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Personal networks and cognitive health across rural–urban contexts

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Abstract

Objectives: **Prior research often reports geographic cognitive health disparities in later life, including across rural–urban contexts. Yet few studies have examined the role of personal social networks in shaping these geographic disparities. This study investigates whether social networks moderate or mediate the association between geographic context and cognitive health.**

Methods: **We use data from the Social Environment and Cognitive Health in Urban and Rural Areas study, which is a state representative sample of adults aged 55 and older. A latent measure of social bridging (i.e., connections to weak and diverse ties) was extracted using personal network data. Cognitive health was measured using the Montreal Cognitive Assessment (MoCA). Rurality was defined using the Indiana County Classification. Moderation and mediation pathways were tested using linear regression models.**

Results: **There were no observed rural–urban differences in MoCA scores. Yet the association between social bridging and MoCA was significantly stronger among rural participants compared to urban participants. Rural participants with the lowest levels of social bridging performed significantly worse on the MoCA compared to urban participants with similar bridging levels. These geographic disparities were not present when comparing rural and urban participants with high levels of social bridging.**

Discussion: **The ability to personally bridge social ties within a network appears to play a more critical role in the cognitive health of rural residents, who live in communities with fewer structural opportunities for social stimulation, compared to urban residents.**

Keywords: Social bridging, Moderation/mediation, Place, Disparity

Age-related cognitive decline is a widespread problem in the United States (Alzheimer's Association, 2024). Yet the risk of impairment is not uniformly distributed across the population, as evidenced by a long line of research documenting enduring geographic cognitive health disparities (Cassarino & Setti, 2015; Russ et al., 2012). Research in this area finds that people who live in communities with large and diverse populations and extensive social infrastructures that encourage community-building activities and events tend to exhibit fewer cognitive health issues compared to people who live in communities that are largely devoid of such structural opportunities (Clarke et al., 2015; Goldman et al., 2025; Roth et al., 2025). These geographic distinctions are important for understanding health disparities because they disproportionately expose residents to socially stimulating environments that are shown to improve cognitive resilience (Ferraro & Han, 2025; Finlay et al., 2022; Hyun et al., 2025).

An adjacent literature builds on these findings to explore whether people who live in rural communities, which tend to have limited structural opportunities for social life (Rhubart et al., 2022; Sun et al., 2025), exhibit similar cognitive health outcomes compared to people who live in urban communities. Although multiple studies find that rural residents are more likely to experience cognitive health issues compared to urban residents (Kramer et al., 2025; Taylor et al., 2017; Weden et al., 2018), the magnitude of these findings is often modest. For example, using nationally representative data from the Health and Retirement Study, Lawrence et al. (2023) found a rural disadvantage in cognitive function of only about 0.08 standard deviations.

Despite the widespread attention to people's place of residence, few studies consider the multilevel nature of what it means to live and socialize within a community. Whereas the concept of rurality represents a macro-level feature of the social environment that provides structural opportunities for social exposure, it obfuscates the fact that people simultaneously occupy meso-level social environments that reflect a personalized set of exposures. Although there are numerous conceptualizations of the meso-level social

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environment, we direct attention to personal networks (i.e., webs of relationships surrounding focal individuals). These networks are particularly relevant in the cognitive health context because they directly expose people to protective social stimuli and resources in ways that the mere structural presence of the macro-level environment does not guarantee (Bianchi et al., 2023; Peng et al., 2021; Perry et al., 2022). Socially derived cognitive stimulation is our primary focal mechanism, but personal networks may also influence cognitive health through social support, stress buffering, and health-related behaviors. Although these mechanisms operate through micro-level individual experiences and behaviors, the social stimuli and resources that shape them arise from and are conveyed through the meso-level personal network environment.

Older adults are therefore simultaneously embedded in a macro-level geographic context that structures broad opportunities for social exposure and a meso-level personal network environment that shapes the specific social stimuli and resources encountered at the micro level. We examine two theoretically distinct pathways linking these environments to cognitive health (Figure 1). First, the moderation pathway suggests that the relationship between personal networks and cognitive health varies across settings (Peng & Perry, 2026; Roth & Perry, 2026). This pathway assumes that networks will exert a stronger influence in rural communities where structural opportunities for cognitively stimulating social activities are typically more limited (Rhubart et al., 2022; Sun et al., 2025). Residents in these communities may therefore leverage their personal stocks of social resources to compensate for the structural disadvantages of their communities. Second, the mediation pathway posits that residential location conditions the types of networks in which people are embedded (Blau, 1977; Small & Adler, 2019). Residents who live in urban communities that are large and densely populated with abundant social infrastructures have easier access to a wide range of potential network members compared to those who live in rural communities. The mediation pathway therefore assumes that geographic residence will influence personal network formation, which will subsequently explain cognitive health disparities.

In the present study, we analyze data from the Social Environment and Cognitive Health in Urban and Rural Areas study to examine the role of personal networks—specifically the ability to bridge social ties within a network—in cognitive health among older adults residing across urban and rural communities. Upon investigating the two distinct pathways, we find evidence of the moderation pathway such that older adults residing in rural communities exhibit a considerably stronger positive relationship between social bridging and cognitive health than their urban counterparts. These findings suggest that the benefits of personal networks are not universal but instead depend on the rural–urban context in which older adults live.

Rural-urban context

Although there are many competing classifications that separate communities into rural and urban categories, it is generally agreed that rural communities, on average, are characterized by their population demographics (e.g., lower population density and less diverse populations) and a relative lack of structural opportunities for social life—two unique characteristics that often co-exist within geographic spaces. Indeed, sparsely populated communities have been shown to have fewer social infrastructures (i.e., formal spaces that induce social interactions between residents) than densely populated communities (Rhubart et al., 2022). These same communities tend to consist of relatively homogeneous populations (Lichter et al., 2023; Martin et al., 2017; Slack & Monnat, 2024). Taken together, this implies that residents of rural communities have fewer structural opportunities for stimulating social experiences than their urban counterparts via the former's relative lack of a diverse local population and the infrastructures that bring people together. These structural differences—which may prompt residents to cognitively engage with their surroundings—may partially explain the previously documented cognitive health disparities occurring across

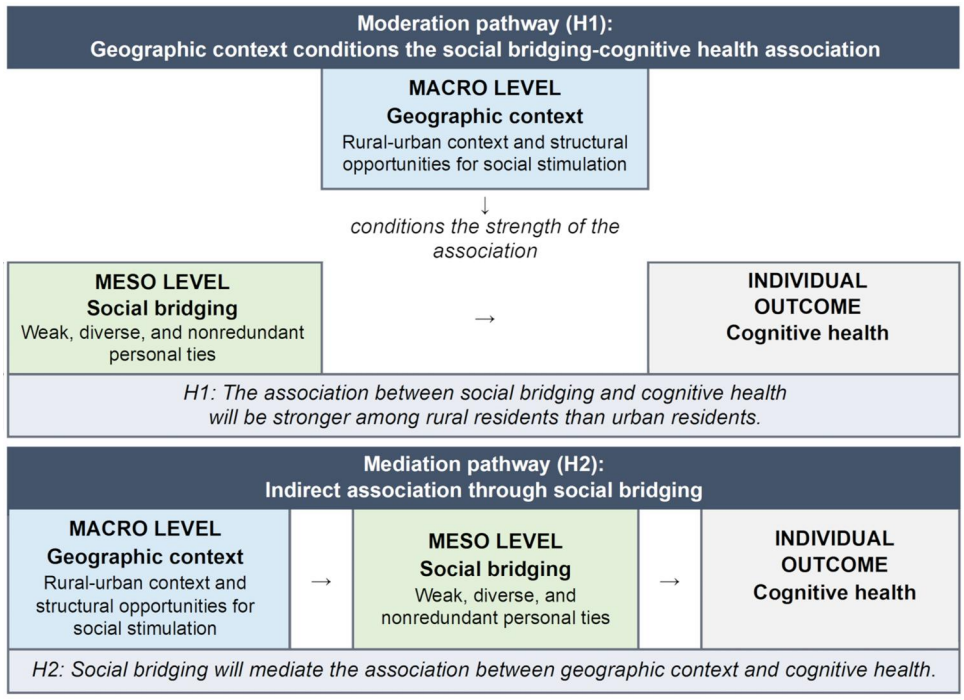


Figure 1 Conceptual framework linking macro-level geographic context, meso-level social bridging, and cognitive health.

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the rural–urban context (Kramer et al., 2025; Lawrence et al., 2023; Taylor et al., 2017; Weden et al., 2018).

At the same time, these geographic differences should not be interpreted as uniform or deterministic, as there is considerable heterogeneity within urban and rural communities (Slack & Monnat, 2024; Small et al., 2018). Some urban communities are resource-deprived, socially isolating, or characterized by stressors such as crime and residential instability, which may undermine cognitive health through multiple pathways, including reduced opportunities for cognitive stimulation and increased chronic stress (Clarke et al., 2015; Finlay et al., 2022). Conversely, certain rural communities may indirectly offer cognitive health advantages such as a strong ecosystem of cohesive social infrastructures (Whitham, 2012; Wuthnow, 2013). Equally important is the fact that people have unique social experiences within the same community. For instance, one rural resident may routinely interact with friends at a café, acquaintances at a yoga class, and extended family in their nearby homes throughout a typical week, whereas another resident of the same community may primarily stay within the confines of their own home, only socializing with their immediate family. These divergent experiences may subsequently have long-term health implications, especially when contextualized within the broader macro-level context of living in a rural community. In the following section, we explore how one specific type of meso-level social environment is particularly relevant for cognitive health.

Personal networks and cognitive health

The Lancet Commission on Dementia Prevention, Intervention, and Care identifies social connectedness as a leading modifiable risk factor, accounting for roughly 5% of dementia cases (Livingston et al., 2024). Meta-analyses confirm robust associations between social connectedness and cognitive health (Piolatto et al., 2022). Most of these types of studies rely on broad indicators of connectedness such as contact frequency with family and friends or participation in organized activities. Recent work, however, has moved toward using a personal network methodology to capture the unique social worlds that each individual participant inhabits (Bianchi et al., 2023; Peng & Perry, 2026; Perry et al., 2022). A hallmark of this methodology is the systematic collection of detailed data on the structure, composition, and functional content of individuals' social ties, enabling researchers to move beyond proxy indicators and examine specific relational mechanisms. These approaches generate measures such as tie strength, network diversity, and patterns of interconnection among network members, thereby providing a direct account of the meso-level social environment.

One dimension of particular importance is social bridging (i.e., connections to weak, diverse, and non-overlapping ties), which provides exposure to novel information, environments, and social stimuli (Peng et al., 2022; Perry et al., 2022). Rooted in classic network theory, weak ties and structurally expansive networks facilitate access to nonredundant information and perspectives, while role diversity further broadens exposure to varied social interactions across distinct social groups (Burt, 2009; Granovetter, 1973). Indeed, the cognitive reserve hypothesis, which posits that cognitively stimulating environments promote resilience in later life (Stern, 2012), implies that interacting with bridging ties requires greater use of social cognitive skills such as emotion recognition, face memory, and theory of mind compared to exchanges with close others. These cognitively demanding interactions may therefore strengthen cognitive reserve capacity and, in turn, help delay the onset of decline even in the presence of neurodegeneration (Krendl et al., 2024; Peng et al., 2022). Indeed, prior research shows that less redundant networks, greater diversity in relationship types, larger network size, and the presence of weak ties are associated with better cognitive function (Peng et al., 2021; Perry et al., 2022).

Despite extensive research on social bridging and cognitive impairment, few studies have examined whether the formation and function of personal networks vary by place of residence (cf. Roth & Perry, 2026). This gap is important for two reasons. First, the benefits of social bridging may be elevated in rural communities that, on average, offer limited structural opportunities for novel and stimulating social interactions. Second, rurality represents a macro-level environment that shapes people's opportunities to develop bridging ties, potentially contributing to geographic differences in cognitive function. The following subsections build on these two distinct assumptions by outlining the moderation and mediation pathways through which social bridging may contribute to rural–urban variation in cognitive function.

Moderation pathway

Rural and urban communities differ in the cognitive stimulation they afford. Urban residents are generally exposed to a wider range of novel social interactions through employment, leisure, and community engagement (Rhubart et al., 2022; Sun et al., 2025). This perspective would hold that older adults residing in urban communities are likely to indirectly encounter cognitively stimulating experiences through the broader social and physical milieu of city life. As a result, the benefit of social bridging for cognitive health may be relatively small in urban settings where stimulation from the surrounding environment is already abundant (Cassarino & Setti, 2015). In contrast, rural residents are more likely to face structural constraints such as limited access to diverse populations and social infrastructures that reduce their exposure to stimulating environments. Therefore, personal networks—specifically networks that offer the ability to bridge diverse social ties—may become a compensatory pathway within rural communities. In other words, connecting with a non-overlapping group of people from different backgrounds may provide rural residents with access to novel information, perspectives, and activities that are disproportionately lacking within their community. This mechanism aligns with the compensation model, which states that a scarcity of institutional and environmental sources of stimulation prompts individuals to rely more heavily on interpersonal networks to fulfill similar functions (Peng & Perry, 2026). Taken together, these insights suggest that the cognitive benefits of social bridging may be contingent on the communities in which people reside. We therefore hypothesize the following:

H1: The association between social bridging and cognitive health will be stronger among rural residents than urban residents.

Mediation pathway

An alternative perspective points to a longstanding tenet of social network theory, which states that individuals must come into contact before they can form a social tie (Blau 1977). Social networks are therefore posited to be a function of where individuals live (Feld, 1981; Small & Adler, 2019). This claim finds support in a number of studies that show that individuals residing in rural communities tend to have slightly smaller and more densely interconnected personal networks than those residing in urban communities (Beggs et al., 1996; Roth et al., 2022). There are three broad mechanisms that guide this perspective on network formation.

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First, the composition of a community determines the potential pool of network members from which one can activate social ties (Blau, 1977). An individual who resides in a community characterized by a small and homogeneous population has a low probability of forming a personal network consisting of non-overlapping and diverse ties (i.e., gaining access to social bridging) given that most people in their community likely either know or recognize one another and share similar traits. Conversely, an individual who resides in a community with a large and diverse population has a higher probability of forming such networks. Second, a long line of sociological research notes that individuals tend to meet and form ties in areas of focused activity (Feld, 1981). Social infrastructures such as restaurants, cafés, gyms, and civic organizations often serve as such points of contact because they provide contexts in which community members come into close proximity with one another and may form ties through repeated interactions (Rhubart et al., 2022; Roth & Peng, 2024). Third, the distance separating people from one another and from the social infrastructures in which they are likely to interact has also been shown to influence network formation (Small & Adler, 2019). Individuals who are spatially distant from one another are less likely to come into repeated contact and therefore less likely to form a social tie.

Collectively, these three mechanisms imply that rural residents are likely to have less access to social bridging within their personal networks compared to urban residents because the latter live in communities that provide greater access to a diverse network of people who live nearby. Based on the knowledge that social bridging is closely associated with cognitive health (Perry et al., 2022), we formulate the following hypothesis:

H2: Social bridging will mediate the association between geographic context and cognitive health.

Method

Data come from the Social Environment and Cognitive Health in Urban and Rural Areas (SECHURA) study, a state-representative sample of Indiana residents aged 55 and older (Roth et al., 2026). Indiana has a population of 6.8 million people, with its largest metropolitan area located in the center of the state. Compared to coastal states, Indiana's urban system is dominated by small- and mid-sized cities with nearly all residents living within 45 miles of a metropolitan area (Devaraj et al., 2022). The spatial structure of the state, which reduces the degree of separation between rural and urban populations, provides a relatively conservative test of rural–urban differences.

Between November 2023 and March 2024, SECHURA conducted a computer-assisted in-person interview (CAPI) survey with 509 participants, yielding a 61% response rate. Weights were provided to adjust for nonresponse and sampling structure to ensure it is representative of Indiana residents aged 55+. A central aim of the study was to address the social environments in which participants are embedded. This included the macro-level environment (i.e., communities) and the meso-level environment (i.e., personal networks).

Measures

Cognitive health

Immediately after providing the network data, participants completed a series of cognitive assessments. We used the Montreal Cognitive Assessment (MoCA-22), a widely used cognitive screening tool, as our dependent variable. The MoCA-22 is a shortened version of the original MoCA (Nasreddine et al., 2005), which consists of 22 items that cover multiple cognitive domains, including memory, visuospatial ability, executive functions, attention, language, and orientation to time and place. Higher scores indicated better cognitive health. Scores ranged from 1 to 22 in the SECHURA sample. We conducted a sensitivity analysis in which we omitted participants who scored under a certain threshold on the MoCA to determine whether participant recall plays a role in our initial findings.

Social bridging

The personal network module was placed at the beginning of the CAPI survey to minimize recall fatigue. Participants were presented with name-generating prompts designed to elicit the names of people who fulfilled specific roles in their lives. Four name generators were used to elicit: (1) people with whom they discussed important matters, (2) people with whom they discussed their health, (3) people who tried to get them to do something about their health, and (4) people with whom they spent their free time. Participants could list an unlimited number of names for each generator and could name the same person across multiple generators. Following name generation, participants completed name-interpreting prompts, reporting each network member's gender, race/ethnicity, and age. They also indicated their relationship with each member (e.g., spouse, child, friend, coworker), the types of support provided (e.g., listening, advising, lending money), and the strength of the relationship on a 1-to-10 scale. Finally, participants reported how well each network member knew the others ("don't know each other," "not very close," "sort of close," "very close").

Data from the network module were used to construct the social bridging measure, which was operationalized as a latent variable using indicators of structural holes (e.g., density, effective size, and sole bridge status), the diversity of social roles in the network (i.e., number of different types of social relationships), weak ties (i.e., minimum tie strength), and overall size (i.e., total number of network members named) (Peng et al., 2021). See Supplementary Material (Methods S1) for a detailed description of these measures. We chose a latent variable approach because these indicators are highly correlated, and this method captures the underlying construct while accounting for shared variance among indicators. The overall fit statistics for confirmatory factor analysis (CFA) suggested a very good model fit of this latent social bridging measure (CFI = 0.998, which surpasses the 0.95 cut-point; TLI = 0.992, which surpasses the 0.95 cut-point; and RMSEA = 0.039, which met the threshold of RMSEA <0.08); see Figure S1 for factor loadings of CFA.

Geographic context

We measured geographic context at the county level because this offers a more complete picture of one's community than focusing directly on their residential neighborhood. Although there are many national classifications dividing counties into rural–urban categories, we relied on the Indiana County Classification (ICC) because it was developed specifically for the local context (Ayres et al., 2012). The ICC separates Indiana's counties into either "urban," "mixed," or "rural" based on a combination of population density, size of the county's largest municipality, and a subjective indicator of how residents view their home county. SECHURA participants reside within 41 of the state's 92 counties (17 urban counties, 5 mixed counties, and 19 rural counties). Given the small number of participants who reside in "mixed" counties ($n = 43$), we combined these participants into the "urban" category for our main analysis.

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Next, we reran our original analysis but substituted the ICC variables with the following county-level variables that theoretically epitomize the relevant differences between rural–urban communities as they pertain to cognitive health: population density, racial heterogeneity, restaurant rate, gym rate, civic/social organization rate, and household income for each county. These variables provide a macro-level account of potential exposure to large and diverse populations as well as social infrastructures, both of which have been demonstrated to provide cognitive benefits (Finlay et al., 2022; Hyun et al., 2025; Roth et al., 2025). See Supplementary Material (Methods S2) for details on the construction of variables used in the sensitivity analysis.

Finally, we explored several alternative operationalizations of geographic context as part of a sensitivity analysis. This included retaining mixed counties as a separate group based on the ICC's original classification as well as applying a rural–urban distinction to the census-tract level. For this latter analysis, we used the Rural–Urban Commuting Area (RUCA) codes, which allowed us to investigate whether our findings hold when operationalizing geographic context at a finer-grained level than county. The RUCA classifies all U.S. census tracts into the following 10 categories: metropolitan core, metropolitan high commuting, metropolitan low commuting, micropolitan core, micropolitan high commuting, micropolitan low commuting, small town core, small town high commuting, small town low commuting, and rural area. We followed the Economic Research Service's recommendations for a binary split and used the first three categories to indicate that participants live in an urban census tract (Dobis & Sanders, 2025).

Covariates

We included the following covariates in our final models: age (years), gender (man/woman), race (White/non-White), education (less than high school, high school or GED, some college or technical school, or college graduate), 15-item Geriatric Depression Scale (Sheikh & Yesavage, 1986), and functional activity limitation measured using a 10-item scale (e.g., assembling tax records, buying groceries, heating water, preparing a meal, and traveling out).

Analytic strategy

Social bridging was modeled using a two-step approach (Bollen, 2002). First, we used latent variable modeling to generate a factor score for social bridging that we incorporated into the linear regression models. As part of the regression analysis, we interacted the rurality and social bridging variables to examine whether rurality moderates the association between social bridging and cognitive health (H1), while adjusting for covariates. We then conducted a mediation analysis to examine whether social bridging mediates the relationship between rurality and cognitive health (H2). Specifically, we used the causal mediation method (VanderWeele, 2015), which accounts for the possibility of moderated mediation. All covariates were included in the mediation models. Finally, we ran a series of sensitivity analyses using alternative geographic measures as well as a set of models where we omitted participants who scored below a certain threshold on the MoCA. There were no missing data for any variables in the regression models. We applied survey weights to adjust for nonresponse and oversampling of some groups. All analyses were conducted in Stata 19. Code is available at https://github.com/PengSiyun/Networks-and-Cognitive-Health-Across-Rural-Urban-/tree/main.

Results

Table 1 presents descriptive statistics for the analytic sample ($n = 509$), stratified by urban ($n = 305$) and rural ($n = 204$) residence. Mean age differed significantly by residence ($p < .01$), with urban residents being younger on average (M = 68.23, $SD = 9.13$) than rural residents (M = 72.26, $SD = 9.53$). Racial identity also varied substantially ($p < .001$), with 80% of urban participants identifying as White, compared to nearly all participants in rural counties. No geographic difference was observed for education. Contrary to prior studies, we found no observed geographic difference in cognitive health as measured by the MoCA. Moreover, there was no difference in social bridging across geographic contexts. The latter finding fails to provide initial support for the mediation pathway, which assumed that rural residents would have lower access to social bridging within their personal networks than urban residents.

Table 2 shows the output from linear regression models that regress MoCA on rurality, social bridging, and covariates. Similar to the bivariate comparisons in Table 1, rurality was not independently associated with MoCA (Model 1, $\beta = 0.05$, $SE = 0.40$, $p > .05$). However, this null finding belies the underlying relationship between geographic context and cognitive health that emerged in Model 2. In this latter model, there was a significant interaction term between geographic context and social bridging ($\beta = 0.56$, $SE = 0.18$, $p < .01$). When interpreted alongside the main effects, this interaction term indicates that rural residents with higher levels of social bridging (+2 *SD*) were predicted to score over 2 points higher on the MoCA than rural residents with lower levels of social bridging (−1 *SD*). Conversely, urban residents who had higher levels of social bridging (+2 *SD*) were predicted to score only 0.5 points higher on the MoCA compared to urban residents with lower levels of social bridging (−1 *SD*). These trends, which are visualized in Figure 2, broadly support H1. More specifically, this suggests that, while rural residents appear to benefit disproportionately from greater social bridging, they are simultaneously harmed by an absence of social bridging (via their personal networks) in a way that urban residents are not.

The descriptive results in Table 1 showed no significant difference in cognitive health by rurality. Thus, a mediation effect of social bridging would not be expected unless a suppression effect existed. Consistent with this assumption, the formal mediation analysis revealed no statistically significant mediation effect, as shown by the natural indirect effect in Table 3. Thus, there was no evidence supporting H2.

Our conceptual models that informed the analysis presented in the prior tables assumed that rural and urban counties differ in the demographic composition of their populations as well as their availability of social infrastructure. Although this assumption is consistently reported within the rural–urban literature (Lichter et al., 2023; Rhubart et al., 2022), we nevertheless conducted our own analysis to ensure that this provides an accurate representation of the counties used in our sample. A bivariate comparison of rural and urban counties (as classified by the ICC) showed that, on average, rural counties were significantly less densely populated ($p < .001$), less racially heterogeneous ($p < .001$), and had lower household income ($p < .05$) than urban counties. Moreover, rural counties have significantly lower rates of restaurants ($p < .001$) and gyms ($p < .01$) than urban counties but significantly higher rates of civic and social organizations ($p < .05$). See Table S1 for further details on these comparisons.

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Table 1 Descriptive statistics ($n = 509$).

Variables	Urban ($n = 305$)				Rural ($n = 204$)				*F*-test
	%	Mean	*SD*	Range	%	Mean	*SD*	Range	
Women	48				49				
Age		68.23	9.13	55–96		72.26	9.53	55–102	**
White	80				100				***
Education									
Less than HS	10				13				
HS or GED	30				33				
Some college	30				29				
College	29				25				
Depressive symptoms		2.88	2.72	0–14		3.38	2.91	0–14	
Functional activity limitation	54				56				
Cognitive health		17.01	3.16	8–22		16.88	3.38	1–22	
Social bridging		0.13	1.21	−1.84–6.91		0.06	0.87	−1.76–4.12	

Note. *SD* = standard deviation; HS = high school; GED = general educational development.
*$p < .05$. **$p < .01$. ***$p < .001$.

We next reran the interaction models but substituted the ICC variable with the county demographic and social infrastructure variables. These models were used to help determine whether the previously observed interaction between rurality and social bridging was operating through the presence of a specific macro-level construct (e.g., population density) or whether there is something holistic about rural communities that facilitates the moderation pathway more broadly. We found evidence that population density, racial heterogeneity, restaurant rates, and gym rates (but not civic organization rates) all significantly interact with social bridging such that there is a stronger relationship between bridging and MoCA scores among participants who reside in counties that have fewer structural opportunities for diverse social stimulation via demographic composition or social infrastructures (with the exception of civic organizations). See Table S2 for the regression table and Figures S2–S6 for visualization of the predicted MoCA values from these interaction terms.

Sensitivity analyses

It is important to conduct diagnostic checks to ensure that our interaction estimates are robust (Hainmueller et al., 2019). As shown in Figure S7, the distribution of social bridging is right-skewed, particularly among urban residents, raising potential concerns about extrapolation at extreme values. To address this issue, we categorized social bridging into quartiles to reduce the influence of extreme observations and ensure adequate representation across groups. As illustrated in the bottom panel of Figure S8, this transformation yielded a more balanced distribution of social bridging across rural and urban residents, thereby mitigating concerns about common support and extrapolation. Figure S9 shows an interaction pattern consistent with our main findings, indicating that our interaction results are robust to these potential issues; see Table S3 (Model 1) for full results.

There may also be concern that our results are vulnerable to the modifiable areal unit problem such that we may be misconceptualizing the appropriate areal level of the social environment. It is possible that counties are too spatially broad to accurately capture people's social exposures and obfuscate important within-area heterogeneity. We therefore conducted a sensitivity analysis at the census tract level using the RUCA code as a marker of rurality. As shown in Figure S10 (see Table S3, Model 2 for full model details), results were substantively unchanged. Geographic context continued to interact significantly with social bridging, with the strongest association between

Table 2 Linear regression models predicting MoCA ($n = 509$).

Variables	Model 1	Model 2
Women	0.899**	0.924**
	(0.325)	(0.322)
Age	−0.079***	−0.077***
	(0.017)	(0.017)
White	1.980***	2.037***
	(0.528)	(0.533)
Education (ref. = less than HS)		
HS or GED	2.203**	2.177**
	(0.745)	(0.744)
Some college	3.101***	3.023***
	(0.631)	(0.624)
College	3.738***	3.648***
	(0.616)	(0.624)
Depressive symptoms	−0.173**	−0.173**
	(0.064)	(0.064)
Functional activity limitation	−0.535	−0.623
	(0.514)	(0.500)
Social bridging	0.332*	0.170
	(0.127)	(0.129)
Rural	0.051	−0.016
	(0.404)	(0.334)
Rural* Social bridging		0.555**
		(0.184)
Constant	18.421***	18.360***
	(1.569)	(1.582)
Observations	509	509
***R*-squared**	0.350	0.356

Note. MoCA = Montreal cognitive assessment; ref. = reference group; HS = high school; GED = general educational development. Standard errors in parentheses.
*$p < .05$. **$p < .01$. ***$p < .001$.

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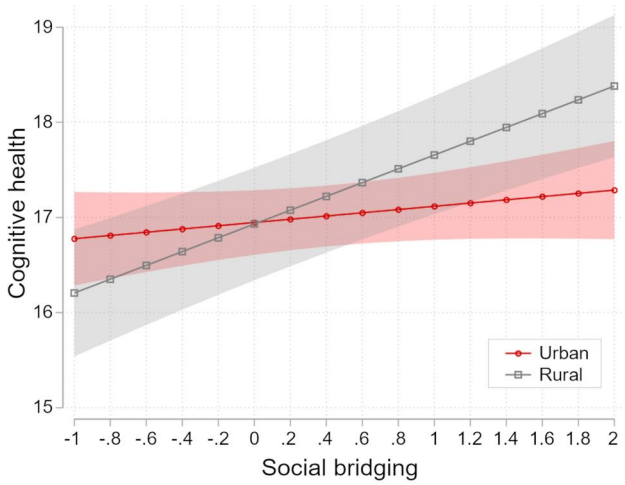


Figure 2 Predicted mean cognitive health across levels of social bridging, by county-level rurality ($n = 509$).

Table 3 Linear regression–based causal mediation analysis of social bridging as a mediator between rurality and cognitive health ($N = 509$).

Variables	Cognitive health
Natural indirect effect	
Rural vs urban	−0.027 (0.136)
Natural direct effect	
Rural vs urban	0.051 (0.476)
Total effect	
Rural vs urban	0.024 (0.491)

Note. Standard errors are in parentheses.

these two variables and the outcome observed among rural residents. This suggests that the moderation pathway is robust to both county-level and census tract–level measures of rurality. We applied the same recoding of rurality to the mediation analysis, and the mediation effect remained statistically insignificant (see Table S4).

Rather than limiting the comparison to participants residing in rural and urban counties, we reran the original models but parsed the counties into the three ICC categories (rural, mixed, and urban) as a sensitivity check. As shown in Figure S11 (full model details in Table S3, Model 3), the results remained substantively unchanged. Social bridging continued to significantly moderate the association between geographic context and cognitive health, with the strongest association observed among rural residents. This finding suggests that the observed interaction is robust to alternative specifications of county-level rurality. Applying the same specification to the mediation analysis yielded a similarly non-significant mediation effect (Table S4, Model 3).

Another potential concern was that cognitively impaired participants may not be able to accurately report their social networks. Prior research suggests that older adults with a MoCA score of 10 or higher can reliably report their network characteristics (Roth et al., 2021). Accordingly, we conducted a sensitivity analysis excluding participants with MoCA scores below 10 (corresponding to <8 on the MoCA-22). As shown in Figure S12 (full model details in Table S3, Model 4) and Model 4 in Table S4, both the moderation and mediation results remained essentially unchanged, indicating that the observed effects are robust.

Discussion

The present study situated cognitive health within a multilevel framework in which individuals are simultaneously embedded in a macro-level social environment defined by their residential communities and a meso-level social environment defined by their personal networks. A key strength of this study was its inclusion of rural residents—a hard-to-reach and often underrepresented population in cognitive aging and network research. This feature allowed us not only to examine the role of social connectedness in cognitive health but also to shed light on mechanisms of rural–urban health disparities. Specifically, we assessed whether personal stocks of social bridging moderate or mediate the association between rurality and cognitive health. Several noteworthy findings emerged.

Whereas prior research using large-scale data has shown that older adults residing in rural communities are more likely to experience cognitive impairment and dementia incidence (Kramer et al., 2025; Weden et al., 2018), participants in our sample recorded similar levels of cognitive function across geographic contexts, both in bivariate analyses and after adjusting for relevant covariates. Our finding is consistent with the modest effect sizes reported in previously documented rural disadvantages in cognitive function—e.g., 0.08 standard deviations in the Health and Retirement Study sample as reported in Lawrence et al. (2023). In our sample, rural residents exhibit 0.04 standard deviations lower cognitive function than urban residents. This suggests the rural–urban difference is small in magnitude and may reach statistical significance only in larger samples.

The absence of a statistically significant average difference may also reflect the geographic setting represented in the present study. Indiana's urban system is dominated by small- and medium-sized cities, and most rural communities are located relatively close to metropolitan areas. The state's rural–urban continuum may therefore be less polarized than that of states containing very large metropolitan centers or highly remote rural regions. This comparatively compressed rural–urban contrast may contribute to the similar average cognitive scores observed across rural and urban participants and limits the extent to which the average geographic difference can be generalized to all U.S. settings.

Given the absence of significant rural–urban differences in cognitive health within our sample, it is not surprising that we find no evidence of a mediating pathway. However, our analysis revealed a significant interaction between social bridging and cognitive health. Rural residents appeared to derive more cognitive stimulation from their personal networks than their urban counterparts. This finding underscores the theoretical importance of taking a multilevel approach to understanding the interplay between the social environment and cognitive health. As our analysis shows, the rural counties in our sample were structurally limited in the opportunities they can provide for cognitively stimulating social activity via a combination of population diversity and social infrastructure. Thus, residents with low levels of social bridging within such communities appear to be experiencing a double disadvantage in that they cannot adequately build up cognitive resilience via either level of their social environments. However, rural residents who managed to maintain a high degree of social bridging fared significantly better because they are able to draw on their personal networks to substitute for the presumptive lack of cognitively beneficial resources within their communities. This interpretation relies on theoretical insights arguing that personal

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connections that bridge social worlds provide access to novel information, roles, and perspectives that build cognitive reserve (Bianchi et al., 2023; Perry et al., 2022). Moreover, our findings align with the compensation model, which suggests that cognitively demanding social exchanges help offset deficits in other environmental resources (Peng & Perry, 2026).

In contrast, our analyses revealed that urban residents appear to rely less on social bridging for cognitive stimulation. This implies that living in an urban community confers cognitive benefits that extend beyond one's personal network (Cassarino & Setti, 2015). Over the course of a typical day, an urban resident might ride public transportation, visit a crowded market, wait in line at a bank, walk through a park, and dine at a busy restaurant. The accumulation of these social exposures—each providing opportunities to observe or interact with diverse people and situations (Fingerman et al., 2020; Roth & Peng, 2024)—can itself serve as a form of cognitive stimulation, even in the absence of direct engagement within one's personal network (Hyun et al., 2025). Indeed, urban participants within our sample lived in counties that had denser and more racially diverse populations as well as higher rates of social infrastructure such as restaurants and gyms.

The supplemental contextual analyses further refine this interpretation. The association between social bridging and cognitive health was stronger in counties with lower population density, less racial heterogeneity, and fewer restaurants and gyms. These findings suggest that the cognitive relevance of social bridging depends more specifically on the types of structural opportunities available for diverse, novel, and incidental social exposure. Thus, even if the precise rural–urban contrast observed in Indiana does not generalize to all U.S. settings, the underlying structural process may be relevant to rural or urban communities characterized by similarly limited opportunities for such exposure.

There are several limitations to this study. First, the cross-sectional design limits our ability to establish temporal ordering or causality among geographic context, social bridging, and cognitive health. We cannot examine whether within-person changes in social bridging are related to changes in cognitive health or determine whether geographic residence shapes personal network formation, which subsequently influences cognitive health, as proposed by the mediation pathway. The observed associations may also reflect reverse or reciprocal processes, whereby lower cognitive function, including mild cognitive impairment, constrains network size and diversity. This process may be particularly consequential in rural settings, where opportunities to form or replace social ties may be more limited. Thus, the mediation analysis should be interpreted as assessing whether the observed associations are consistent with the proposed pathway rather than establishing its direction or temporal sequence. Second, because the sample consists primarily of cognitively normal adults, the findings may not generalize to individuals with mild cognitive impairment or dementia and should be replicated in those populations. Third, because the sample is representative of older adults in Indiana, the magnitude of the rural–urban differences may not generalize to states with very large metropolitan centers, highly remote rural regions, or sharper geographic inequalities. Nevertheless, the consistency of the interaction across population density, racial heterogeneity, and several forms of social infrastructure suggests that the underlying process may extend beyond the rural–urban classification itself. Replication across geographically diverse U.S. settings is needed to evaluate this possibility. Fourth, social bridging captures only one dimension of social connectedness. Our measure reflects structural and relational features of personal networks, including network size, role diversity, weak ties, and non-redundant ties, but does not capture other dimensions such as relationship quality, perceived support, loneliness, or negative interactions. Future research should examine how these dimensions operate alongside social bridging and whether their associations with cognitive health also vary across geographic contexts. Finally, we did not have data on participants' residential histories and therefore cannot assess their duration of exposure to rural or urban contexts. Future research should adopt a life course perspective by incorporating residential histories across early adulthood, midlife, and older age. This would allow researchers to assess whether cumulative exposure to rural and urban environments shapes personal networks and cognitive trajectories.

Ultimately, this study demonstrates that the cognitive benefits of social bridging are amplified in rural communities where personal networks may compensate for limited institutional and environmental resources. By situating social bridging within a geographic context, our findings contribute to a more nuanced understanding of how social and structural forces jointly shape cognitive aging. Efforts to reduce cognitive health disparities should consider strategies that foster bridging ties and expand the social worlds of older adults, particularly in under-resourced communities.

Supplementary material

Supplementary material is available at *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* online.

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Conflicts of interest

A. R. Roth is the organizer of the supplement in which this article is published but was not involved in the manuscript's review process or decision to accept it for publication. Other authors have no conflicts to declare.

Data availability

This study was not preregistered. SECHURA data will be made available upon request at a future date.

Ethics approval

The SECHURA study was approved by the Institutional Review Board at Indiana University (IRB-IUB-16000) and exempted by the Institutional Review Board at Oklahoma State University (IRB-22-351).

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References

Alzheimer's Association. (2024). 2024 Alzheimer's disease facts and figures. *Alzheimer's & Dementia*, *20*, 3708–3821. https://doi.org/10.1002/alz.13809

Ayres, J., Waldorf, B., McKendree, M., & Hoelscher, L. (2012). Defining rural Indiana—The first step. *Purdue Center for Rural Development. EC-766-W.* http://www.extension.purdue.edu/extmedia/ec/ec-766-w.pdf

Beggs, J. J., Haines, V. A., & Hurlbert, J. S. (1996). Revisiting the rural–urban contrast: Personal networks in nonmetropolitan and metropolitan settings. *Rural Sociology*, *61*, 306–325. https://doi.org/10.1111/j.1549-0831.1996.tb00622.x

Bianchi, F., Piolatto, M., Marengoni, A., & Squazzoni, F. (2023). Structure of personal networks and cognitive abilities: A study on a sample of Italian older adults. *Social Networks*, *74*, 71–77. https://doi.org/10.1016/j.socnet.2023.02.005

Blau, P. M. (1977). A macrosociological theory of social structure. *American Journal of Sociology*, *83*, 26–54. https://doi.org/10.1086/226505

Bollen, K. A. (2002). Latent variables in psychology and the social sciences. *Annual Review of Psychology*, *53*, 605–634. https://doi.org/10.1146/annurev.psych.53.100901.135239

Burt, R. S. (2009). *Structural holes: The social structure of competition*. Harvard University Press.

Cassarino, M., & Setti, A. (2015). Environment as 'Brain Training': A review of geographical and physical environmental influences on cognitive aging. *Ageing Research Reviews*, *23*, 167–182. https://doi.org/10.1016/j.arr.2015.06.003

Clarke, P. J., Weuve, J., Barnes, L., Evans, D. A., & Mendes de Leon, C. F. (2015). Cognitive decline and the neighborhood environment. *Annals of Epidemiology*, *25*, 849–854. https://doi.org/10.1016/j.annepidem.2015.07.001

Devaraj, S., Faulk, D., Hicks, M., Terrell, D., Wornell, E., Deckard, C., Pitzer, H., & Weiss, S. (2022). *The State of the Rural Economy in Indiana*. Center for Business and Economic Research. https://www.in.gov/ocra/files/State-of-the-Rural-Economy-Ball-State-Indiana_2022_Sept.pdf

Dobis, E., & Sanders, A. (2025). *Rural-Urban Commuting Area Codes—Users' Guide.* Economic Research Service. https://ers.usda.gov/data-products/rural-urban-commuting-area-codes/users-guide

Feld, S. L. (1981). The focused organization of social ties. *American Journal of Sociology*, *86*, 1015–1035. https://doi.org/10.1086/227352

Ferraro, K. F., & Han, B. (2025). Does cognitive capital reduce the risk of cognitive decline in later life? *Innovation in Aging*, *9*, igaf115. https://doi.org/10.1093/geroni/igaf115

Fingerman, K. L., Huo, M., Charles, S. T., & Umberson, D. J. (2020). Variety is the spice of late life: Social integration and daily activity. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *75*, 377–388. https://doi.org/10.1093/geronb/gbz007

Finlay, J., Esposito, M., Langa, K. M., Judd, S., & Clarke, P. (2022). Cognability: An Ecological Theory of neighborhoods and cognitive aging. *Social Science & Medicine*, *309*, 115220. https://doi.org/10.1016/j.socscimed.2022.115220

Goldman, A. W., Finlay, J., & Bea, M. D. (2025). Associations between U.S. county-level social infrastructure and dementia among Medicare beneficiaries, 2020. *Alzheimer's & Dementia: Behavior & Socioeconomics of Aging*, *1*, e70029. https://doi.org/10.1002/bsa3.70029

Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, *78*, 1360–1380. https://doi.org/10.1086/225469

Hainmueller, J., Mummolo, J., & Xu, Y. (2019). How much should we trust estimates from multiplicative interaction models? Simple tools to improve empirical practice. *Political Analysis*, *27*, 163–192. https://doi.org/10.1017/pan.2018.46

Hyun, J., Cerino, E. S., Katz, M. J., Lovasi, G., Lipton, R. B., & Sliwinski, M. J. (2025). Neighborhood bonding and bridging social capital, social activity participation, and short-term cognitive variability in later life. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *80*, gbaf157. https://doi.org/10.1093/geronb/gbaf157

Kramer, M., Cutty, M., Knox, S., Alekseyenko, A. V., & Mollalo, A. (2025). Rural–urban disparities of Alzheimer's disease and related dementias: A scoping review. *Alzheimer's & Dementia*, *11*, e70047. https://doi.org/10.1002/trc2.70047

Krendl, A. C., Peng, S., Hamilton, L. J., & Perry, B. L. (2024). Social and general cognition are uniquely associated with social connectedness in later life. *Psychology and Aging*, *39*, 644–657. https://doi.org/10.1037/pag0000831

Lawrence, E., John, S. E., & Bhatta, T. (2023). Urbanicity and cognitive functioning in later life. *Alzheimer's & Dementia*, *15*, e12429. https://doi.org/10.1002/dad2.12429

Lichter, D. T., Thiede, B. C., & Brooks, M. M. (2023). Racial diversity and segregation: Comparing principal cities, inner-ring suburbs, outlying suburbs, and the suburban fringe. *The Russell Sage Foundation Journal of the Social Sciences*, *9*, 26–51. https://doi.org/10.7758/RSF.2023.9.1.02

Livingston, G., Huntley, J., Liu, K. Y., Costafreda, S. G., Selbæk, G., Alladi, S., Ames, D., Banerjee, S., Burns, A., Brayne, C., Fox, N. C., Ferri, C. P., Gitlin, L. N., Howard, R., Kales, H. C., Kivimäki, M., Larson, E. B., Nakasujja, N., Rockwood, K., … Mukadam, N. (2024). Dementia prevention, intervention, and care: 2024 report of the Lancet Standing Commission. *Lancet*, *404*, 572–628. https://doi.org/10.1016/S0140-6736(24)01296-0

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Martin, M. J. R., Matthews, S. A., & Lee, B. A. (2017). The spatial diffusion of racial and ethnic diversity across U.S. counties. *Spatial Demography*, *5*, 145–169. https://doi.org/10.1007/s40980-016-0030-8

Nasreddine, Z. S., Phillips, N. A., Bédirian, V., Charbonneau, S., Whitehead, V., Collin, I., Cummings, J. L., & Chertkow, H. (2005). The Montreal Cognitive Assessment, MoCA: A brief screening tool for mild cognitive impairment. *Journal of the American Geriatrics Society*, *53*, 695–699. https://doi.org/10.1111/j.1532-5415.2005.53221.x

Peng, S., & Perry, B. (2026). A life course perspective on cognitive aging: The interplay between early and later life stimulating environments. *Journal of Health and Social Behavior*, *67*, 196–215. https://doi.org/10.1177/00221465251356611

Peng, S., Roth, A. R., Apostolova, L. G., Saykin, A. J., & Perry, B. L. (2022). Cognitively stimulating environments and cognitive reserve: The case of personal social networks. *Neurobiology of Aging*, *112*, 197–203. https://doi.org/10.1016/j.neurobiolaging.2022.01.004

Peng, S., Roth, A. R., & Perry, B. L. (2021). A latent variable approach to measuring bridging social capital and examining its association to older adults' cognitive health. *Social Neuroscience*, *16*, 684–694. https://doi.org/10.1080/17470919.2021.2001368

Perry, B. L., McConnell, W. R., Coleman, M. E., Roth, A. R., Peng, S., & Apostolova, L. G. (2022). Why the cognitive "fountain of youth" may be upstream: Pathways to dementia risk and resilience through social connectedness. *Alzheimer's & Dementia*, *18*, 934–941. https://doi.org/10.1002/alz.12443

Piolatto, M., Bianchi, F., Rota, M., Marengoni, A., Akbaritabar, A., & Squazzoni, F. (2022). The effect of social relationships on cognitive decline in older adults: An updated systematic review and meta-analysis of longitudinal cohort studies. *BMC Public Health*, *22*, 278. https://doi.org/10.1186/s12889-022-12567-5

Rhubart, D., Sun, Y., Pendergrast, C., & Monnat, S. (2022). Sociospatial disparities in "third place" availability in the United States. *Socius*, *8*. https://doi.org/10.1177/23780231221090301

Roth, A. R., & Peng, S. (2024). Streams of interactions: Social connectedness in daily life. *Social Networks*, *78*, 203–211. https://doi.org/10.1016/j.socnet.2024.03.001

Roth, A. R., Peng, S., Coleman, M. E., Finley, E., & Perry, B. L. (2021). Network recall among older adults with cognitive impairments. *Social Networks*, *64*, 99–108. https://doi.org/10.1016/j.socnet.2020.08.005

Roth, A. R., Peng, S., Jarin, J. N., Qu, T., Fekete, M., & Perry, B. L. (2026). Rationale and study design for the Social Environment and Cognitive Health in Urban and Rural Areas Study. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *81*, gbag184. https://doi.org/10.1093/geronb/gbag184

Roth, A. R., Peng, S., & Perry, B. L. (2022). Personal network bridging potential across geographic context. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, *77*, 626–635. https://doi.org/10.1093/geronb/gbab103

Roth, A. R., & Perry, B. L. (2026). Cognitive function and the social environment: A multilevel approach. *Social Science & Medicine*, *390*, 118877. https://doi.org/10.1016/j.socscimed.2025.118877

Roth, A. R., Railey, A. F., & Peng, S. (2025). Bridging social capital potential and Alzheimer's disease mortality rates. *Socius: Sociological Research for a Dynamic World*, *11*, 23780231251327540. https://doi.org/10.1177/23780231251327540

Russ, T. C., Batty, G. D., Hearnshaw, G. F., Fenton, C., & Starr, J. M. (2012). Geographical variation in dementia: Systematic review with meta-analysis. *International Journal of Epidemiology*, *41*, 1012–1032. https://doi.org/10.1093/ije/dys103

Sheikh, J. I., & Yesavage, J. A. (1986). Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. In T. L. Brink (Ed.), *Clinical Gerontology: A guide to assessment and intervention*. (pp. 165–173). The Haworth Press.

Slack, T., & Monnat, S. M. (2024). *Rural and small-town America: Context, composition, and complexities*. (Vol. *9*). University of California Press.

Small, M. L., & Adler, L. (2019). The role of space in the formation of social ties. *Annual Review of Sociology*, *45*, 111–132. https://doi.org/10.1146/annurev-soc-073018-022707

Small, M. L., Manduca, R. A., & Johnston, W. R. (2018). Ethnography, neighborhood effects, and the rising heterogeneity of poor neighborhoods across cities. *City & Community*, *17*, 565–589. https://doi.org/10.1111/cico.12316

Stern, Y. (2012). Cognitive reserve in ageing and Alzheimer's disease. *The Lancet Neurology*, *11*, 1006–1012. https://doi.org/10.1016/S1474-4422(12)70191-6

Sun, Y., Esposito, M. H., Sagehorn, M., Melendez, R. A., & Finlay, J. M. (2025). Uneven access to essential services and amenities: Geographic disparities in 'third place' availability across the United States from 2010 to 2021. *Health & Place*, *96*, 103583. https://doi.org/10.1016/j.healthplace.2025.103583

Taylor, C. A., Greenlund, S. F., McGuire, L. C., Lu, H., & Croft, J. B. (2017). Deaths from Alzheimer's disease—United States, 1999–2014. *MMWR. Morbidity and Mortality Weekly Report*, *66*, 521–526. https://doi.org/10.15585/mmwr.mm6620a1

VanderWeele, T. (2015). *Explanation in causal inference: Methods for mediation and interaction*. Oxford University Press.

Weden, M. M., Shih, R. A., Kabeto, M. U., & Langa, K. M. (2018). Secular trends in dementia and cognitive impairment of US rural and urban older adults. *American Journal of Preventive Medicine*, *54*, 164–172. https://doi.org/10.1016/j.amepre.2017.10.021

Whitham, M. M. (2012). Community connections: Social capital and community success. *Sociological Forum*, *27*, 441–457. https://doi.org/10.1111/j.1573-7861.2012.01325.x

Wuthnow, R. (2013). *Small-town America: Finding community, shaping the future*. Princeton University Press.

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