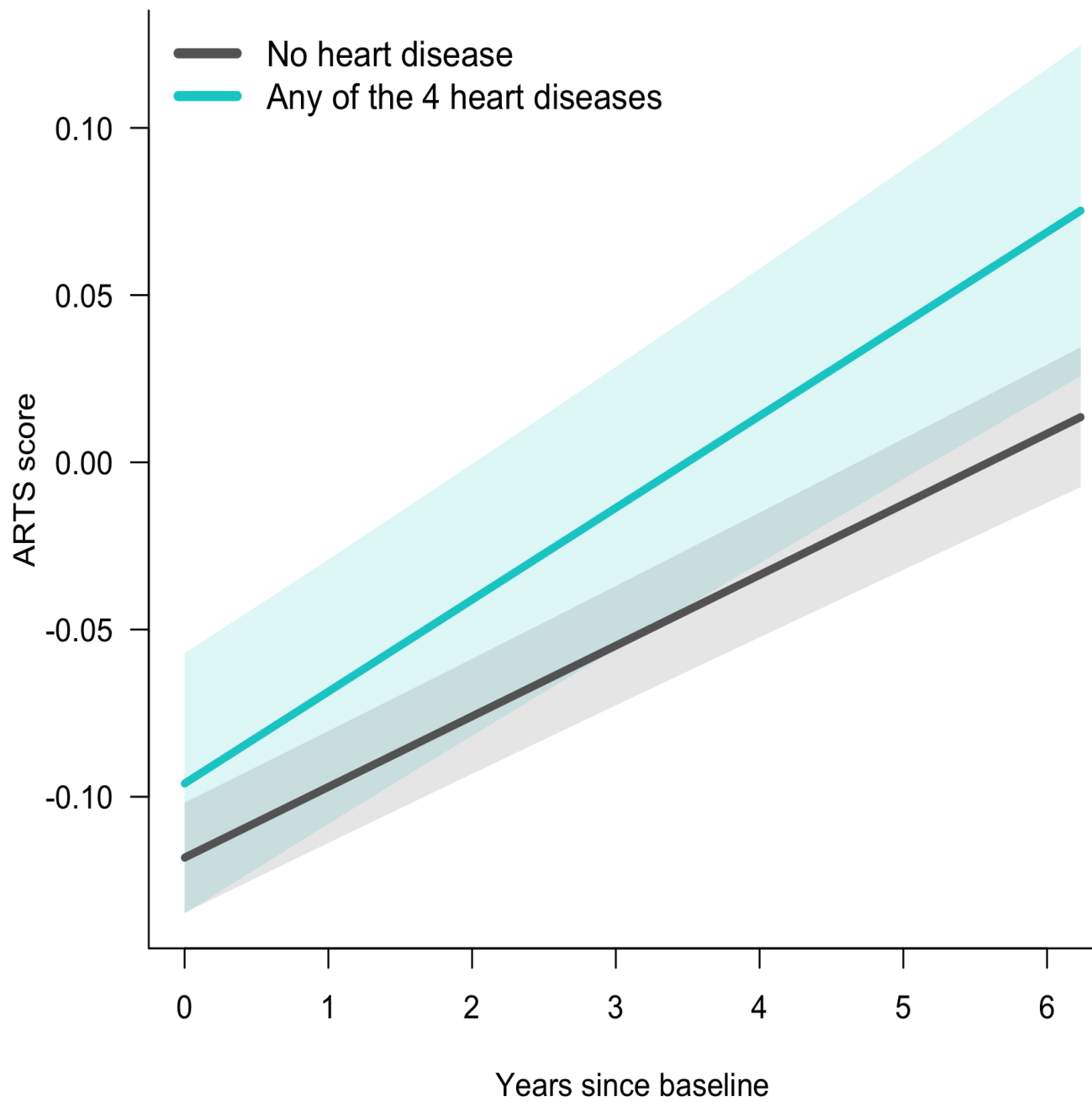


Fig. 6: Mean ARTS trajectories by history of heart disease.

- **ARTS scores increased over time.**
- **Participants who were older at baseline had higher ARTS score ($\beta = 0.015 \pm 0.001$, $p < 0.001$) and a higher rate of increase in ARTS ($\beta = 0.00073 \pm 0.0001$ year, $p < 0.001$) (Fig. 5).**
- **Participants who had a history of heart disease also had a higher rate of increase in ARTS ($\beta = 0.0064 \pm 0.0023$, $p = 0.005$) (Fig. 6).**
- **No other factors showed a significant association with the slope of ARTS.**

DISCUSSION

- ARTS may allow in-vivo monitoring of arteriolosclerosis burden over time.
- ARTS scores increase with age.
- Older age and a history of heart disease are associated with a faster increase in ARTS score.
- Individuals of older age and those with a history of heart disease may have a faster increase in arteriolosclerosis burden.
- This study was conducted in a large community-based cohort, largely free of dementia.
- This study extends prior cross-sectional analyses on the association of ARTS with demographics, vascular risk factors, and vascular diseases.

References: [1] Oveisgharan, S. et al. Acta Neuropathol. 136(6), Dec 2018. [2] Barnes, L.L. et al. Neurology 85(6), Aug 2015. [3] Arvanitakis, Z. et al. Lancet Neurol. 15(9), Aug 2016. [4] Buchman, A.S. et al. Neurology 80(8), Feb 2013. [5] Makkinejad, N. et al. NeuroImage Clin. 31, 2021. [6] Fleischman, D.A. et al. Alzheimers Dement. 21(7), Jul 2025. [7] Bennett, D.A. et al. J. Alzheimers Dis. 64(S1), Jun 2018. [8] Barnes, L.L. et al. Curr. Alzheimers Res. 9(6), Jul 2012. [9] Schneider, J.A. et al. J. Alzheimers Dis. 18(3), 2009. [10] Marquez, D.X. et al. Neuroepidemiology 54(5), 2020. [11] Proust-Lima, C. et al. J. Stat. Softw. 78(2), 2017.

iit.edu/~mri

Correspondence to: **Ana Tomash, atomash@hawk.illinoistech.edu**

