Supplementary Materials

Supplementary Table 1. Summary of Semi-Structured Interview Topics and Questions. Aging in the Right Place Study (2015-2016).

Interview sections	Semi-structured question topics
Personal Information	i. Background: age, gender, birthplace/time in the US, self-identified race/ethnicity, language, education, marital status, past employment, driving ability ii. Living situation: Housing tenure, length of residence, living arrangement
Physical & Built Environment	i. The local neighborhood: daily routines, perceived boundaries, level of satisfaction, (un)met needs ii. Availability and accessibility of services, mobility iii. Perceived safety and comfort in the home and neighborhood, fall history iv. Planning for the future; perceptions of "aging in place" - expectations, desires, (dis)advantages, barriers; suggestions for neighborhood improvement/investment
Neighborhood and Social Connections	i. Family, friend, and neighbor social interactions and connections ii. Sense of isolation and vulnerability iii. Perceived inclusion/ exclusion with family/ friends and in the community, experiences of ageism
Health and Quality of Life	i. Quality of life, sense of happiness, sources of sadness and/or anxiety ii. Perceptions of aging and getting older iii. Self-perceived health, any concerns, limitations iv. Sense of independence

Supplementary Table 2. Description of cognitive screening tests contributing to the global cognitive function factor score.

Cognitive Test	Score Range	Cognitive Domain
Animal Fluency Test (AFT)	Number of unique animals named in 1 minute	Language and executive function
Letter Fluency Test (LF)	Number of unique words beginning with the letter "F" named in 1 minute	Language and executive function
World List Learning (WLL)	0-30	Verbal learning
Word List Delayed (WLD)	0-10	Verbal memory
Montreal Cognitive Assessment (MoCA) subset[a]	0-11	Verbal memory and orientation

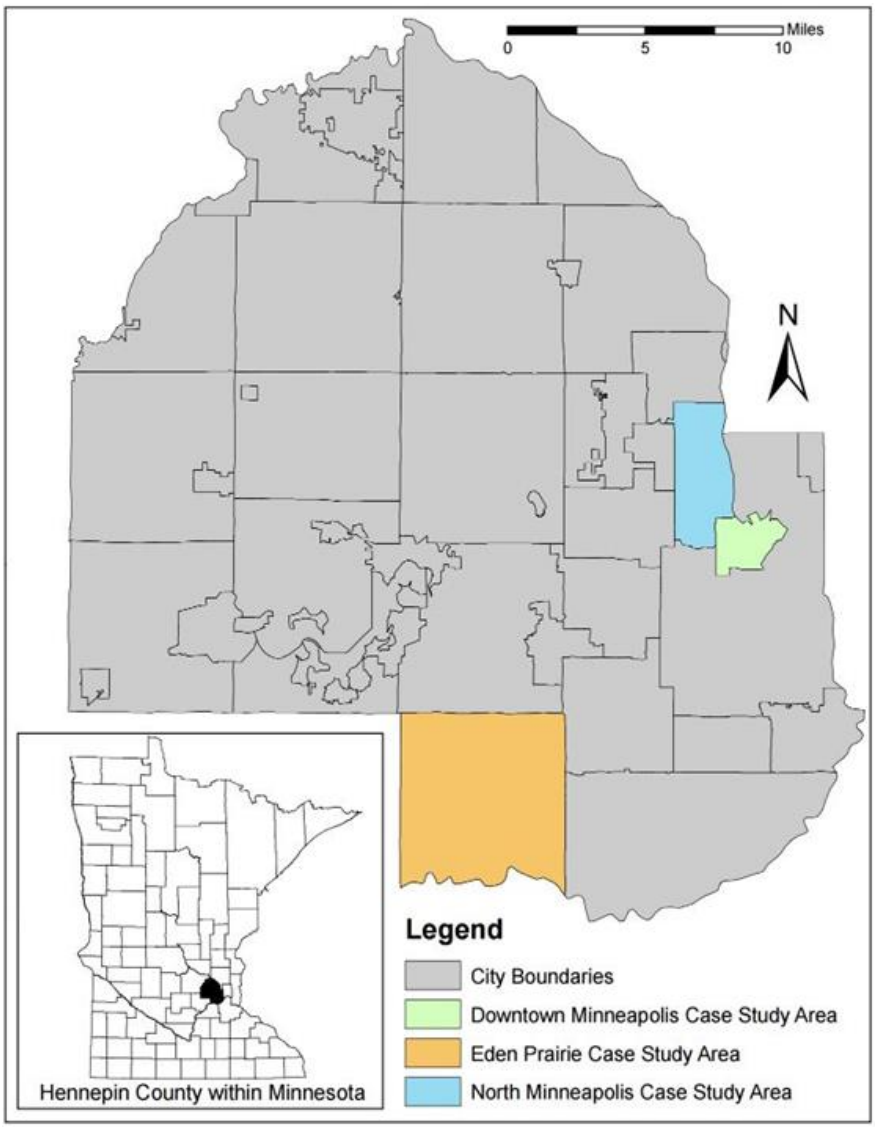
Note: Factor loadings ranged from 0.43 (MoCA) to 0.79 (AFT), and model fit improved when allowing for correlated error among the memory items (WLL, WLD, MoCA).
[a] MoCA subset: 5-word delayed memory recall, 6-item orientation

Supplementary Table 3. Social Infrastructure Categories.

Category	NAICS Code	Illustrative examples
Civic and Social Organizations	8134	Social clubs, Booster clubs, Veterans' membership organizations
Food and Drinking Places	7224 and 7225	Restaurants (full-service and limited-service), Cafeterias, Bars, Cocktail lounges
Services for the Elderly and Persons with Disabilities	624120	Adult day care centers, Senior citizen activity centers, Disability support groups

Note: Codes derived from the North American Industry Classification System (NAICS).

Supplementary Figure 1. Case study areas in the Minneapolis metropolitan area, Hennepin County, MN: Aging in the Right Place Study (2015-2016).



Note: The purposive design of the case studies selected for socio-demographic and geographic characteristics. Eden Prairie is a low-density, car-oriented suburban area. It is the wealthiest of the three case study areas. North Minneapolis is a medium-density, urban residential area inhabited primarily by Black residents. It has higher levels of unemployment and socioeconomic disadvantage. Downtown Minneapolis is a high-density, pedestrian-oriented city center. It is socioeconomically polarized between more affluent condo- and apartment-dwelling individuals and lower-income populations residing in subsidized housing and homeless shelters. See Finlay (2018) for additional information.

Supplemental Analysis. Higher-Order Interactions of Neighborhood Social Infrastructure and Cognitive Function

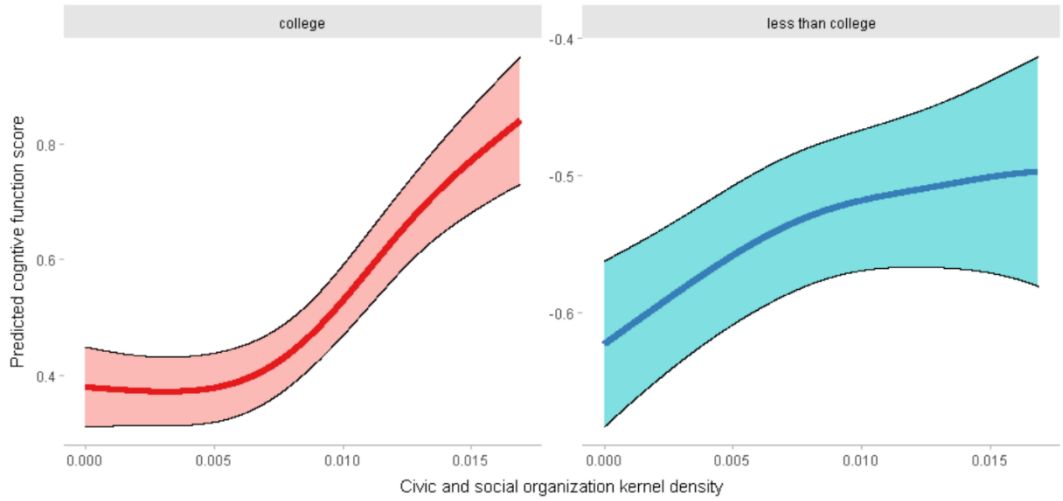
The estimates in the main text provide a broad description of the association between cognitive function and neighborhood social infrastructure. By averaging over the entire sample population in our models, we demonstrate a novel connection among social context and cognitive health. These descriptive analyses stimulate new consideration on the links between neighborhoods and cognitive outcomes and prompt future research directions into how these associations may further vary by person and place. The underlying process by which adults maintain cognitive function as they age is likely heterogeneous and conditional on other social traits that confer power and privilege—such as age, gender, race, ethnicity, education, and income (Besser et al., 2018; Brewster et al., 2019; Lovden, Fratiglioni, Glymour, Lindenberger, & Tucker-Drob, 2020). While investigating these higher-order complexities is beyond the scope of the current manuscript, we strongly encourage future researchers to build upon our work and examine if and how the association between cognitive function and neighborhood social resources varies according to other social conditions.

As a brief example of this type of investigation, we draw upon our qualitative analysis which suggested that socioeconomic status (SES) shapes residents' ability to use civic organizations for social support. Affluent participants more often discussed their involvement in committees and volunteer organizations, such as parks and civic boards, planning advisory committees, neighborhood block groups, charities, political campaigns, and veterans' organizations. Multiple high SES downtown-dwellers belonged to a community aging organization that provided robust social programs and classes for fee-paying members. If higher SES individuals are more readily able to access civic and social organizations for social support, then we hypothesize that said neighborhood resources play a larger role in shaping cognitive function among higher SES individuals.

Although the limited economic measures available in the REGARDS Study preclude a thorough analysis of this hypothesis, we can utilize educational attainment as a marker of SES to examine a potential interaction between cognitive function, neighborhood civic and social organizations, and personal socioeconomic status. For this exploratory analysis, we re-fit the models described in the main text, and additionally allowed for the smooth effect of civic/social organization kernel density to differ between respondents who had completed a college degree (n = 8,016) and those who had not (n = 13,135). These models are conditional on the covariates and random terms described in the main text. We again summarize results using predicted values derived from our models.

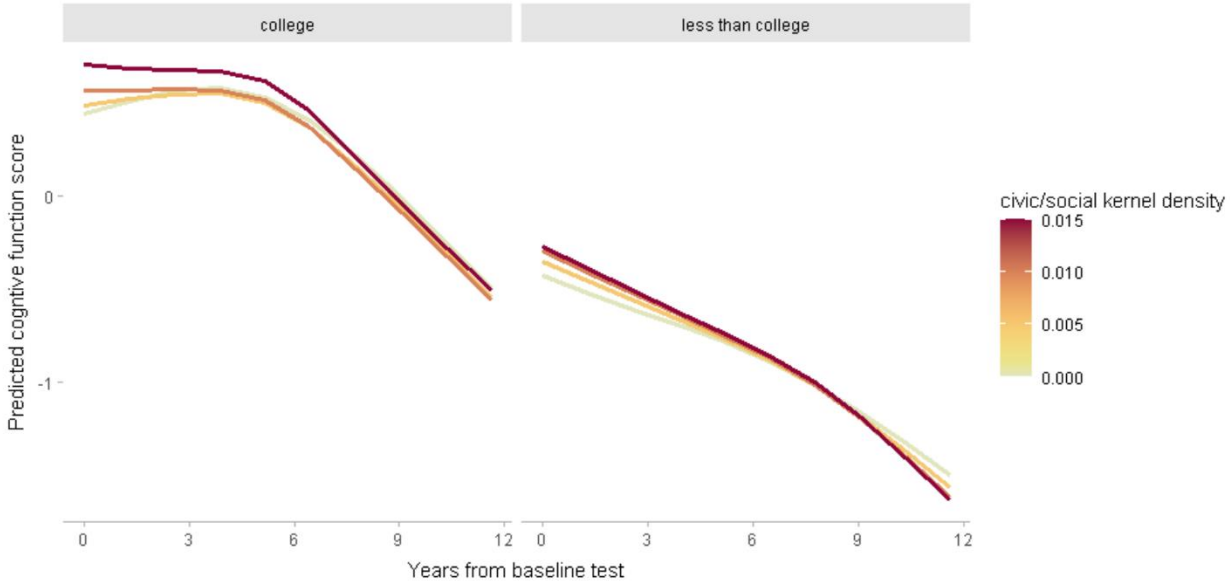
Supplementary Figure 2 summarizes a model that allows for the strength of the association among cognitive function and neighborhood civic and social organization kernel density to vary by educational attainment. Here, we see evidence which suggests that the association between neighborhood social infrastructure and cognitive function is conditional on educational attainment. Indeed, college educated individuals who lived in areas with little to no access to social organizations displayed predicted cogntive test scores of approximately 0.40, while college educated individuals who lived in areas that were densely packed with civic and social organizations had estimated cognitive test scores of approximately 0.80. In contrast, individuals without college degrees who were situated in neighborhoods with few social organizations displayed estimated cognitive scores of roughly -0.6, while individuals without college degrees who lived in areas with many civic and social organizations had predicted cognitive scores of

approximately -0.5. Altogether, this analysis hints that cognitive function is more dependent on neighborhood social infastructure among college educated individuals than it is among non-college educated individuals.



Supplementary Figure 2: Predicted cognitive function scores across a range of civic and social organization kernel densities by educational attainment. Note: 90% uncertainty intervals are marked by shaded regions. All additional model covariates (e.g., race, gender) are held constant at their medians or modes. Predictions are displayed for individuals between the 1st and 99th percentile of observed kernel densities.

Supplementary Figure 3 summarizes a second model that allows for REGARDS respondents' cognitive trajectories over time to vary jointly by educational attainment and civic/social organization kernel density. While education appears to have some influence on the shape of cognitive trajectories, we do not see evidence to suggest that neighborhood social infrastructure affects cognitive decline for either educational group. Indeed, within educational groups, the rate at which individuals' cognitive function declines over time appears to be largely similar across areas with different densities of civic and social organizations.



Supplementary Figure 3: Model predicted change in cognitive function across time by educational attainment and civic/social organization kernel density. All additional model covariates (e.g., race; gender) are held constant at their medians or modes.

While stronger theoretical models and richer measures of socioeconomic status are required to make more definitive statements about the complex interplay between cognitive function, interpersonal economic resources, and neighborhood social infrastructure, the results presented in this supplement demonstrate additional complexities that researchers should pursue to further complicate our understanding of how neighborhoods may be related to cognitive outcomes among older adults. Further qualitative research is needed to explicitly examine differential use and perceptions of social infrastructure among diverse older adults, and varying ways of navigating cognitive aging in community settings. Quantitative studies can focus exclusively on potential interactions of traits that confer power and privilege such as age, gender, race, ethnicity, and income/wealth. We encourage future researchers to build upon our exploratory work to examine if and how the association between cognitive function and neighborhood social infrastructure varies by social factors.