

Building Healthy Brains Through Productive Aging: Confronting Structural Lags and Gaps

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Linking Social Structures with Cognitive Health

Cognition is a complex, multifaceted dimension of health. Improving cognitive health at a societal level requires a multidisciplinary lifespan approach. Genetic factors, specifically APOEε4 alleles, have long been thought to be significant predictors of Alzheimer's disease, yet the evidence is inconclusive when examined across diverse samples (Belloy et al., 2023; Lee et al., 2024; Powell et al., 2021; Rajan et al., 2019). Modifiable factors across the life-course are strongly associated with cognitive health and the prevention of Alzheimer's disease and related dementias: education in early life, cardiovascular health in midlife, depression and social isolation in later life (Livingston et al., 2024). Most of this research has limited the theoretical parameters to microlevel factors without acknowledging larger socioecological contexts, such as the composition of the population and institutional structures that provide opportunities for healthy brain and cognitive development across the lifespan.

We hypothesize that the (in)congruence between institutional norms, social policies, and shifting compositions of society's age-race-ethnicity-gender structure are key drivers to cognitive health inequities. Riley et al. (1994) argued that social institutions lagged behind quickly shifting demographics with a particular emphasis on age. Social institutions represented a tripartite age-segregated society (Figure 1A): education was mainly relegated to early life, employment to midlife, and retirement/leisure to later life. Elements of the tripartite model are evident today and the majority of cognitive health research reflects this archetype (Livingston et al., 2024).

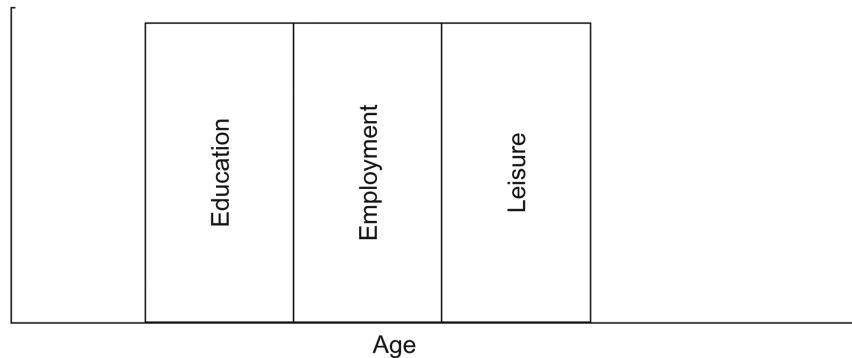
We offer modified versions of the age-integrated model (Figure 1B and C) that integrate productive activities alongside opportunities to strengthen cognitive health. These figures certainly do not depict the tripartite model nor perfectly

reflect the age-integration model aspired to by Riley et al. (1994) or Amundsen (2022) with lifelong engagement in education, work, leisure, family, and health—rather, these figures represent transitional models. Productive activities (and leisure) occur throughout the lifespan. We indicate cognitive health across productive activities in Figure 1C with the thick blue solid line, while visually trying to show that different productive activities occur at different ages and that there could be overlap (e.g. work and caregiving). Cognitive health varies much more in later life than in earlier life. Some people experience a slower rate of cognitive decline, whereas others experience accelerated decline. The wider thickness of the blue solid line and shaded area in later life represent this variability. The steepness of the curves likely varies by the intensity, duration, and complexity of the productive activity. Furthermore, depending on which aspects of cognitive health domains are being measured (numeric or spatial ability, for example), the shape of the curves may vary. We argue that social stratification processes in productive activities, namely education, work, caregiving, and civic engagement, are likely key life-course drivers of brain development and cognitive health.

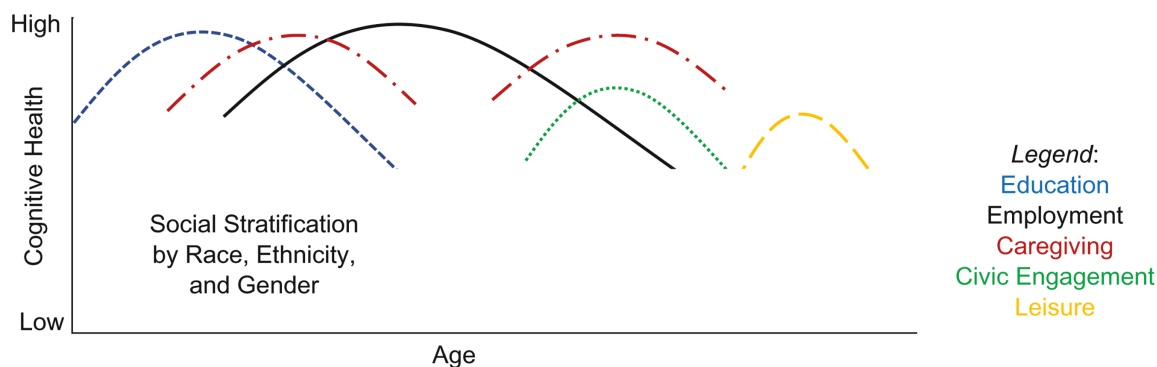
Education and Cognitive Health

Education is a strong predictor of cognitive functioning (Livingston et al., 2024). The extant research has relied heavily on the number of educational years linked with cognitive health. Although crude and simplistic, this measure is predictive of later life cognitive functioning (Lövdén et al., 2020). From childhood to adulthood, racial and ethnic minorities face significant barriers to achieving higher quantity and quality education, which may represent early stratification processes that magnify across the lifespan and interlock with labor market stratification (Ferguson & Koning, 2018). Ensuring everyone has access to quality education and higher education will likely improve cognitive functioning at the

A. Age Differentiated Society.



B. Age Integration Model of Productive Activities with Cognitive Health.



C. Cognitive Health Peaks by Productive Activities across the Lifespan.

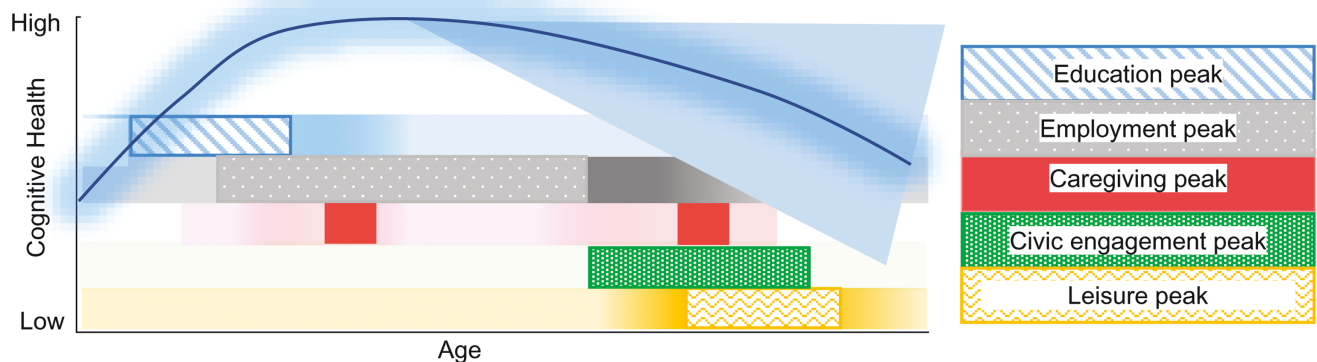


Figure 1. Productive activities and cognitive health across the lifespan. **A.** Age differentiated society. **B.** Age integration model of productive activities with cognitive health. **C.** Cognitive health peaks by productive activities across the lifespan. *Notes:* The steepness of the blue curve (cognitive health) varies by key productive and leisure activities. Depending on various cognitive health domains, the shape of the curve will also vary. Cognitive health varies greater in later life than early life. Some people experience a slower rate of decline, while others experience accelerated decline. The thickness of the blue solid line and horizontal funnel represents variation.

population level for a diversifying society (NASEM, 2022a; Whetung, 2024).

Significant areas remain for scientific inquiry: the quality of education and educational settings, such as socioemotional health, teacher-to-student ratios, classroom dynamics, curricular variation, mentorship, friendship, heterogeneity, and inclusivity in classroom and school environments. Examining multidimensions of education may offer greater insight into educational mechanisms associated with brain health

and cognitive reserve (Bleil et al., 2024; NASEM, 2024). Additional research is needed to examine the relationship between lifelong learning and cognition.

Employment and Cognitive Health

Occupational complexity is one facet of employment that may play a critical mediating role between education and cognitive health (Kohn & Schooler, 1978). Various mechanisms of occupational complexity, whether physical, social,

or intellectual, can potentially delay the onset of cognitive impairment, as well as the severity. Although the literature on this topic is still developing, some studies suggest that jobs with higher mental and social demands are associated with better cognitive outcomes (Fisher et al., 2017; Gonzales et al., 2022; Lee et al., 2022). Physically demanding jobs have shown inconsistent associations with cognitive health, suggesting a broader perspective on occupational influences is needed. The U.S. workforce is more racially segregated now than in previous generations (Ferguson & Koning, 2018), with minorities disproportionately represented in low-paying, physically demanding jobs. A gap remains in understanding how labor market stratification is linked with cognitive functioning and workplace interventions that can build healthy brains.

Caregiving and Cognitive Health

Although it is clear that informal caregiving necessitates cognitive, social, and physical skills, the research is mixed on whether it improves or diminishes cognitive functioning (Brown & Cohen, 2020). When compared with noncaregivers, caregivers demonstrated higher levels of immediate and delayed recall and verbal fluency (García-Castro et al., 2022). Caregiving can yield positive psychosocial health outcomes, and not every caregiver experiences stress (Roth et al., 2015). Despite this, there is clear evidence family caregivers are at greater risk of retiring early, remaining retired, and living in poverty (Gonzales et al., 2017). Mental health, such as depression and anxiety, is also associated with certain caregiving demands. Available data sources do not capture the diversity of caregiving experiences associated with cognitive health. Intervention research is needed to understand how federal, state, and workplace policies can support caregivers' cognitive health and the long term consequences and/or benefits.

Civic Engagement and Cognitive Health

Science has clearly shown the beneficial effects of formal volunteering on various dimensions of health, including cognitive functioning (Gonzales et al., 2019; Guiney & Machado, 2018; Kim et al., 2023; Morrow-Howell, 2010; Wang et al., 2022) and may further mediate the relationship between educational and work opportunities with cognitive health in later life. Volunteering is especially beneficial for individuals with low levels of formal education (Proulx et al., 2018). Volunteers in an intergenerational program, AARP's Experience Corps, exhibited increased brain activity in the left prefrontal cortex and anterior cingulate cortex over the 6-month interval relative to matched controls among African American women with low educational attainment and low incomes (Carlson et al., 2009). The mechanisms that link civic engagement with cognitive health are unknown and an important area of research. How civic activities bolster cognitive health across diverse populations, including Hispanic, Native American/Alaska Native, Asian, Native Hawaiian/Pacific Islander populations also remains unknown. In the context of tribal communities, many elders participate as advisors to council members, make food for pow-wows, teach cultural histories at local museums, etc. The complexity of formal volunteering activities is not measured in national surveys and may underestimate the importance of cultural traditions to civic engagement and cognitive health.

Pathways and Mechanisms

Social policies pertaining to productive aging may facilitate the development of various facets of brain health and cognitive reserve from the ability to learn, think, remember, engage in metacognition, and solve problems (cognitive functioning). Productive activities also necessitate individuals to manage emotions and cope with stress (emotional well-being), and to engage in various types of social relationships that require persuasion, informing, cooperation, mentorship, and transfer or knowledge (social interaction). Physical effort is also required, which may be the third pathway associated with cognitive health. These activities likely expand cognitive reserve—the brain's ability to adapt and compensate for damage or decline in cognitive function (Stern, 2009).

Social Policy Implications

Public policy plays a central role in ensuring that everyone has opportunities to build a healthy brain and contribute to society through the production of goods and services. There are a number of potential legislative and programmatic interventions that can help to achieve these goals (Table 1).

Intergenerational programs have grown in quality and quantity. They offer opportunities to scale efficient, evidence-based programs that simultaneously benefit older adults and younger generations (Jarrott et al., 2021). AARP's Experience Corps Program, for example, involved a combination of randomized field trials and quasi-experimental designs with more than 2,000 elementary school children from kindergarten to third grade across 23 schools in three cities. These children were matched with older tutors who underwent training and skill development to support children with reading and math. Tutored children demonstrated improvements in literacy skills, socioemotional health and fewer behavioral referrals (Lee et al., 2012; <https://www.aarp.org/experience-corps/our-impact/>). Older tutors experienced cognitive plasticity; reduction in depression, social isolation, frailty and risk of falls; and increased sense of purpose, generativity, and quality of life. We need to collect additional life-course data on students in these randomized controlled trials (RCTs) who are now entering adulthood to learn which dimensions of education quality are linked with cognitive health, occupations, and social relations in midlife and beyond.

In some cases, federal policies that target structures related to inequitable cognitive health in later life exist. The Bureau of Indian Education, The Indian Healthcare Improvement Act, and Title VI of the Older Americans Act were all designed to increase access to resources across the lifespan for Native American children, families, and older adults. Title V of the Older Americans Act is also poised to increase educational and work complexity opportunities to low-income older adults. However, these policies are chronically underfunded or do not measure health and cognitive health outcomes, limiting our understanding of the full range of benefits (Halvorsen et al., 2023; National Congress of American Indians, 2024; Ujvari et al., 2019).

Policies and practices that confront bias, discrimination, and harassment are a top priority given population aging, health, and solvency concerns of social insurance programs (Burns et al., 2019; Chang et al., 2020; Chen et al., 2024; Gonzales et al., 2015, 2021). Age discrimination occurs across the entire working lifespan, from ages 18 to later life

Table 1. Policy Response to Challenges of Equity and Structural Lags

Challenge	Policy response
Inequities in educational quality and quantity	Scale evidence-based intergenerational interventions proven to improve the quality of education and/or attainment of higher education and bolster the health of older adults simultaneously (e.g. AARP's Experience Corps) Bolster material and social resources to communities through existing federal programs, including Older Americans Act, Title V (Senior Community Service Employment Program), Title VI (Services for Native Americans), Bureau of Indian Education Amend the Older Americans Act so that all titles are encouraged to promote intergenerational programs with a focus on health and cognitive health, and mentorship and training in workforce shortage areas Expand loan forgiveness programs in critical workforce shortage areas (social work, nursing, gerontology, geriatricians) Promote lifelong learning initiatives
Intersectional discrimination in the workplace	Protect Older Workers Against Age Discrimination Act (Senate bill 1030, House of Representatives bill 6581) Incivility training that incorporates bias based on age, race, ethnicity, sexual and gender orientation Raise awareness on workplace harassment guidance by the U.S. Equal Employment Opportunity Commission
Promote role enhancement and substitution	FAMILY Act (Senate bill 1714, House of Representatives bill 3481) The Social Security Caregiver Credit Act (Senate bill 1211, House of Representatives bill 3729) Paid Family and Medical Leave Tax Credit Extension and Enhancement Act (Senate bill 3680, House of Representatives bill 8860) Family Leave for Parental Involvement in Education Act (House of Representatives bill 7978) Schedules that Work Act (House of Representatives bill 5563) Grandparent-Grandchild Medical Leave Act (House of Representatives bill 2528)
Crosscutting research needs	Introduce Notices of Funding Opportunity with the National Institutes of Health to synthesize datasets and model lifespan and life-course phenomena with cognitive health inequities Fund productive aging (education, work, caregiving, volunteering) research with cognitive health across diverse populations across federal funding agencies Coordinate interventions and longitudinal data between Departments of Education, Labor, Social Security Administration, and federal civic programs

Notes: AARP = American Association of Retired Persons; FAMILY = The Family and Medical Insurance Leave Act.

(Marchiondo et al., 2016; North & Fiske, 2012). Legislation such as Protecting Older Workers Against Discrimination Act (<https://www.govtrack.us/congress/bills/118/s1030>, <https://www.govtrack.us/congress/bills/118/hr6581>) would reinstate age as a factor, not the deciding factor, in an age discrimination act, which was Congress's original intent with the Age Discrimination in Employment Act. This will likely reduce barriers to work in later life. We also encourage extending age discrimination federal laws across the entire working lifespan.

Interventions are also needed outside of the workplace to counter stereotypes and discrimination to promote a healthy, productive, and peaceful society. Evidence from RCTs suggest it is possible to confront stereotypes and attitudes based on age, race, ethnicity, nativity, gender, sexual orientation, and religion (Burns et al., 2019; Paluck et al., 2019). These RCTs can be scaled. Research is needed to learn whether it is possible to combat two forms of bias simultaneously (e.g. ageism and racism), and whether community-based interventions that modify cognitive-attitudinal-behavioral domains have spillover effects within interpersonal dynamics and relations in the workplace.

Social policies that enable individuals to occupy multiple productive roles while buffering the adverse health, economic, and social outcomes are needed (Moen et al., 2022; NASEM, 2022b). Role strain and role ambiguity, rather than role enhancement, are clearly evident in these transitional models (1b-d). Role strain is associated with economic consequences, stress, and likely compromised cognitive health. Legislation such as Credit for Caring Act, the FAMILY Act (Senate bill 1714, House of Representatives bill 3481), The Social Security Caregiver Credit Act (Senate bill 1211, House

of Representatives bill 3729), Paid Family and Medical Leave Tax Credit Extension and Enhancement Act (Senate bill 3680, House of Representatives bill 8860), Family Leave for Parental Involvement in Education Act (House of Representatives bill 7978, which also extends to grandchildren's educational and extracurricular activities), Schedules that Work Act (House of Representatives bill 5563), Grandparent-Grandchild Medical Leave Act (House of Representatives bill 2528) can support caregivers with the time to care for their loved ones while working as well as reduce the risk of economic insecurity during the time of care and when they start to collect Social Security Retirement Income. These are examples of policies that can support caregivers and their families, which could mean more opportunities for productive engagement that promotes cognitive health.

Conclusion

Cognitive health inequities are likely due to many genetic and environmental factors, ranging from individual to structural contexts. This article aimed to expand the focus from microlevel factors related to cognitive health inequities to socioecological contexts and infused structural lag, intersectionality, and equity perspectives in the context of productive aging and cognitive health. Social policies and practices have not kept pace with shifts in the population structure, leading to structural lags and systemic disadvantages among minoritized populations in key productive activities across the life-course, namely education, work, caregiving, and volunteering. We hypothesized structural lags undermine opportunities for healthy brain development and cognitive reserve across

gender, race, and ethnic groups. Productive activities may share common mechanisms to cognitive health, yet access to the quality and type of productive roles has been unevenly distributed across the diverse U.S. population. Furthermore, these populations may experience adversity in other life domains stemming from social stratification, which may heighten stress and undermine cognitive health. Although we identified a number of gaps in basic and intervention research, we highlighted opportunities for targeted social policies and programs to achieve an age-integrated society that promotes productivity and cognitive health across the lifespan.

Social policies and practices have not kept pace with shifts in the population structure, leading to structural lags and systemic disadvantages among minoritized populations in key productive activities across the life-course, namely education, work, caregiving, and volunteering. [W]e highlighted opportunities for targeted social policies and programs to achieve an age-integrated society that promotes productivity and cognitive health across the lifespan.

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Conflict of Interest

None.

References

- Amundsen, D. (2022). Indigenous and older adult higher education students: Challenging systemic and linear transitions for inclusion. *International Journal of Educational Research Open*, 3, 100148. <https://doi.org/10.1016/j.ijedro.2022.100148>
- Belloy, M. E., Andrews, S. J., Le Guen, Y., Cuccaro, M., Farrer, L. A., Napolioni, V., & Greicius, M. D. (2023). APOE genotype and Alzheimer disease risk across age, sex, and population ancestry. *JAMA Neurology*, 80(12), 1284–1294. <https://doi.org/10.1001/jamaneurol.2023.3599>
- Bleil, M. E., Roisman, G. I., Hamilton, D. T., Magro, S. W., Appelhans, B. M., Gregorich, S. E., Booth-LaForce, C., & Pianta, R. C. (2024). Which aspects of education are health protective? A life course examination of early education and adulthood cardiometabolic health in the 30-year study of early child care and youth development (SECCYD). *BMC Public Health*, 24(1), 1092. <https://doi.org/10.1186/s12889-024-18560-4>
- Brown, M. J., & Cohen, S. A. (2020). Informal caregiving, poor mental health, and subjective cognitive decline: results from a population-based sample. *Journal of Gerontological Nursing*, 46(12), 31–41.
- Burnes, D., Sheppard, C., Henderson, C. R. Jr, Wassel, M., Cope, R., Barber, C., & Pillemer, K. (2019). Interventions to reduce ageism against older adults: A systematic review and meta-analysis. *American Journal of Public Health*, 109(8), e1–e9. <https://doi.org/10.2105/AJPH.2019.305123>
- Carlson, M. C., Erickson, K. I., Kramer, A. F., Voss, M. W., Bolea, N., Mielke, M., McGill, S., Rebok, G. W., Seeman, T., & Fried, L. P. (2009). Evidence for neurocognitive plasticity in at-risk older adults: The experience corps program. *The Journals of Gerontology: Series A, Biological Sciences and Medical Sciences*, 64(12), 1275–1282. <https://doi.org/10.1093/gerona/glp117>
- Chang, E. S., Kanno, S., Levy, S., Wang, S. Y., Lee, J. E., & Levy, B. R. (2020). Global reach of ageism on older persons' health: A systematic review. *PLoS One*, 15(1), e0220857. <https://doi.org/10.1371/journal.pone.0220857>
- Chen, R., Byrd, D. R., Whitfield, K. E., & Williams, D. R. (2024). Associations of major lifetime and everyday discrimination with cognitive function among middle-aged and older adults. *Ethnicity & Disease*, 34(3), 137–144. <https://doi.org/10.18865/EthnDis-2023-42>
- Ferguson, J. P., & Koning, R. (2018). Firm turnover and the return of racial establishment segregation. *American Sociological Review*, 83(3), 445–474. <https://doi.org/10.1177/0003122418767438>
- Fisher, G. G., Chaffee, D. S., Tetrack, L. E., Davalos, D. B., & Potter, G. G. (2017). Cognitive functioning, aging, and work: A review and recommendations for research and practice. *Journal of Occupational Health Psychology*, 22(3), 314–336. <https://doi.org/10.1037/ocp0000086>
- García-Castro, F. J., Bendayan, R., Dobson, R. J. B., & Blanca, M. J. (2022). Cognition in informal caregivers: Evidence from an English population study. *Aging & Mental Health*, 26(3), 507–518. <https://doi.org/10.1080/13607863.2021.1893270>
- Gonzales, E., Matz-Costa, C., & Morrow-Howell, N. (2015). Increasing opportunities for the productive engagement of older adults: A response to population aging. *The Gerontologist*, 55(2), 252–261. <https://doi.org/10.1093/geront/gnu176>
- Gonzales, E., Lee, Y., & Brown, C. (2017). Back to work? Not everyone. Examining the longitudinal relationships between informal caregiving and paid work after formal retirement. *Journals of Gerontology: Series B, Psychological Sciences and Social Sciences*, 72(3), 532–539. <https://doi.org/10.1093/geronb/gbv095>
- Gonzales, E., Suntai, Z., & Abrams, J. (2019). Volunteering and health outcomes among older adults. In Gu, D., & Dupre, M. (Eds.), *Encyclopedia of Gerontology and Population Aging*. Springer. https://doi.org/10.1007/978-3-319-69892-2_649-1
- Gonzales, E., Lee, Y. J., & Marchiondo, L. A. (2021). Exploring the consequences of major lifetime discrimination, neighborhood conditions, chronic work, and everyday discrimination on health and retirement. *Journal of Applied Gerontology*, 40(2), 121–131. <https://doi.org/10.1177/0733464819892847>
- Gonzales, E., Whetung, C., Lee, Y. J., & Kruchten, R. (2022). Work demands and cognitive health inequities by race and ethnicity: A scoping review. *The Gerontologist*, 62(5), e282–e292. <https://doi.org/10.1093/geront/gnac025>
- Guiney, H., & Machado, L. (2018). Volunteering in the community: Potential benefits for cognitive aging. *Journals of Gerontology: Series B, Psychological Sciences and Social Sciences*, 73(3), 399–408. <https://doi.org/10.1093/geronb/gbx134>
- Halvorsen, C., Werner, K., McColloch, E., & Yulikova, O. (2023). How the Senior Community Service Employment Program influences participant well-being: A participatory research approach with program recommendations. *Research on Aging*, 45(1), 77–91. <https://doi.org/10.1177/01640275221098613>
- Jarrott, S. E., Scrivano, R. M., Park, C., & Mendoza, A. N. (2021). Implementation of evidence-based practices in intergenerational programming: A scoping review. *Research on Aging*, 43(7-8), 283–293. <https://doi.org/10.1177/0164027521996191>
- Kim, S., Halvorsen, C., & Han, S. H. (2023). Volunteering and changes in cardiovascular biomarkers: Longitudinal evidence from the health and retirement study. *Innovation in Aging*, 7(5), igad048. <https://doi.org/10.1093/geroni/igad048>
- Kohn, M. L., & Schooler, C. (1978). The reciprocal effects of the substantive complexity of work and intellectual flexibility: A longitudinal assessment. *American Journal of Sociology*, 84(1),

- 24–52. <https://doi.org/10.1086/226739>. <https://www.jstor.org/stable/2777977>
- Lee, Y. J., Gonzales, E., & Anel, R. (2022). Multifaceted demands of work and cognitive functioning: Findings from the Health and Retirement Study. *Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, 77(2), 351–361. <https://doi.org/10.1093/geronb/gbab087>
- Lee, Y. J., Gonzales, E., Wu, Y., Braun, K. L., Martin, P., Willcox, B., & Anel, R. (2024). The association between activities and cognitive health: Stratified analysis by APOE ϵ 4 status. *Journal of Alzheimer's Disease Reports*, 8(1), 1502–1515. <https://doi.org/10.1177/25424823241290528>
- Lee, Y. S., Morrow-Howell, N., Jonson-Reid, M., & McCrary, S. (2012). The effect of the Experience Corps® Program on student reading outcomes. *Education and Urban Society*, 44(1), 97–118. <https://doi.org/10.1177/0013124510381262>
- 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 (London, England)*, 404(10452), 572–628. [https://doi.org/10.1016/S0140-6736\(24\)01296-0](https://doi.org/10.1016/S0140-6736(24)01296-0)
- Lövden, M., Fratiglioni, L., Glymour, M. M., Lindenberg, U., & Tucker-Drob, E. M. (2020). Education and cognitive functioning across the life span. *Psychological Science in the Public Interest*, 21(1), 6–41. <https://doi.org/10.1177/1529100620920576>
- Marchiondo, L. A., Gonzales, E., & Ran, S. (2016). Development and validation of the workplace age discrimination scale. *Journal of Business and Psychology*, 31, 493–513. <https://doi.org/10.1007/s10869-015-9425-6>
- Moen, P., Peditke, J. H., & Flood, S. (2022). Derailed by the COVID-19 economy? An intersectional analysis of older adults' work by age, gender, race/ethnicity, and social class. *American Behavioral Scientist*, 0, 000276422110660. <https://doi.org/10.1177/00027642211066061>
- Morrow-Howell, N. (2010). Volunteering in later life: Research frontiers. *Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, 65(4), 461–469. <https://doi.org/10.1093/geronb/gbq024>
- National Academies of Sciences, Engineering, & Medicine. (2024). Identifying midlife social exposures that might modify risk for cognitive impairment associated with early life disadvantage: A workshop. Washington, DC.
- National Academy of Medicine; Commission for a Global Roadmap for Healthy Longevity. (2022a). *Global roadmap for healthy longevity*. National Academies Press (US), 7, <https://www.ncbi.nlm.nih.gov/books/NBK587299/>
- National Academies of Sciences, Engineering, and Medicine, Fiske, S., Aguila, E., Berg, P. B., Borsch-Supan, A., Coile, C. C., Gonzales, E., James, J. B., Moen, P., Neumark, D., Wang, M., Becker, T., Ghilerman, M., & Majmundar, K. M. (2022b). *Understanding the aging workforce: Defining a research agenda*. The National Academies Press. <https://doi.org/10.17226/26173>
- National Congress of American Indians. (2024). *81st Annual Program: Policy Updates*. <https://www.ncai.org/section/81st-annual-program/table-of-contents/policy-updates>
- North, M. S., & Fiske, S. T. (2012). An inconvenienced youth? Ageism and its potential intergenerational roots. *Psychological Bulletin*, 138(5), 982–997. <https://doi.org/10.1037/a0027843>
- Paluck, E. L., Green, S. A., & Green, D. P. (2019). (2019). The contact hypothesis re-evaluated. *Behavioural Public Policy*, 3(2), 129–158. <https://doi.org/10.1017/bpp.2018.25>
- Powell, D. S., Kuo, P. L., Qureshi, R., Coburn, S. B., Knopman, D. S., Palta, P., Gottesman, R., Griswold, M., Albert, M., Deal, J. A., & Gross, A. L. (2021). The relationship of APOE ϵ 4, race, and sex on the age of onset and risk of dementia. *Frontiers in Neurology*, 12, 735036. <https://doi.org/10.3389/fneur.2021.735036>
- Proulx, C. M., Curl, A. L., & Ermer, A. E. (2018). Longitudinal associations between formal volunteering and cognitive functioning. *Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, 73(3), 522–531. <https://doi.org/10.1093/geronb/gbx110>
- Rajan, K. B., McAninch, E. A., Wilson, R. S., Weuve, J., Barnes, L. L., & Evans, D. A. (2019). Race, APOE ϵ 4, and long-term cognitive trajectories in a biracial population sample. *Journal of Alzheimer's Disease : JAD*, 72(1), 45–53. <https://doi.org/10.3233/JAD-190538>
- Riley, M. W., Kahn, R. L., & Foner, A. (1994). *Age and structural lag: Society's failure to provide meaningful opportunities in work, family, and leisure*. Wiley.
- Roth, D. L., Fredman, L., & Haley, W. E. (2015). Informal caregiving and its impact on health: A reappraisal from population-based studies. *The Gerontologist*, 55(2), 309–319. <https://doi.org/10.1093/geront/gnu177>
- Stern, Y. (2009). Cognitive reserve. *Neuropsychologia*, 47(10), 2015–2028. <https://doi.org/10.1016/j.neuropsychologia.2009.03.004>
- Ujvari, K., Fox-Grage, W., Houser, A., Dean, O., & Feinberg, L. F. (2019). *Older Americans Act*. AARP Public Policy Institute.
- Wang, Y., Wong, R., Amano, T., & Shen, H. W. (2022). Associations between volunteering and cognitive impairment: The moderating role of race/ethnicity. *Health & Social Care in the Community*, 30, e4433–e4441. <https://doi.org/10.1111/hsc.13847>
- Whetung, C. (2024). *Weathering the storm of cognitive inequities: Testing the minority stress and cognition model with indigenous older adults*. New York University. ProQuest, <http://proxy.library.nyu.edu/login?url=https://www.proquest.com/dissertations-theses/weathering-storm-cognitive-inequities-testing%2Fdocview%2F3053909511%2Fse-2%3Faccountid%3D12768>