



Amenity Variety Is Linked to Memory but Not Executive Function Trajectories in U.S. Older Adults

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Introduction

An estimated 40% of dementia cases are attributable to potentially modifiable risk factors [1]

The built environment is one modifiable context that may shape cognition in later life [2]

Previous work has examined how individual amenities or groups of amenities are linked to cognition [3]

We employ an information-theoretic measure of how evenly a community's amenities are distributed across types, without assigning greater value to any amenity category

Objective: Examine how amenity variety, and its distribution, is related to cognitive function over time

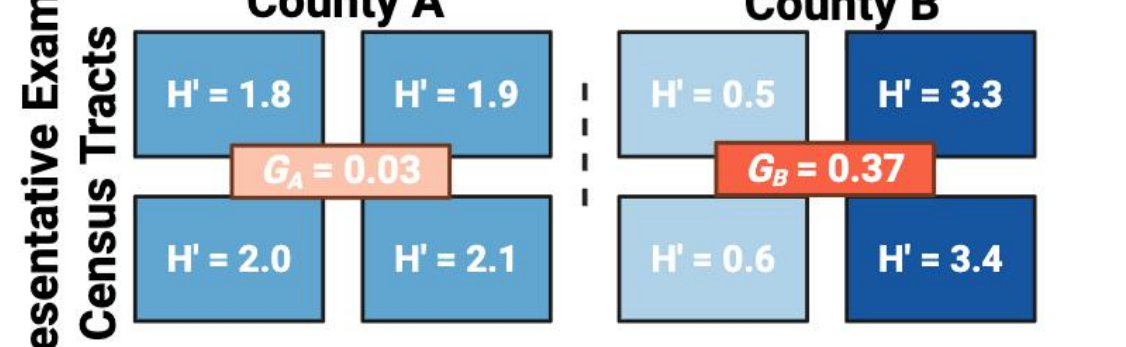
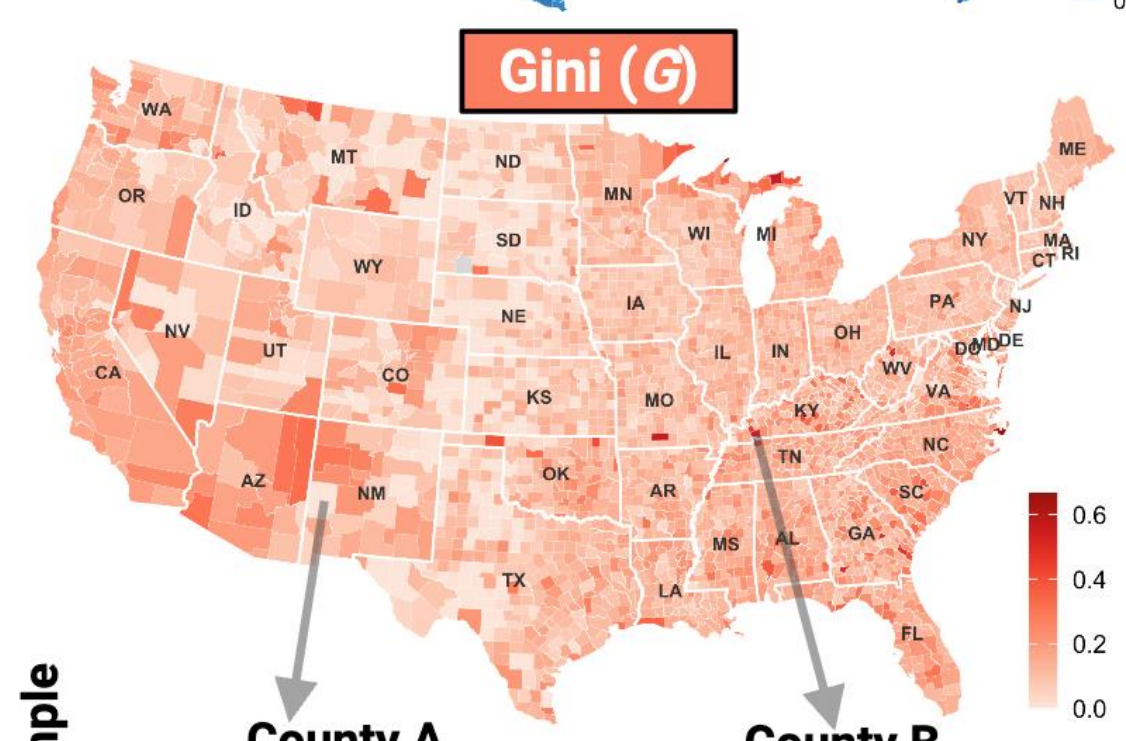
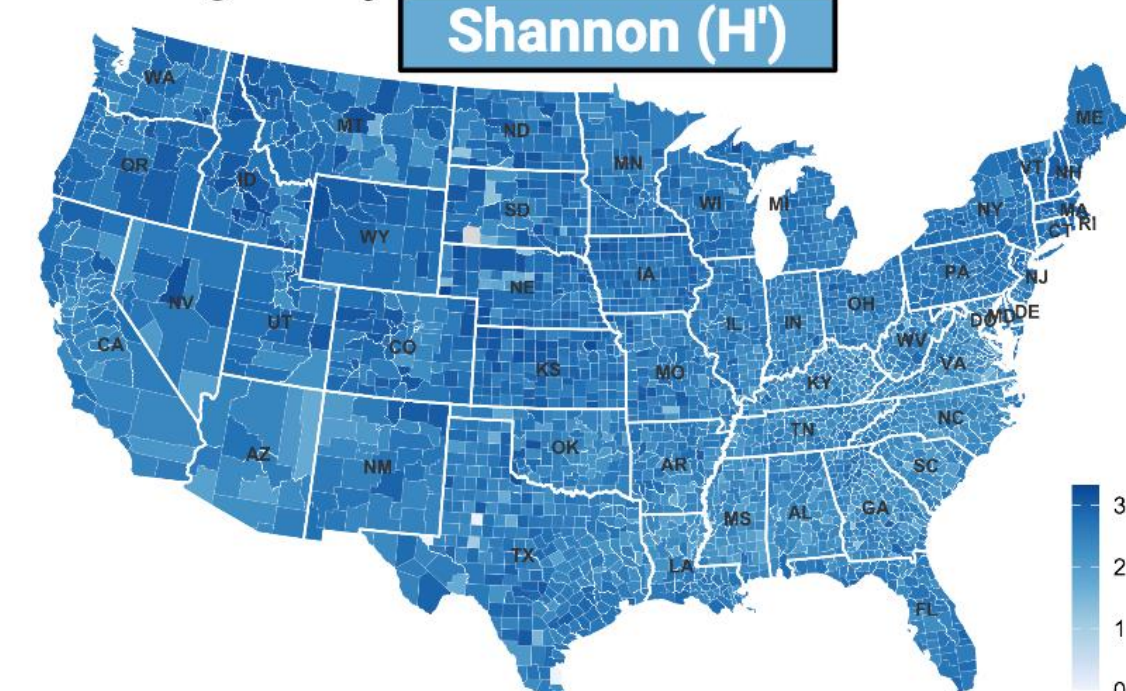
Methods

Computing Compositional Amenity Variety

National Neighborhood Data Archive (NaNDA): contextual measures for amenities across the USA
Spatially referenced, nationwide measures of the physical and social environment [4]

$$H' = - \sum_i p_i \ln(p_i)$$

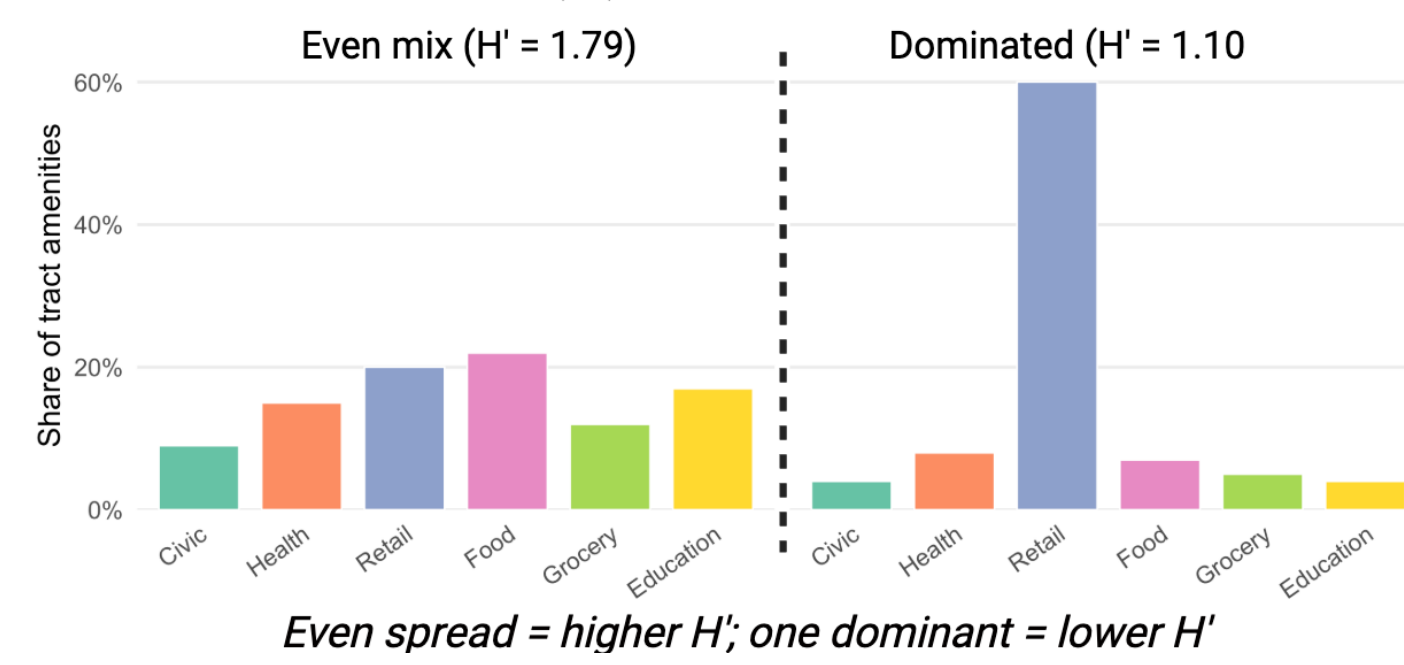
A. Measuring amenity composition mix and heterogeneity



Same Mean Shannon (H') ≈ 1.95
Different Gini (G)

Same county average, but tract-level composition varies widely within County B

B. Census tract diversity (H') represents the balance and mix of amenities



	(N=21,136)
Age at entry, mean (SD)	63.5 (10.8)
Female, N (%)	11710 (56.4%)
Race/ethnicity, N (%)	
NHW	12493 (60.1%)
NHB	4388 (21.1%)
Hispanic	3038 (14.6%)
Other	857 (4.1%)
Education, N (%)	
< HS	3981 (19.2%)
HS/GED	6616 (31.8%)
Some college	5330 (25.7%)
College+	4849 (23.3%)
Census region, N (%)	
Northeast	3541 (17.0%)
Midwest	4264 (20.5%)
South	8233 (39.6%)
West	4738 (22.8%)
Respondent entry wave, N (%)	
2006	12643 (60.9%)
2010	4821 (23.2%)
2016	3312 (15.9%)
County mover during follow-up, N (%)	3433 (16.5%)
Cognitive outcomes at entry, mean (SD)	
Total cognition (0-27)	15.21 (4.43)
Immediate recall (0-10)	5.48 (1.65)
Delayed recall (0-10)	4.36 (1.98)
Serial 7s (0-5)	3.49 (1.68)
CAV exposure at entry, mean (SD)	
Subtype Shannon	2.472 (0.192)
Waves per person, mean (SD)	4.81 (2.35)

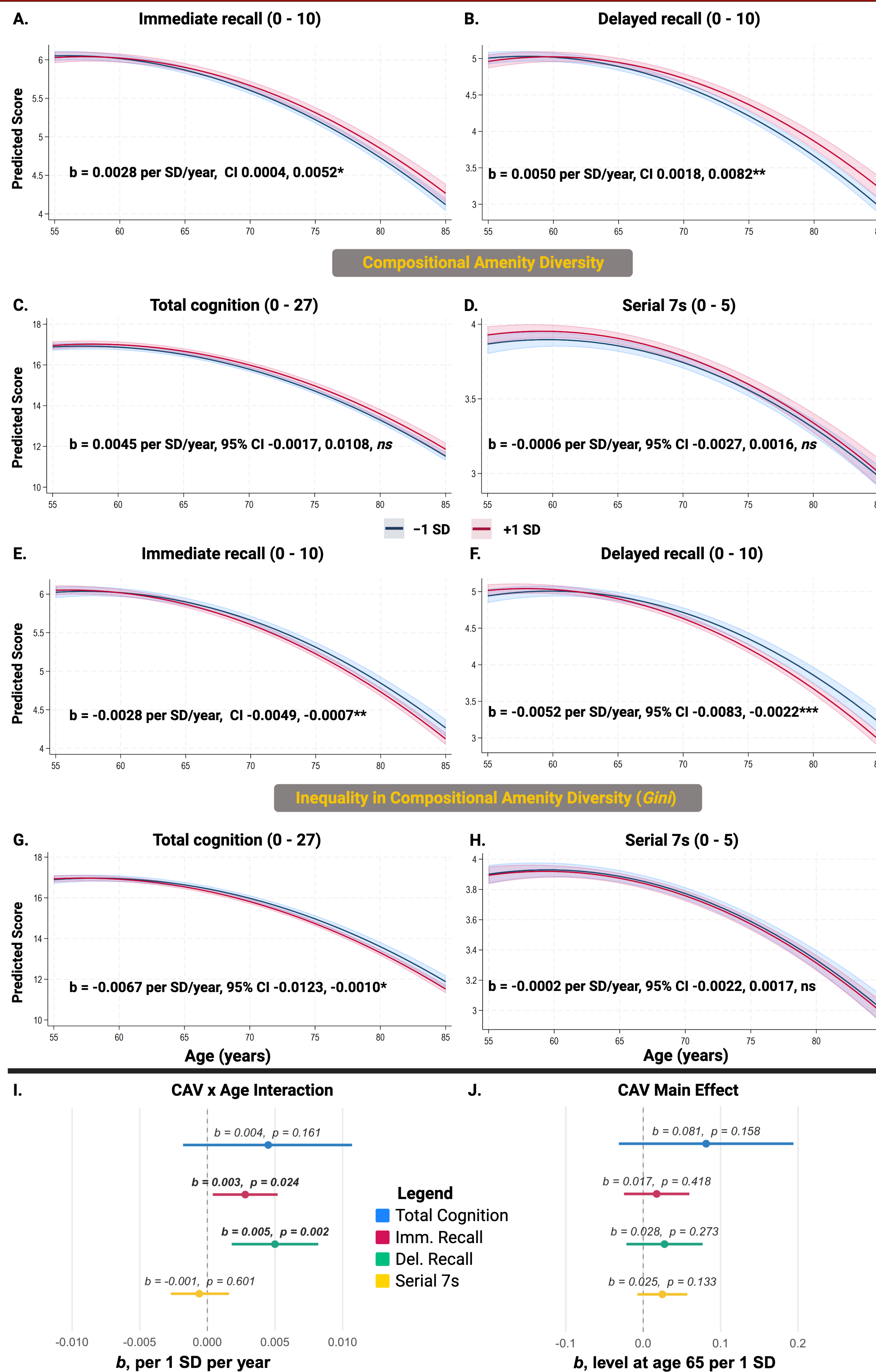
Statistical Analysis and Scoring

- We used three-level growth curve models (STATA) to examine how county EC predicts cognitive trajectories.
 - Nested within persons, nested within counties.
 - Survey-weighted
 - County-level random effects

- Examine **baseline** level and **rate of change** in Health and Retirement Study cognition [5].
 - Total Cognition (0-27)
 - Immediate Recall (0-10)
 - Delayed Recall (0-10)
 - Serial 7s (0-5)

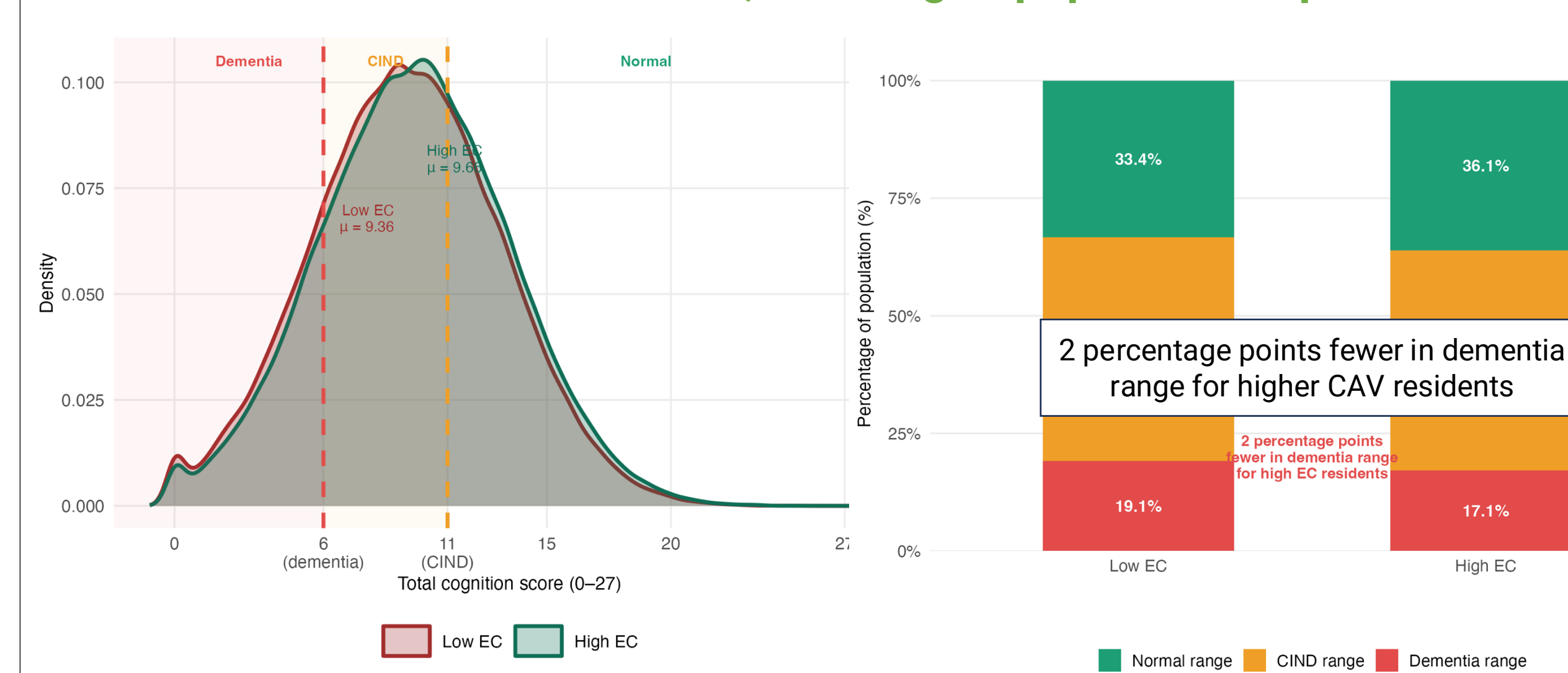
- Adjusted for age, age², sex, race/ethnicity, education, wealth, census region, cohort, and county mobility

Results



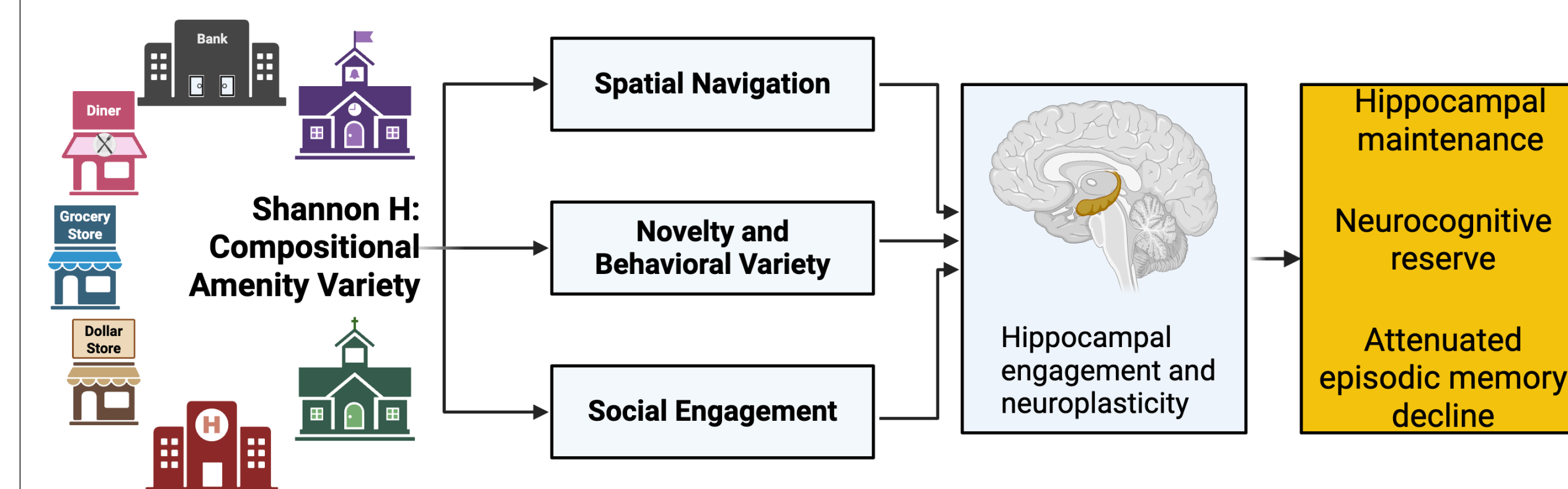
Discussion

How meaningful is this?
Small individual effects, meaningful population impact



Comparable to multi-morbidity index estimated in HRS [6]
Each one-point increase in morbidity index was associated with faster declines in immediate recall over time (-0.001 , 95% CI: -0.002 , -0.001 fewer words/year faster)

Putative Mechanism



Conclusion and Future Directions

Conclusion

- Residents of higher-CAV counties were estimated to have comparable recall scores at age 65 but slower age-related memory decline (immediate and delayed recall).
- Within-county distribution in tract-level CAV (Gini) showed the opposite slope pattern, with greater inequality associated with faster decline in immediate recall, delayed recall, and total cognition.

Future Directions

- Test for cognitive domain specificity (are the effects tested truly episodic memory-specific) using the Health and Retirement Study's Harmonized Cognitive Assessment Protocol

References

- Livingston, G. et al., (2024). Dementia prevention, intervention, and care: 2024 report of the Lancet standing Commission
- Clarke, P. J., et al., (2015). Cognitive decline and the neighborhood environment.
- Finlay, J., et al., (2022). Cognability: an ecological theory of neighborhoods and cognitive aging
- Clarke, P., et al., (2025). National neighborhood data archive (NaNDA): socioeconomic status and demographic characteristics of census tracts and ZIP code tabulation areas, United States, 1990- 2022
- Crimmins, E. M., et al., (2011). Assessment of cognition using surveys and neuropsychological assessment: the Health and Retirement Study and the Aging, Demographics, and Memory Study.
- Wei, M. Y., et al., (2020). Multimorbidity and cognitive decline over 14 years in older Americans.

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