Social Environment and Cognitive Health in Urban and Rural Areas (SECHURA)

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Abstract

The Social Environment and Cognitive Health in Urban and Rural Areas (SECHURA) study was designed to examine cognitive health disparities in later life. It gathers data on access to social resources, engagement in cognitively stimulating interactions, and exposure to activity spaces. We enrolled 510 participants from 41 Indiana counties during baseline data collection in Fall 2023. All participants completed a survey that gathered data on their cognitive, mental, and physical health, personal networks, sociodemographic attributes, occupational history, lifestyle activities, and social support. Two hundred and seventy-three participants completed a follow-up module in which they used a smartphone to record ecological momentary assessments (EMAs) that were administered four times per day for seven days. The mean age was 69.9 years. Most participants were women (64.5%), white (90.2%), and retired (54.5%). The average participant named 5.38 network members. Participants were at home (70.7%) and alone (60.2%) for the majority of their EMAs. We conclude by outlining a research agenda that (1) characterizes the social networks, interactions, and place-based activities of participants across geographic contexts, and (2) assesses the potential pathways between a combination of networks, interactions, and activities and cognitive function.

Keywords: Social interactions; social networks; aging; cognitive health

INTRODUCTION

Increasing longevity has led to a rise in prevalence of cognitive impairment in the United States (Alzheimer's Association 2024). Yet rates of cognitive impairment are disproportionately higher in rural populations than urban populations (Russ et al. 2012; Weden et al. 2018). A prominent explanation for these geographic disparities is that rural communities limit opportunities for cognitive stimulation via education and occupational pathways (Herd, Sicinski, and Asthana 2021; Lorenzo-López et al. 2017; Weden et al. 2018). Although education and employment are important, recent research argues for a broader focus on the social environment by including the activities in which individuals partake, the places these activities occur, the people with whom they share social ties, and their everyday social interactions (Cagney et al. 2014, 2020; Letellier et al. 2019; Perry, Will R. McConnell, et al. 2022; Roth 2020; Zhaoyang et al. 2021). Indeed, several meta-analyses indicate that various aspects of the social environment (e.g., number of friends, participation in social activities, community characteristics) are linked with cognitive decline (Clarke et al. 2015; Kelly et al. 2017; Piolatto et al. 2022).

The SECHURA study was designed to prospectively examine multiple social-environmental factors that can be used to identify social mechanisms underlying rural-urban cognitive health disparities. The aims of the study are to (1) characterize the social networks, social interactions and place-based activities of participants across geographic contexts, and (2) assess the pathways between a combination of networks, interactions, and activities and participants' cognitive function. This paper describes the design, baseline summary statistics, and strengths and limitations of the SECHURA study.

STUDY DESIGN AND PROCEDURE

SECHURA participants were recruited from a preexisting sample that was collected for the Person to Person Health Interview Study (P2P). The P2P is a state representative omnibus health and wellness study fielded from 2018-2021 that used a probability sampling frame to recruit and gather data on 2685 participants (age 18 and over) who resided in 41 Indiana counties. See elsewhere for further

detail on the P2P sample (Green and Pescosolido 2024; Perry 2021; Railey et al. 2023; Railey and Greene 2024; Roth, Peng, and Perry 2022).

In Fall 2023, we began recruiting all P2P participants who (a) were 55 years or older, (b) were still residing in Indiana, and (c) agreed to be contacted for follow-up studies. Figure 1 presents a flowchart that includes the eligibility status, recruitment procedure, and final disposition of the participants. Ultimately, 510 of the 868 recruited participants consented into the SECHURA study and completed a CAPI (computer-assisted personal interview) survey between November 2023 and March 2024. This converts to a 61% AAPOR's Response Rate 3 using the values presented in Figure 1 (American Association for Public Opinion Research 2023). The mean duration of the CAPI surveys was 79 minutes (SD = 30.73 minutes).

After completing the CAPI survey, the field interviewers introduced participants to a follow-up module that requested participants to complete a week's worth of ecological momentary assessments (EMA). This latter approach leverages smartphone technology that allows participants to respond to questions about their behaviors and perceptions as they are experienced in real-time in their natural environments (Roth 2024). The EMA module took place as follows:

(1) All participants were shown a short instructional video explaining the nature of the EMA module of the study (Roth 2023).
(2) Two hundred and seventy-three participants consented to the EMA module and installed the LifeData app onto their smartphone. Participants who did not own a smartphone were offered a loaner phone to reduce selection bias.
(3) For the following seven days after the CAPI survey, the LifeData app began randomly notifying the participants four times per day to respond to an EMA. Each notification was spaced at least two hours apart and only came between the hours of 8:00am and 8:00pm.
(4) Participants were instructed to complete an EMA—which consisted of 8-14 questions—every time they heard a notification.

Internet access was only required during the installation phase of the LifeData app. The SECHURA field interviewers inquired about internet connectivity before scheduling the in-home visit. This allowed them to install the app on a loaner smartphone before visiting the homes of participants who did not have internet access. After installing the app, all data that participants recorded throughout the EMA module were temporarily stored in the smartphone's internal memory. The data were automatically uploaded to LifeData's secure online platform as soon as the smartphone re-connected to the internet.

CAPI survey

The CAPI survey asked participants questions related to the following six domains: (1) personal networks; (2) sociodemographic attributes; (3) cognitive, mental, and physical health; (4) occupational history; (5) lifestyle activities; and (6) perceived social support.

1. Personal networks

A central theme of the SECHURA study is to understand the social environments in which participants are embedded. Personal networks (i.e., webs of social relationships surrounding focal individuals) constitute a fundamental aspect of the social environment (Perry, Roth, and Small 2024). We placed the personal network module at the beginning of the CAPI survey to minimize the recall

fatigue that occurs when the network module is placed at the end of a survey (Pustejovsky and Spillane 2009).

Participants were presented with five name generating prompts that were intended to elicit the names of people who played a specific role in their lives. These name generators asked participants to list (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, (4) people with whom they spent their free time, and (5) people who caused them problems. There was no limit to the number of names that participants could name for each generator. Participants could name the same person across generators. The name generating protocol is adapted from the PhenX Social Network Battery (PhenX Toolkit 1991).

After populating the personal network, participants were presented with a series of name interpreting prompts. These name interpreters asked participants to report the gender, race/ethnicity, and age of each network member. Participants were also asked how they were connected to each network member (e.g., spouse, romantic partner, child, friend, coworker), the different types of support provided by each network member (e.g., listens, advises, lends money), and the strength of their relationship on a scale from 1 to 10.

Finally, participants were asked a series of questions about how well each network member knew the other members. This procedure is especially time consuming since the number of these questions exponentially increases with the number of network members a participant names. Therefore, we only asked about the relationships between 10 randomly selected network members to save time. This method has been shown to produce reliable results with respect to constructing measures of network structure (e.g., density) (Peng, Roth, and Perry 2023). The vast majority (93%) of the SECHURA sample listed 10 network members or less. Therefore, our randomization procedure only applied to 34 participants (7% of the sample).

2. Sociodemographic attributes

SECHURA gathered data on the following sociodemographic attributes: date of birth, gender (man/woman), and race/ethnicity (White, Black/African American, Hispanic, Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, Other), marital status (married, divorced/separated, widowed, never married), employment status (working full time, working part time, temporarily laid off/sick leave/maternity leave, unemployed and looking for work, unemployed and not looking for work, retired, disabled, homemaker, other), education (less than high school, high school, technical certificate, some college, college degree or greater), and annual household income including from employment, retirement, pensions, social security, and other sources (less than $10,000, $10,000 - $24,999, $25,000 - $49,999, $50,000 - $99,999, $100,00 - $149,999, $150,000 or more).

3. Cognitive, mental, and physical health

Participants next completed a series of assessments and questions designed to measure their cognitive, mental, and physical health. First, participants completed four cognitive assessments: the Montreal Cognitive Assessment (MoCA), the Rey Auditory Verbal Learning Test (AVLT), the Functional Activities Questionnaire (FAQ), and the Cognitive Change Index (CCI). The MoCA is a clinically designed assessment that measures global cognitive function by testing attention, memory, visuospatial ability, abstraction, delayed recall, and orientation to time and place (Nasreddine et al. 2005). MoCA scores range from 0 to 30.

The AVLT is one of the most widely used memory assessments in clinical research and practice (Schmidt 1996). A list of 15 words (List A) is read aloud for five consecutive trials and each trial is

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followed by a free-recall test (Trials 1-5). After the fifth trial, an interference list of 15 different words (List B) is presented, followed by a free-recall test of that list. A free recall of List A (Trial 6) is tested immediately after list B is presented. Finally, a delayed recall of list A is measured 30 minutes after the immediate recall (Trial 7).

The CCI assesses subjective perceptions of cognitive decline. We use the CCI-5 to evaluate self-reports of memory, executive functioning, language, and attention over the past five years. Participants were instructed to rate each item on a 5-point Likert scale (1 = no change or normal ability, 2 = minimal change or slight/occasional problem, 3 = some change or mild problem, 4 = clearly noticeable change or moderate problem, 5 = much worse or severe problem). Higher scores indicate greater perceived cognitive decline (Rattanabannakit et al. 2016).

The FAQ asks participants to report their degree of difficulty with the following ten daily activities that require cognitive effort: (1) writing checks, paying bills, or balancing a checkbook; (2) assembling tax records, business affairs, or other papers; (3) shopping alone for clothes, household necessities, or groceries; (4) playing a game of skill such as bridge or chess, working on a hobby; (5) heating water, making a cup of coffee, turning on the stove; (6) preparing a balanced meal; (7) keeping track of current events; (8) paying attention to and understanding a TV program, book, or magazine; (9) remembering appointments, family occasions, holidays, medications; (10); traveling out of the neighborhood, driving, or arranging to take public transportation (Mayo 2016). Response options included "not applicable (i.e., never did)," "no assistance needed," "have difficulty but can do by myself," "requires some assistance," and "completely dependent."

Mental health was assessed using the 15-item Geriatric Depression Scale (GDS-15) and the 3-item short scale adaptation of the UCLA Loneliness Scale. The GDS-15 includes the following 15 questions regarding participants' feelings within the past week: (1) are you basically satisfied with your life? (2) have you dropped many of your activities and interests? (3) do you feel that your life is empty? (4) do you often get bored? (5) are you in good spirits most of the time? (6) are you afraid that something bad is going to happen to you? (7) do you feel happy most of the time? (8) do you often feel helpless? (9) do you prefer to stay home, rather than going out and doing new things? (10) do you feel you have more problems with memory than most? (11) do you think it is wonderful to be alive now? (12) do you feel pretty worthless the way you are now? (13) do you feel full of energy? (14) do you feel your situation is hopeless (15) do you think most people are better off than you are? (Yesavage and Sheikh 1986). GDS scores ranged from 0 to 15.

The adapted UCLA loneliness scale asked participants (1) "how often do you feel that you lack companionship?" (2) "how often do you feel left out?" and (3) "how often do you feel isolated from others?" These three items—which have been previously validated (Hughes et al. 2004)—have a Cronbach's alpha of 0.80 in the SECHURA sample.

Physical health was assessed by asking participants about their activities of daily living (ADL) as well as their co-morbidities. Participants were first asked how much difficulty ("no difficulty," "some difficulty," "much difficulty") they had with the following nine activities: (1) walking one block; (2) walking across a room; (3) dressing (including putting on shoes and socks); (4) bathing or showering; (5) eating (e.g., cutting up food?); (6) getting in or out of bed; (7) using the toilet (including getting up and down); (8) driving a car during the day; (9) driving a car during the night. These items—which combined to create the ADL scale (Huisingh-Scheetz et al. 2014)—have a Cronbach's alpha of 0.83 in the SECHURA sample.

Finally, participants were asked if they had ever been told by a doctor that they had any of the following medical conditions: (1) arthritis; (2) stomach ulcers or peptic ulcer disease; (3) emphysema, chronic bronchitis or chronic obstructive lung disease; (4) asthma; (5) stroke, cerebrovascular accident blood clot or bleeding in the brain or transient ischemic attack; (6) high blood pressure or hypertension; (7) diabetes or high blood sugar; (8) Alzheimer's disease or related dementia; (9) cirrhosis

or serious liver damage; (10) HIV/AIDS; (11) leukemia or polycythemia vera; (12) lymphoma; (13) skin cancer, including melanoma, basal cell carcinoma, squamous cell carcinoma; (14) cancer other than skin cancer, leukemia, or lymphoma; (15) poor kidney function; thyroid problems; or (16) enlarged prostate gland (men only).

4. Occupational history

The next domain asked participants about occupational history. This follows prior research which suggests that the complexity of the jobs that people hold throughout their lives is associated with cognitive function in older adulthood (Andel et al. 2005; Coleman et al. 2023). Participants were first asked about their longest held job. This could be their current job or a past job. They were asked to provide a job title, an open-ended description of the type of work it entailed, the most important activities in that job, the year they started, and the year they ended. These questions were skipped if participant had never held a job. This was followed by the same set of questions as it pertained to their second-longest held job. Finally, participants were asked to provide the total number of jobs they worked in their lifetime.

5. Lifestyle activities

Participants were next asked a series of questions about their routine activities related to their social life, work life, and private life. They were asked how often and for how long they read magazines/newspapers, do crossword puzzles, play card games, do jigsaw puzzles, write, attend lectures/visit museums, practice memory/thinking techniques, sew/knit/crafts, watch TV, listen to the radio, use a computer/tablet/smartphone, play a musical instrument, visit family and friends, and receive visitors in their home. They were next asked about the number of social groups and organizations that they routinely participate in.

6. Perceived social support

The final domain of the CAPI survey asked participants about their perceptions of social support from family and friends using the multidimensional scale of perceived support (Zimet et al. 1988). Participants were prompted to respond to the following eight items: (1) my family really tries to help me out; (2) I get the emotional help and support I need from my family; (3) my friends really try to help me out; (4) I can count on my friends when things go wrong; (5) I can talk about my problems with my family; (6) I have friends with whom I can share my joys and sorrows; (7) my family is willing to help me make decisions; (8) I can talk about my problems with my friends. Participants were instructed to respond to these items using a 5-point Likert scale ("Strongly agree," "Agree," "Neutral," "Disagree," "Strongly disagree"). These items have a Cronbach's alpha of 0.87 in the SECHURA sample.

Ecological momentary assessments

The 273 participants who agreed to the EMA module produced a total of 5,588 EMAs. Each EMA asked the same series of questions during each session with the exception of the first EMA of each day, which additionally asked participants to estimate the number of people they interacted with the prior day. GPS coordinates were gathered for each EMA response. Participants had 20 minutes to respond to each notification before it expired with three additional reminder notifications being sent

in five-minute intervals. The mean time that it took participants to complete an EMA was one minute and 18 seconds. A majority of participants (84.0%) completed their EMAs in less than two minutes.

Each EMA session started by asking participants where they were when they first heard the notification ("my home," "someone else's home," "workplace," "restaurant/bar/café," "store," "place of worship," "library," "park," "somewhere else outdoors," "healthcare facility," "other"). This was followed by asking what they were doing when they first heard the notification ("eating/drinking," "socializing," "relaxing," "working," "shopping," "household chores," "volunteering," "transporting [e.g., car, bus, bike]," "medical care," "other"). Participants were then asked to respond to the following three prompts: (1) "I was being exposed to new information or recommendations when I heard the notification;" (2) "I was being challenged to consider a new perspective when I heard the notification;" (3) "I was using a lot of cognitive effort when I heard the notification." Each of these items was accompanied by a 10-point slider scale where 1 represents the low end (e.g., "no new perspective") and 10 represents the high end (e.g., "completely new perspective"). These three items were intended to measure exposure to stimulating social situations are theorized to promote cognitive resilience (Perry, Will R. McConnell, et al. 2022). The Cronbach alpha for these three items is 0.89 in the SECHURA sample.

Participants were next asked if they were interacting with anyone (face-to-face or via telecommunication) when they heard the notification. This is an important distinction because if they were asked to report who they were with when they were completing the EMA (as opposed to when they heard the notification), this would likely bias the results to show more participants reporting being alone rather than with someone. If the participants reported that they were alone when they heard the notification, the EMA session ended. If they were interacting with someone, there were five follow-up questions.

First, participants who were interacting with someone during their EMA were asked to approximate the number of people they were interacting. Second, they were asked to list all the types of people they were interacting with ("Spouse/romantic partner," "Parent [include step- or in-law]," "Sibling [include step- or in-law]," " Child [include step- or in-law]," " Grandchild/great-grandchild," "Other relative," "Friend," "Co-worker, colleague, employer, employee," "Neighbor," "Fellow church group member," "Fellow group member [sports, social, leisure club, etc.]," "Fellow volunteer," "Professionals [healthcare provider, lawyer, accountant, etc.]," "Acquaintance," "Stranger [someone you are meeting for the first time]," "Other"). Third, they were asked the mode of communication for that specific interaction ("face-to-face," "telecommunication," "both"). Fourth, participants were asked to approximate the number of people who were nearby during their interaction but whom they were neither talking to nor interacting with.

Finally, participants who were with someone during their EMA were presented with the following three prompts: (1) "My mood was good because of this social interaction;" (2) "I felt stressed because of this social interaction;" (3) "I felt a close, personal connection during this social interaction." These prompts were intended to capture the psychological impact of social interactions which are theorized to buffer against cognitive decline (Perry, William R McConnell, et al. 2022). Participants were again presented with a 10-point slider to answer each item where 1 was low and 10 was high. The Cronbach alpha for these three items was 0.68 in the SECHURA sample.

FINDINGS

Table 1 presents the summary statistics for the sociodemographic attributes of the SECHURA sample. The mean age is 69.9 years (SD = 9.3). The majority of participants were women (64.5%), white (90.2%), and retired (54.5%). A plurality of participants (43.9%) were married, 28.2% were divorced,

and 21.6% were widowed. The median household income was $25,000 - $49,999 with 29.4% of the sample falling into this category.

Figure 2 presents a map of the 41 Indiana counties where SECHURA participants resided during the baseline wave. There was an average of 12.4 participants per county (SD = 13.4). Figure 2 is color coded according to the Indiana County Classification, which separates the state's counties into three categories—urban (red), rural (tan), and rural/mixed (peach)—based on population size, population density, size of county's largest municipality, and a subjective indicator of how Indiana residents viewed their home county (Ayres et al. 2012). The majority of participants resided in either urban counties (51.4%) or rural counties (40.2%) as per SECHURA's focus on these two geographic contexts.

Table 2 presents the health statistics for the sample. The mean MoCA score was 23.7 (SD = 4.44). Approximately one third (34.1%) of the sample scored below 23, which is a recommended cutoff for mild cognitive impairment (Carson, Leach, and Murphy 2018). The mean score was 7.30 (SD = 2.37) for the AVLT immediate recall and 6.73 (SD = 3.94) for the AVLT delayed recall. These values represent the correct number of words that participants recalled from the list of 15 words. The mean loneliness (1.52) and GDS-15 (2.94) scores were relatively low. These variables were both positively skewed which means that the majority of participants reported low levels of loneliness and few depressive symptoms. The mean ADL score was 0.26 (SD = 0.33). The average participant reported 2.89 comorbidities (SD = 1.91). Only 6.3% of the participants reported zero comorbidities.

Table 3 presents the network statistics. The average participant named 5.38 network members (SD = 2.93). Only two participants did not name a single network member whereas the majority of participants (60.8%) named between three and six network members. The mean network density—which can only be calculated for networks that have at least 2 members—was 0.76 (SD = 0.26). In other words, 76% of all possible connections between members were present in the average participant's personal network. The mean diversity was 3.10 (SD = 1.22), which means that the average participant was connected to three different types of network members (e.g., spouse, friend, co-worker).

Figure 3 shows an example of three personal networks that approximate the SECHURA participants at the 25th, 50th and 75th percentiles for size, density, and diversity. Network A shows a participant who is connected to three network members (one spouse and two children) whom all know each other. These network statistics (size = 3, density = 1.0, diversity = 2) reflect those at the 25th percentile for the SECHURA sample. Network B shows a participant who is connected to five network members (one spouse, two children, two friends), most of whom know each other. These statistics (size = 5, density = 0.80, diversity = 3) reflect those at the 50th percentile for the SECHURA sample. Network C shows a participant who is connected to seven members (one spouse, two children, three friends, one coworker), only some of whom know each other. These statistics (size = 7, density = 0.60, diversity = 4) reflect those at the 75th percentile of SECHURA sample.

Table 4 presents summary statistics for the lifestyle activities. The majority of participants engage in the following activities either daily or weekly: reading newspaper, writing, watching TV, listening to the radio, using a computer or smartphone, visiting family/friends. A minority of participants frequently played crossword, card games, and jigsaw puzzles, attended lectures or went to museums, sewed or knitted, or played a musical instrument. Meanwhile, the mean score for the perceived social support scale was 4.16 (out of a possible 5.0) with a standard deviation of 0.64. In other words, the SECHURA sample perceived high levels of support from their family and friends.

Table 5 summarizes the distribution of key EMA variables. The average participant completed 20.48 EMAs (SD = 6.59). The most commonly reported activity was relaxing (27.9%) followed by paid work (14.6%), other (14.1%), and eating/drinking (13.8%). The majority of EMAs occurred at home (70.7%). The workplace was the next most common location (9.54%) followed by other (5.15%),

someone else's home (4.46%), and the store (3.15%). Participants were alone for the majority of most EMAs (60.2%). They were with their spouse for 15.1% of the EMAs, children for 7.03% of EMAs, and friends for 6.57% of the EMAs. Approximately one tenth of EMAs (9.35%) occurred in the presence of multiple types of social partners (e.g., spouse and children; friends and neighbors).

STRENGTHS AND LIMITATIONS

The SECHURA study offers two innovations that will contribute to research on the social determinants of cognitive function in later life. First, it consists of a state representative sample of older adults residing in urban and rural areas to study geographic disparities in cognitive health. Few studies use probability samples of rural and urban residents to explore such disparities. Although existing urban-centric studies lend valuable insight into the social mechanisms of cognitive impairment, it is unclear whether previously identified mechanisms operate to similar degrees in rural areas. Second, the SECHURA study adopts a multi-level approach to studying the social environment which considers the places where participants live (e.g., residential county), the people to whom they are connected (e.g., personal networks), and their daily interactions, activities, and mobility patterns (e.g., EMA data). Collectively, these data will allow us to identify specific aspects of the social environment that relate to cognitive function among older adults in rural and urban areas.

There are, however, several methodological limitations to the study. First, there is a possibility that participants may have experienced difficulty with the network module (e.g., misinterpreting the prompts, forgetting to name specific people) (Bernard et al. 1984; Brewer 2000). Although this concern may become especially pertinent when dealing with an older population, we saw no clear evidence of it in the SECHURA sample. Moreover, a recent study that found that older adults with mild cognitive impairment were neither more nor less likely than cognitively normal older adults to systematically omit members from their networks (Roth et al. 2021). Second, all SECHURA participants were asked to respond to four EMAs for seven days, but approximately half did not participate in this module. This may have introduced response bias. Third, the intention of the EMA module was to provide a detailed view of their daily lives. However, it is possible that one week was not long enough to capture the "normal" routines of participants. We limited the EMA module to one week to avoid overburdening participants. Yet there was still some evidence of non-compliance during the EMA module, despite our attempt to alleviate participant burden. There is currently no standard approach for dealing with missingness in EMA studies (Stone et al. 2023).

FUTURE PLANS

SECHURA is a prospective cohort study that is scheduled to collect a second wave of data starting in Fall 2025. The longitudinal nature of this study will eventually allow us to identify dynamic pathways leading to cognitive decline in older adulthood. In the interim, we will merge secondary area-level data (e.g., population demographics, social infrastructures) with participant data. Introducing these additional layers of ecological data will provide a more comprehensive view of the social environment. We will also aggregate the EMA data and network data to create participant-level measures of social interactions and networks. These constructed variables will allow us to estimate variations in cognitive health outcomes across participants.

REFERENCES

Alzheimer's Association. 2024. "2024 Alzheimer's Disease Facts and Figures." *Alzheimer's & Dementia* 20(5):3708–3821. doi: 10.1002/alz.13809.

American Association for Public Opinion Research. 2023. *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys*. 10th edition.

Andel, Ross, Michael Crowe, Nancy L. Pedersen, James Mortimer, Eileen Crimmins, Boo Johansson, and Margaret Gatz. 2005. "Complexity of Work and Risk of Alzheimer's Disease: A Population-Based Study of Swedish Twins." *The Journals of Gerontology: Series B* 60(5):P251–58. doi: 10.1093/geronb/60.5.P251.

Ayres, J., B. Waldorf, M. McKendree, and L. Hoelscher. 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*.

Bernard, H. Russell, Peter Killworth, David Kronenfeld, and Lee Sailer. 1984. "The Problem of Informant Accuracy: The Validity of Retrospective Data." *Annual Review of Anthropology* 13(1):495–517.

Brewer, Devon D. 2000. "Forgetting in the Recall-Based Elicitation of Personal and Social Networks." *Social Networks* 22(1):29–43.

Cagney, Kathleen A., Christopher R. Browning, Aubrey L. Jackson, and Brian Soller. 2014. "Networks, Neighborhoods, and Institutions: An Integrated 'Activity Space' Approach for Research on Aging." in *New Directions in the Sociology of Aging*. Washington, DC: The National Academies Press.

Cagney, Kathleen A., Erin York Cornwell, Alyssa W. Goldman, and Liang Cai. 2020. "Urban Mobility and Activity Space." *Annual Review of Sociology* 46:623–48.

Carson, Nicole, Larry Leach, and Kelly J. Murphy. 2018. "A Re-Examination of Montreal Cognitive Assessment (MoCA) Cutoff Scores." *International Journal of Geriatric Psychiatry* 33(2):379–88. doi: 10.1002/gps.4756.

Clarke, Philippa J., Jennifer Weuve, Lisa Barnes, Denis A. Evans, and Carlos F. Mendes de Leon. 2015. "Cognitive Decline and the Neighborhood Environment." *Annals of Epidemiology* 25(11):849–54.

Coleman, Max E., Meghan E. H. Roessler, Siyun Peng, Adam R. Roth, Shannon L. Risacher, Andrew J. Saykin, Liana G. Apostolova, and Brea L. Perry. 2023. "Social Enrichment on the Job: Complex Work with People Improves Episodic Memory, Promotes Brain Reserve, and Reduces the Risk of Dementia." *Alzheimer's & Dementia* 19(6):2655–65. doi: 10.1002/alz.13035.

Green, Harold D., and Bernice A. Pescosolido. 2024. "Social Pathways to Care: How Community-Based Network Ties Shape the Health Care Response of Individuals with Mental Health Problems." *Social Psychiatry and Psychiatric Epidemiology* 59(3):431–42. doi: 10.1007/s00127-023-02476-2.

Herd, Pamela, Kamil Sicinski, and Sanjay Asthana. 2021. "Does Rural Living in Early Life Increase the Risk for Reduced Cognitive Functioning in Later Life?" *Journal of Alzheimer's Disease* 82(3):1171–82. doi: 10.3233/JAD-210224.

Hughes, Mary Elizabeth, Linda J. Waite, Louise C. Hawkley, and John T. Cacioppo. 2004. "A Short Scale for Measuring Loneliness in Large Surveys: Results from Two Population-Based Studies." *Research on Aging* 26(6):655–72.

Huisingh-Scheetz, Megan, Masha Kocherginsky, Phillip L. Schumm, Michal Engelman, Martha K. McClintock, William Dale, Elizabeth Magett, Patricia Rush, and Linda Waite. 2014. "Geriatric Syndromes and Functional Status in NSHAP: Rationale, Measurement, and Preliminary Findings." *The Journals of Gerontology: Series B* 69(Suppl_2):S177–90. doi: 10.1093/geronb/gbu091.

Kelly, Michelle E., Hollie Duff, Sara Kelly, Joanna E. McHugh Power, Sabina Brennan, Brian A. Lawlor, and David G. Loughrey. 2017. "The Impact of Social Activities, Social Networks, Social Support and Social Relationships on the Cognitive Functioning of Healthy Older Adults: A Systematic Review." *Systematic Reviews* 6(1):259.

Letellier, Noémie, Isabelle Carrière, Laure-Anne Gutierrez, Audrey Gabelle, Jean-François Dartigues, Carole Dufouil, Catherine Helmer, Emmanuelle Cadot, and Claudine Berr. 2019. "Influence of Activity Space on the Association between Neighborhood Characteristics and Dementia Risk: Results from the 3-City Study Cohort." *BMC Geriatrics* 19(1):1–11.

Lorenzo-López, Laura, José C. Millán-Calenti, Rocío López-López, Clara Diego-Diez, Blanca Laffon, Eduardo Pásaro, Vanessa Valdiglesias, and Ana Maseda. 2017. "Effects of Degree of Urbanization and Lifetime Longest-Held Occupation on Cognitive Impairment Prevalence in an Older Spanish Population." *Frontiers in Psychology* 8:162. doi: 10.3389/fpsyg.2017.00162.

Mayo, Ann M. 2016. "Use of the Functional Activities Questionnaire in Older Adults with Dementia." *Hartford Inst Geriatr Nurs* 13:2.

Nasreddine, Ziad S., Natalie A. Phillips, Valérie Bédirian, Simon Charbonneau, Victor Whitehead, Isabelle Collin, Jeffrey L. Cummings, and Howard Chertkow. 2005. "The Montreal Cognitive Assessment, MoCA: A Brief Screening Tool for Mild Cognitive Impairment." *Journal of the American Geriatrics Society* 53(4):695–99.

Peng, Siyun, Adam R. Roth, and Brea L. Perry. 2023. "Random Sampling of Alters from Networks: A Promising Direction in Egocentric Network Research." *Social Networks* 72:52–58. doi: 10.1016/j.socnet.2022.09.004.

Perry, Brea L. 2021. "Contact Tracing Could Exacerbate COVID-19 Health Disparities: The Role of Economic Precarity and Stigma." *American Journal of Public Health* 111(5):778–81. doi: 10.2105/AJPH.2021.306244.

Perry, Brea L., Will R. McConnell, Max E. Coleman, Adam R. Roth, Siyun Peng, and Liana G. Apostolova. 2022. "Why the Cognitive 'Fountain of Youth' May Be Upstream: Pathways to Dementia Risk and Resilience through Social Connectedness." *Alzheimer's & Dementia* 18(5):934–41. doi: 10.1002/alz.12443.

Perry, Brea L., William R McConnell, Siyun Peng, Adam R. Roth, Max Coleman, Mohit Manchella, Meghann Roessler, Heather Francis, Hope Sheean, and Liana A. Apostolova. 2022. "Social

Networks and Cognitive Function: An Evaluation of Social Bridging and Bonding Mechanisms." *The Gerontologist* 62(6):865–75. doi: 10.1093/geront/gnab112.

Perry, Brea L., Adam R. Roth, and Mario L. Small. 2024. "Personal Networks and Egocentric Analysis." Pp. 439–54 in *Sage Handbook of Social Network Analysis*. London, UK: Sage Publications.

PhenX Toolkit. 1991. Retrieved (https://www.phenxtoolkit.org/protocols/view/211101).

Piolatto, Matteo, Federico Bianchi, Matteo Rota, Alessandra Marengoni, Aliakbar Akbaritabar, and Flaminio Squazzoni. 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(1):278. doi: 10.1186/s12889-022-12567-5.

Pustejovsky, James E., and James P. Spillane. 2009. "Question-Order Effects in Social Network Name Generators." *Social Networks* 31(4):221–29.

Railey, Ashley F., and Alison Greene. 2024. "Stigma as a Local Process: Stigma Associated with Opioid Dependency in a Rural-Mixed Indiana County." *International Journal of Drug Policy* 124:104327. doi: 10.1016/j.drugpo.2024.104327.

Railey, Ashley F., Adam R. Roth, Anne C. Krendl, and Brea L. Perry. 2023. "Intergroup Relationships with People Who Use Drugs: A Personal Network Approach." *Social Science & Medicine* 317:115612. doi: 10.1016/j.socscimed.2022.115612.

Rattanabannakit, Chatchawan, Shannon L. Risacher, Sujuan Gao, Kathleen A. Lane, Steven A. Brown, Brenna C. McDonald, Frederick W. Unverzagt, Liana G. Apostolova, Andrew J. Saykin, and Martin R. Farlow. 2016. "The Cognitive Change Index as a Measure of Self and Informant Perception of Cognitive Decline: Relation to Neuropsychological Tests." *Journal of Alzheimer's Disease* 51(4):1145–55.

Roth, Adam R. 2020. "Social Networks and Health in Later Life: A State of the Literature." *Sociology of Health & Illness* 42(7):1642–56. doi: 10.1111/1467-9566.13155.

Roth, Adam R., dir. 2023. *SECHURA (LifeData Video)*. YouTube.

Roth, Adam R. 2024. "Ecological Momentary Assessments in Sociology." *Social Currents* 11(2):103–11. doi: 10.1177/23294965231203027.

Roth, Adam R., Siyun Peng, Max E. Coleman, Evan Finley, and Brea L. Perry. 2021. "Network Recall among Older Adults with Cognitive Impairments." *Social Networks* 64:99–108. doi: 10.1016/j.socnet.2020.08.005.

Roth, Adam R., Siyun Peng, and Brea L. Perry. 2022. "Personal Network Bridging Potential Across Geographic Context." *The Journals of Gerontology: Series B* 77(3):626–35. doi: 10.1093/geronb/gbab103.

Russ, Tom C., G. David Batty, Gena F. Hearnshaw, Candida Fenton, and John M. Starr. 2012. "Geographical Variation in Dementia: Systematic Review with Meta-Analysis." *International Journal of Epidemiology* 41(4):1012–32.

Schmidt, Michael. 1996. *Rey Auditory Verbal Learning Test*. Western Psychological Services Los Angeles.

Stone, Arthur A., Stefan Schneider, and Joshua M. Smyth. 2023. "Evaluation of Pressing Issues in Ecological Momentary Assessment." *Annual Review of Clinical Psychology* 19(Volume 19, 2023):107–31. doi: 10.1146/annurev-clinpsy-080921-083128.

Weden, Margaret M., Regina A. Shih, Mohammed U. Kabeto, and Kenneth M. Langa. 2018. "Secular Trends in Dementia and Cognitive Impairment of US Rural and Urban Older Adults." *American Journal of Preventive Medicine* 54(2):164–72.

Yesavage, Jerome A., and Javaid I. Sheikh. 1986. "Geriatric Depression Scale (GDS): Recent Evidence and Development of a Shorter Version." *Clinical Gerontologist* 165–72. doi: 10.1300/J018v05n01_09.

Zhaoyang, Ruixue, Stacey B. Scott, Lynn M. Martire, and Martin J. Sliwinski. 2021. "Daily Social Interactions Related to Daily Performance on Mobile Cognitive Tests among Older Adults." *PLOS ONE* 16(8):e0256583. doi: 10.1371/journal.pone.0256583.

Zimet, Gregory D., Nancy W. Dahlem, Sara G. Zimet, and Gordon K. Farley. 1988. "The Multidimensional Scale of Perceived Social Support." *Journal of Personality Assessment* 52(1):30–41. doi: 10.1207/s15327752jpa5201_2.

Table 1. Sociodemographic attributes (n = 510)

	Mean (SD)/percent
Age	69.9 (9.3)
Gender	
Women	64.5%
Men	35.5%
Race/ethnicity	
White	90.2%
Black	7.25%
Hispanic	1.37%
Asian	0.39%
Other	0.78%
Education	
< HS	6.08%
HS	23.9%
Some college	21.8%
Technical certificate/assoc. degree	16.3%
College degree+	32.2%
Marital status	
Married	43.9%
Divorced	28.2%
Widowed	21.6%
Never married	6.27%
Employment status	
Working full time	19.8%
Working part time	8.63%
Laid off/sick leave/maternity leave	0.20%
Unemployed (seeking work)	1.57%
Unemployed (not seeking work)	1.37%
Retired	54.5%
Disabled	10.8%
Homemaker	1.76%
Other	1.37%
Income	
< $10,000	2.94%
$10,000 - $24,999	23.3%
$25,000 - $49,999	29.4%
$50,000 - $99,999	26.5%
$100,000 - $149,999	6.86%
$150,000+	6.27%
Did not report	4.71%

Table 2. Cognitive, mental, and physical health (n = 510)

	Mean (SD)
Cognitive	
MoCA	23.7 (4.44)
AVLT	7.30 (2.37)
Delayed AVLT	6.73 (3.94)
FAQ	2.18 (3.75)
CCI	1.98 (0.86)
Mental	
Loneliness	1.52 (3.11)
GDS-15	2.94 (2.80)
Physical	
ADL	0.26 (0.33)
Co-morbidities	2.89 (1.91)

Table 3. Social networks (n=510)

	Mean (SD)
Size	5.38 (2.93)
Density[a]	0.76 (0.26)
Diversity[b]	3.10 (1.22)
Strength[b]	8.58 (1.21)
Percent college[b]	39.2 (31.7)

Note: [a]Statistics for density are based on the 493 participants who named at least two network members. [b]Statistics for diversity, strength, and percent college are based on the 508 participants who named at least one network member.

Table 4. Lifestyle activities (n = 510)

	Daily	Weekly	Several times a month	Several times a year	Once a year	Never	Do not know	TOTAL
Read newspaper	39.8%	17.7%	12.8%	9.41%	7.84%	12.4%	0.00%	100%
Crosswords	12.4%	6.50%	5.29%	9.60%	7.30%	25.0%	0.20%	100%
Card games	9.61%	7.06%	11.2%	24.1%	10.6%	36.5%	0.20%	100%
Jigsaw puzzles	20.6%	9.02%	8.63%	10.1%	4.90%	45.7%	0.20%	100%
Write	30.4%	14.5%	11.8%	8.43%	4.31%	30.6%	0.00%	100%
Lectures/museums	0.60%	2.75%	8.04%	21.0%	16.6%	48.0%	0.00%	100%
Memory games	15.7%	7.45%	7.65%	8.82%	5.49%	54.5%	0.40%	100%
Sew/knit/crafts	7.45%	7.84%	11.0%	13.7%	6.27%	53.7%	0.00%	100%
Watch TV	85.1%	9.02%	3.33%	1.57%	0.00%	0.98%	0.00%	100%
Radio	48.2%	22.6%	6.08%	3.73%	0.39%	19.0%	0.00%	100%
Computer/smartphone	84.1%	5.10%	1.76%	0.20%	0.39%	8.43%	0.00%	100%
Musical instrument	1.37%	2.55%	3.53%	4.12%	2.94%	85.5%	0.00%	100%
Visit family/friends	13.9%	32.2%	29.0%	17.7%	2.55%	4.51%	0.20%	100%
Receive visitors	8.43%	22.4%	29.4%	25.3%	4.71%	9.41%	0.39%	100%

Note: Row percentages are displayed

Table 5. Ecological momentary assessments (N=5,588 EMAs)

Activities		Place		Social Interactions[a]	
Eating/drinking	13.8%	My home	70.7%	Alone	60.2%
Socializing	9.13%	Someone else's home	4.49%	Spouse/partner	15.1%
Relaxing	27.9%	Workplace	9.54%	Parent	1.70%
Working	14.6%	Restaurant/bar/cafe	2.18%	Sibling	3.26%
Shopping	3.90%	Store	3.15%	Child	7.03%
Household chore	11.4%	Place of worship	0.75%	Grandchild	3.90%
Volunteering	0.55%	Library	0.18%	Other relative	2.93%
Transporting	3.40%	Park	0.18%	Friend	6.57%
Medical care	1.18%	Somewhere else outdoors	2.31%	Co-worker	5.03%
Other	14.12%	Healthcare facility	1.41%	Neighbor	0.52%
		Other	5.15%	Church member	0.81%
				Group member	0.48%
				Volunteer	0.21%
				Professional	1.56%
				Acquaintance	0.54%
				Stranger	1.29%
				Other	2.40%
TOTAL	100%		100%		113.5%

Note: Column percentages are displayed. [a] Percentages for social interactions sum to more than 100% because participants could report multiple partner types during a single EMA.

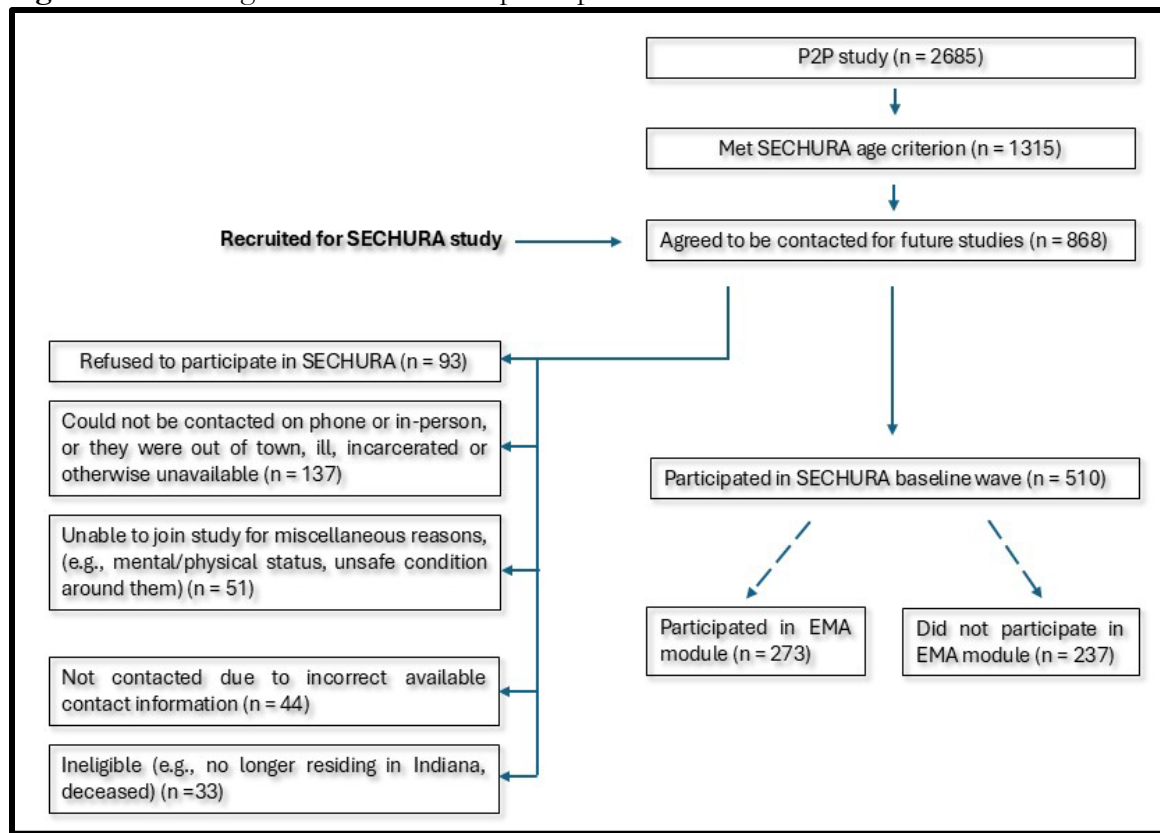**Figure 1.** Flow diagram of SECHURA participant recruitment

Figure 2. Geographic variation in SECHURA cohort. *Note*: Counties are colored according to the Indiana County Classification (Ayres et al. 2012).
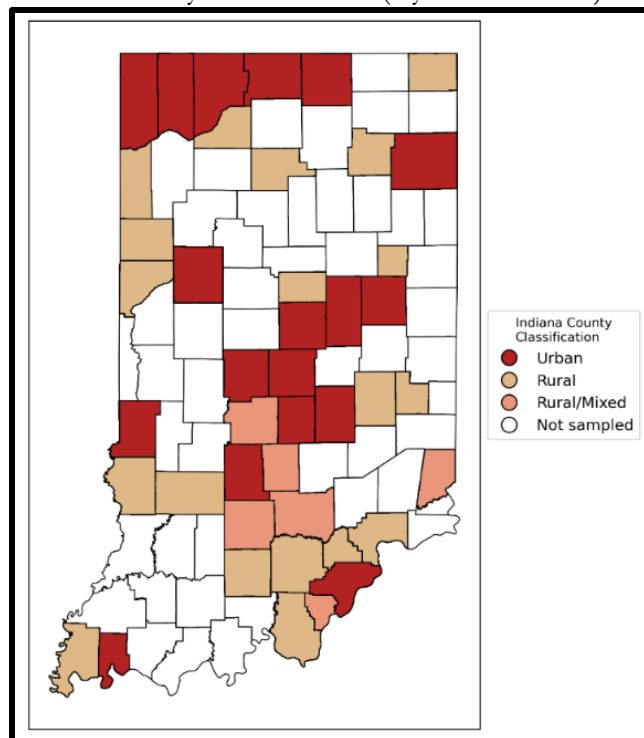
Figure 3. Example of three personal networks from SECHURA sample. *Note*: Networks A, B, and C approximate the network attributes at the 25th, 50th, and 75th percentiles of the sample, respectively.