Journal of Articles in Support of the Null Hypothesis
Vol. 20, No. 1
 1539–8714
www.jasnh.com

Impact of Religious and Spiritual Activity on Risk of Dementia and Cognitive Impairment with Differences across Race/Ethnicity and Sex

Katherine Carroll Britt
University of Pennsylvania, School of Nursing

Kathy C. Richards
Gayle Acton
Kavita Radhakrishnan
The University of Texas at Austin, School of Nursing

Jill Hamilton
Emory University, Nell Hodgson Woodruff School of Nursing
Atlanta, GA

Religion and spirituality (R/S) are positively associated with cognitive function and individual dementia risk factors, yet few studies have examined R/S association with dementia. Identifying possible protective factors against developing dementia is needed to decrease the rising dementia burden. We examined the frequency of religious attendance on the risk of developing a cognitive condition over time, adjusting for race/ethnicity and age in U.S. older adults ($N = 103$). A higher frequency of religious attendance and a higher percentage of dementia was found among non-Hispanic Black, Hispanic, and female older adults. However, religious attendance was not associated with developing a cognitive condition over time. More research is needed to examine these associations with consideration of a bi-directional relationship between stress and R/S practices and with consideration of premature mortality. In addition, examining if R/S could delay dementia onset should be explored, especially among a large, diverse sample.

Keywords: Religion, spirituality, aging, coping, older adults, Alzheimer's

Corresponding Author: Katherine Carroll Britt, 418 Curie Blvd, Philadelphia, PA, USA; email address: katbritt@nursing.upenn.edu

With the Alzheimer's disease and related dementia (ADRD) burden growing and a present absence of a cure, it is becoming increasingly important to identify and develop effective preventative interventions (Gauthier et al., 2016; Global Burden of Disease, 2019). The population incidence per 1000 person-years of preclinical ADRD known as Mild Cognitive Impairment (MCI) is around 22.5 (ages 75–79 years), 40.9 (ages 80–84 years), and 60.1 (ages 85 years and older) (Wolters et al., 2020) while the population incidence of dementia is around 18 (ages 75–79 years), 35 (ages 80-84 years), and 65 (ages 85 years and older) (Gillis et al., 2019). Therefore, identifying modifiable risk factors, including protective factors, is warranted to recommend activity and behavior modifications for decreasing ADRD risk. ADRD disproportionately affects more socially disadvantaged populations as African Americans are twice as likely, Hispanics are one and half times as likely to be diagnosed with ADRD compared to White populations, and 2/3 of those with ADRD are women (Alzheimer's Association, 2020).

Accumulating research reports positive associations between religion and spirituality (R/S) with cognitive function in older adults, specifically religious participation (Choi et al., 2016; Corsentino et al., 2009; Hill et al., 2006; Kraal et al., 2019; Zhang, 2010; Yeager et al., 2006), spiritual activity (Fung & Lam, 2013), religious activities, and religious coping (Koenig et al., 1997). In addition, positive associations are reported between R/S with individually identified dementia risk factors, including age, cardiovascular health, and physical activity, and negative associations with cancer, smoking, diabetes, alcohol, depression, and hypertension (Koenig, 2012; Koenig, 2015). Very few studies have examined the relationship between R/S and with risk of MCI or dementia. However, results are promising, reporting lower odds of ADRD in older adults with Christian affiliation (Lin et al., 2015) and lower prevalence of ADRD among older adults regularly practicing meditative activities (Fukai et al., 2016). Weekly church attendance was associated with a 66% reduction in the odds of older adults being in the combined group of progressive high frailty and rapid cognitive decline (Howrey et al., 2020). These studies suggest R/S practices and activities offer a protective factor with cognitive benefits. Possible mechanisms include decreasing stress, promoting beneficial physiological effects, and engaging cognitive exercise with higher cortical function through abstract thinking as individuals contemplate morals and ideas related to the sacred or transcendent (Koenig et al., 2012). Studies report that social interaction can increase cognitive reserve, endorsing organized social engagement as a protective factor (Kelly et al., 2017; Scarmeas & Stern, 2003). However, accumulating chronic conditions may impact individuals' social activity involvement as they age.

Minority populations find cultural salience in their faith and R/S practice, as 75% of African Americans and 59% of Latinos report R/S as very important compared to 49% of White populations (Pew Research Center, 2014). However, these communities have more significant health disparities, especially ADRD (Nye et al., 2022). To address the gap in understanding the association between R/S and the risk of developing a cognitive condition, the present study aimed to examine associations between predictive factors such as religious activities on developing a cognitive condition over time (i.e., MCI, all-cause dementia).

Methods

A secondary data analysis utilizing the Aging, Demographics, and Memory Study (ADAMS) and the Health and Retirement Study (HRS) was used to examine the impact of religious attendance in 1992 (HRS) on the risk of developing a cognitive condition over time in 2001-2003 (ADAMS). A nationally representative, high-quality sample, the HRS, and ADAMS are sponsored by the National Institute on Aging (NIA U01AG009740; NIA U01AG009740) and the HRS by the Social Security Administration. ADAMS was the first in-home dementia assessment study of its kind across a national sample (Langa et al., 2005; Plassman et al., 2011; Heeringa et al., 2009) explicitly designed to measure prevalence, risk factors, cost, and health outcomes of cognitive impairment and dementia among U.S. older adults. The institutional review boards approved study procedures at Duke University Medical Center and The University of Michigan, and study respondents or their surrogates provided informed consent. The University of Texas granted the present study exempt status at Austin Institutional Review Board due to the use of de-identified secondary data.

Data were obtained from the RAND HRS Longitudinal and Fat Files for participants who completed the HRS survey in 1992 for religious attendance and covariates (i.e., age (years), race/ethnicity (using non-Hispanic White as the reference to compare to non-Hispanic Black and Hispanic as these two minority groups are at greater risk of developing dementia), and HRS weights (adjusted sampling weights). In addition, data were obtained from ADAMS in 2001-2003 for cognitive condition (i.e., dichotomized as normal cognition or cognitive condition consisting of cognitively impaired not demented (CIND) or all-cause dementia). The incidence of dementia doubles every five years from age 65 to 90 (Jorm & Jolley, 1998). Above the age of 90 years, there is a 38% prevalence (Plassman et al., 2007), with an average age of dementia onset estimated at 83.7 years (Plassman et al., 2011), supporting the utilization of ADAMS for analysis as participants were age 70 years and older (i.e., the mean age of participants was 81.5 years). An *a priori* power analysis to estimate the appropriate sample size of a two-tailed test with a small effect size ($d = 0.30$) indicated 95 participants would be required to achieve 80% power and significance level of alpha = 0.05 using G*Power3 (Faul et al., 2007).

Cognitive condition was measured as CIND or all-cause dementia based on an in-home extensive evaluation (i.e., medical history, cognitive history, neuropsychological examination and measures, past neuroimaging, and lab results) by a Duke-trained neuropsychology technician and a study nurse. These evaluations included the presence of the participant and surrogate familiar with their medical history and everyday activities. They were later scored by a panel of neuro and gerontological experts based on DSM-III-R and DSM-IV (American Psychiatric Association,

1987; Langa et al., 2005; American Psychiatric Association, 1994). In addition, the frequency of religious attendance was assessed using "How often have you attended religious services during the last year? Responses range from not at all (5) to more than once a week (1). This item for religious involvement was selected by HRS based on working group recommendations (Levin, 2003) and has also been reported as one of the strongest R/S predictors of all-cause mortality in research (Koenig, 2012).

Cognitive function was assessed in the HRS at baseline using two-fold cutoff criteria based on MCI diagnostic criteria (Petersen et al., 1997) and consultation with a board-certified clinical neuropsychologist Dr. Jared Benge, PhD., ABPP-CN.: (1) subjective cognitive complaint operationalized as worse self-reported memory compared to one year ago, and (2) memory performance below one standard deviation of the sample mean (operationalize as delayed 20-word recall, mean 3.83 (*SD* = 2.879)).

Multinomial logistic regression models were utilized to determine the association of R/S practice to cognitive condition, adjusting for age and race/ethnicity with p values set at $p < .05$. Regression diagnostics were conducted to test the robustness of all study findings. Statistical analyses were conducted using IBM SPSS Statistics (Version 25). Data were analyzed for missing data, errors, and multicollinearity. The initial sample size consisted of $N = 133$ cases, which overlapped between the two data collection time points (HRS 1992 and ADAMS 2001-2003). Cases were excluded for not meeting normal cognitive function at baseline ($n = 4$) or missing cognitive assessment at baseline ($n = 18$). Missingness was evaluated in SPSS with Missing Value Analysis (MVA), resulting in missing completely at random (MCAR) (Little MCAR $p = 0.329$). Cases with greater than 5% missing data were removed ($n = 8$), resulting in a final sample size of $N = 103$.

Results

The sample was primarily White (80.6%), the mean age at follow-up was 73.15 years, female (72.8%), living in the community (97.4%), married or partnered (87.1%), and Protestant (65.4%). (see Table 1). All respondents were participants and not proxies. Across race/ethnicity, non-Hispanic Black, non-Hispanic other, and Hispanic participants reported higher frequencies of daily religious services than non-Hispanic White counterparts (see Tables 2 and 3). Across cognitive conditions, non-Hispanic Black, Hispanic, and female participants had higher frequencies of dementia and CIND. Females reported a higher frequency of daily religious attendance compared to males. (see Table 3). Frequency of religious attendance across cognitive categories revealed a higher frequency of attendance among those who developed CIND (mean 3.24(SD 1.18)) compared to those who maintained normal cognition (mean 3.01 (*SD* = 1.44)) or those who developed dementia (mean 3.00 (*SD* = 1.58)) (see Table 4).

Binomial logistic regression was performed to ascertain the effects of religious attendance on the likelihood that participants develop a cognitive condition over time, controlling for age and non-Hispanic Black and Hispanic race/ethnicity. Linearity of the continuous variable (i.e., age) for the logit of the dependent variable was assessed via the Box-Tidwell (Box et al., 1962)

Table 1. Description of the Sample (N = 103)

Demographics		*Unweighted Count** (n = 103)	(%)	Mean (SD)	Median (Range)
Age					
Baseline				62.67 (3.03)	59-73
Follow-up				73.15 (2.867)	70-83
Race/Ethnicity					
Non-Hispanic	White	73	(80.6)		
Non-Hispanic	Black	15	(10)		
Non-Hispanic	Other	4	(2.9)		
Hispanic		11	(6.5)		
Gender					
Females		31	(72.8)		
Males		72	(27.2)		
Living Arrangements					
Community		101	(97.4)		
Nursing Home		2	(2.6)		
Education				11.29 (4.00)	0-17
Marital Status					
Single		2	(2.6)		
Married, partnered		87	(87.1)		
Divorced, separated		11	(8.1)		
Widowed		3	(2.3)		
Religious Preference					
Protestant		68	(65.4)		
Catholic		34	(33.3)		
Other		1	(1.3)		
Income				39238.16(34087.01)	0-223,000
Religious Attendance					
Less than once a month		16	(17.5)		
At least once a month		20	(20.7)		
At least once a week		16	(14.6)		
At least 2-3 times a week		33	(31.1)		
Daily		18	(16.2)		
Cognitive Condition					
Normal Cognition		58	(59.2)		
MCI		32	(29.1)		
Dementia		13	(11.7)		

*Note. *Table contains raw counts and survey-weighted: means, standard deviations, median, ranges, and percentages; therefore, percentages may not sum to 100. SD=standard deviation*

Table 2. Comparisons Across Race/Ethnicity

Race/Ethnicity	Non-Hispanic White (N = 73)	Non-Hispanic Black (N = 15)	Non-Hispanic other (N = 4)	Hispanic (N = 11)
	N(%)*	*N*(%)*	*N*(%)*	*N*(%)*
Frequency of Religious Attendance				
Less than once a month	14(19.3)	1(6.5)	1(44.4)	0
At least once a month	17(23.2)	2(12.9)	0	1(10)
At least once a week	11(15.3)	2(9.7)	1(11.1)	2(15)
At least 2-3 times a week	23(30.9)	4(25.8)	0	6(55)
Daily	8(11.2)	6(45.2)	2(100)	2(20)
Cognitive Condition				
Normal	43(60.6)	5(38.7)	2(66.7)	8(70)
MCI	22(28.9)	7(41.9)	2(33.3)	1(10)
Dementia	8(10.4)	3(19.4)	0	2(20)

*Note. *Table contains raw counts and survey-weighted percentages to account for sample design; therefore, percentages may not sum to 100. SD=standard deviation; MCI=Mild Cognitive Impairment*

Table 3. Comparisons Across Sex

Sex	Female (N = 31)	Male (N = 72)
	N*(%)	N*(%)
Frequency of Religious Attendance		
Less than once a month	3(9.5)	13(20.4)
At least once a month	5(19)	15(21.3)
At least once a week	4(13.1)	12(15.1)
At least 2-3 times a week	7(20.2)	26(35.1)
Daily	12(38.1)	6(8)
Cognitive Condition		
Normal	16(53.6)	42(61.3)
MCI	11(32.1)	21(28)
Dementia	4(14.3)	9(10.7)

*Note. *Table contains raw counts and survey percentages to account for sample design; therefore, percentages may not sum to 100. SD=standard deviation; MCI=Mild Cognitive Impairment*

Table 4. Religious Attendance Across Cognitive Category (N=103)

Cognitive Condition	Normal Cognition (N=58)		MCI (N=32)		Dementia (N=13)	
	N*(%)	Mean(SD)	N*(%)	Mean(SD)	N*(%)	Mean(SD)
		3.01(1.44)		3.24(1.18)		3.00(1.58)
Frequency of Religious Attendance						
Less than once a month	10(20.8)		3(6.7)		3(27.8)	
At least once a month	12(19.7)		7(26.7)		1(11.1)	
At least once a week	9(15.8)		5(13.3)		2(11.1)	
At least 2-3 times a week	16(25.1)		12(42.2)		5(33.3)	
Daily	11(18.6)		5(11.1)		2(16.7)	

*Note. *Table contains raw counts and survey percentages to account for sample design; therefore, percentages may not sum to 100. SD=standard deviation; MCI=Mild Cognitive Impairment*

Table 5. Regression Prediction Likelihood of a Cognitive Condition Based on Age, Race/Ethnicity, and Religious Attendance.

	B	SE	Wald	*df*	*p*	Odds Ratio	95% CI for Odds Ratio	
							LL	UL
Age	.151	.084	3.202	1	.074	1.163	.986	1.372
Non-Hispanic Black	1.117	.870	1.649	1	.199	3.056	.556	16.807
Hispanic	-.629	1.109	.322	1	.571	.533	.061	4.688
Religious Attendance (less than once a month)			2.503	4	.644			
Religious Attendance (1) – at least once a month	.401	.810	.245	1	.620	1.494	.305	7.307
Religious Attendance (2) – at least once a week	.166	.887	.035	1	.852	1.180	.207	6.718
Religious Attendance (3) – at least 2-3 times a week	.837	.753	1.236	1	.266	2.309	.528	10.092
Religious Attendance (4) - daily	-.265	.921	.083	1	.773	.767	.126	4.666
constant	-10.253	5.261	3.798	1	.051	.000		

Note. LL = lower limit; UL = upper limit; CI = Confidence Interval; Religious attendance is from low to high (0–4).

procedure; age was found to be linearly related to the logit of the dependent variable. No standardized residuals with values > 2.5 and no multicollinearity were found. The logistic regression model was not statistically significant, $X^2(7) = 8.345$, $p < .303$ (see Table 5). The model explained 13.8% (Nagelkerke R^2) of the variance in developing a cognitive condition and correctly classified 68% of cases. Sensitivity was 40.5%, and specificity was 86.9%. The Hosmer and Lemeshow test showed no significance ($p < .868$), indicating that the model is a good fit (Hosmer et al., 2013). The area under the curve (AUC) was .696 (CI .637 - .756) (see Figure 2), which is rated as poor discrimination (Hosmer et al., 2013). None of the four predictor variables (i.e., age, non-Hispanic Black, Hispanic, and religious attendance) were statistically significant for developing a cognitive condition.

Discussion

Religious attendance was not found to reduce the risk of developing CIND or all-cause dementia among older adults ages 70 years and older. It has been identified with a lower rate of all-cause mortality, depression, and suicide and with a lower rate of common ADRD risk factors (i.e., smoking, heavy drinking, stroke) (Chen et al., 2020; Ellison & Flannelly, 2009; Koenig, 2012; Krause, 2009; Obisesan et al., 2006). Though religious attendance is related to lower rates of ADRD risk factors, it is unclear why it is not associated with lower odds of developing cognitive impairment or dementia. Other studies have found similar results with physical-disease risk factors but no association with physical-disease development (Chen et al., 2020; Koenig, 2012; Koenig, 2015). As such, Hill and colleagues (2020) recently reported that older adults attending more religious services over their life course exhibited poorer working memory and mental status compared to older adults who attended religious services less often. Perhaps as religious attendance is used for coping with stress which elevates risk factors, this simultaneous association offsets the protective benefits of religious attendance. In addition, religious activities may provoke guilt or fear for some, which may also offset the association. Another possibility is that religious activities, especially those continued over a more extended period, may reflect a more automatic or monotonous activity than a diverse activity that supports the triggering of new neural networks (Lee et al., 2021). They may not prompt reasoning abilities or conscious thought but become more procedural (Vance, 2004). These findings suggest that more research is needed to examine these associations over time, considering a bi-directional relationship and diverse religious activities versus a single religious activity that may better support neural network building.

This study is one of the first to examine the association of religious attendance with the risk of developing a cognitive condition over time. Our findings differ from other published research, which reports a significant association supportive of aspects of religion on developing dementia (Fukai et al., 2016; Howrey et al., 2020). Though there have been few, these studies report a lower prevalence of ADRD among older adults regularly engaging in meditative practices (Fukai et al., 2016). Weekly church attendance was protective in older adults against greater frailty and rapid cognitive decline (Howrey et al., 2020). However, a recent study using HRS data found that religious attendance significantly and poorly affected global cognitive function among women and men over a 10-year follow-up period (Das, 2022), supporting a "neural resource depletion" model (Reuter-Lorenz & Park, 2014, p. 362) where religiously active individuals use less demanding cognitive tendencies than less religious individuals (Gervais & Norenzayan, 2012; Hill et al., 2020; Pennycook et al., 2016; Shenhav et al., 2012); In addition, premature mortality could be a factor as those who attend religious services live longer, reaching an older age when cognitive impairment is more common (Chen et al., 2020). There are more factors to consider in these associations.

Another recent study by Rajkumar (2021) reported lower levels of ADRD ($p < 0.01$. for all correlations) amongst 101 countries around the world for higher R/S variables: religious attendance, private prayer, and importance of religion, controlling for depression and social capital but not social interaction. The strongest negative association was found for the R/S variable importance of religion ($r = - 0.65$, $p < 0.01$). This finding suggests R/S has a protective effect on dementia risk at a population level. Benefits may stem from reducing stress, effects on cellular aging, social interaction, and positive psychological concepts (i.e., hope and optimism). R/S activity involves cortical functioning, such as abstract thinking about the divine, and promotes cognitive activity to study, learn, and process religious texts and messages. Lin and colleagues (2015) found that Christian religious affiliation was associated with lower odds of ADRD amongst Taiwanese older adults evaluating a sample across three religions: Taoism, Buddhism, and Christianity. These associations were stronger for females and in participants with increased physical activity.

As increased stress may prompt higher religious attendance, higher religious attendance may decrease stress, and the cycle repeats. We collected religious attendance at one point, which could have limited our findings; therefore, measuring religious attendance over the life course is warranted to see if any associations result. In addition, confounders may have influenced findings. Other factors, such as lifestyle behaviors, could mediate associations of R/S with cognitive conditions. Therefore, more research is needed to determine potential mediators and moderators of religious attendance on health, such as depression, gender, religious coping, intrinsic religiosity, and race/ethnicity (Assari, 2013; Corsentino et al., 2009).

The sample in this study is representative of the U.S. adult population, having used sampling weights created by the original study investigators, which adds to the generalizability of the findings. As seen in the theoretical framework, the vulnerability-stress model incorporating religiosity/spirituality, used in this study (Figure 1) (Zwingmann et al., 2011), there are several R/S concepts along the path between stress and health outcomes, supporting the need to look at these associations between R/S concepts further to build a greater understanding of this pathway. However, this study only examined one R/S concept, religious attendance, potentially limiting our findings. More studies should examine other R/S concepts, such as religious coping, the importance of religion, religious affiliation, and spiritual support. In addition, more studies are needed with a larger sample size across sex and race/ethnicity to examine further the impact of religious attendance on developing a cognitive condition.

There are many causes of dementia, but the most prevalent is Alzheimer's disease (A.D.), accounting for 50-70% of dementias, followed by vascular dementia (VaD), representing up to 10% of cases (Alzheimer's Association, 2021). Though these have similar symptoms, differentiating dementias helps inform the appropriate treatment and support for that condition as course progression and clinical features vary. In R/S research, no identified studies have examined R/S associations with dementia differentiation breaking down risk into Alzheimer's disease (A.D.) and vascular dementia (VaD) type. More research is needed to examine these associations across dementia subtypes.

Implications

There may be nuances to how and why associations are found between R/S practice and poorer health outcomes, such as cognitive decline, MCI, and ADRD. In our sample, females reported a higher religious attendance than males, and non-Hispanic Black and Hispanic participants also reported a higher frequency of religious attendance than non-Hispanic White participants. Thus, examining these associations further amongst these populations is warranted. More research is needed to examine these associations exploring possible mediators and moderators to give a greater understanding of future interventions. Future studies could include an intersectionality lens to individualize these associations, explicitly differentiating for whom R/S practice might be protective and whom it may not be.

Limitations

There are several limitations to this study. First, the sample size was small, and future studies should include a larger

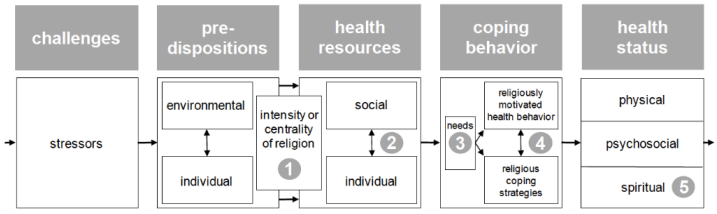

Figure 1. The Vulnerability-Stress Model incorporating Religiosity/Spirituality (VSM-RS). The VSM-RS includes (1) centrality of religion, (2) R/S resources, (3) spiritual needs, (4)religious coping, and (5) spiritual well-being.

sample size. This limited our ability to include other known risk factors for developing dementia, such as health conditions (i.e., hypertension, diabetes mellitus), APOE gene, and depression. Second, the religious preference of the sample consisted of primarily Protestant and Catholic participants with limited others or "nones," lacking religious diversity. Future studies are needed to include a religiously diverse sample to examine associations across a religiously representative sample of the U.S. population. Third, our study only examined one R/S variable in the association, which may have limited our ability to detect significant findings. Fourth, research diagnoses of CIND or dementia in this study may be subject to misclassification error. Finally, this study was one of the first few studies to examine the impact of R/S practice on the risk of developing a cognitive condition over time. Though significance was not found, these findings will inform future studies examining variations across sex and race/ethnicity to look for associations in those who find religion important.

Though not all older adults find R/S important or hold religious beliefs, other forms of social activity engagement may prompt health benefits. These opportunities should be explored to support all populations in promoting mental health in cognitive aging.

Funding. Jonas Philanthropy supports author (Initials) as a Mental Health/Psychology Jonas Scholar and a T32 Postdoctoral Research Fellowship from the National Institutes of Health, National Institute of Nursing Research (5T32NR009356). In addition, the Health and Retirement Study was funded by the National Institutes of Health, the National Institute on Aging (U01AG009740), and the Social Security Administration. The content is solely the authors' responsibility and does not necessarily represent the official views of the National Institutes of Health.

Data Availability Statement. The data utilized in this study are publicly available at https://hrs.isr.umich.edu. (Accessed on 2 November 2021).

References

Alzheimer's Association. (2020). *Alzheimer's disease facts and figures*. https://www.alz.org/media/Documents/alzheimers-facts-and-figures.pdf

Alzheimer's Association. (2021). *Facts and figures*. https://www.alz.org/alzheimers-dementia/facts-figures

American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders*, (3rd ed., revised). American Psychiatric Association.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders*, (4th ed.). American Psychiatric Association.

Assari S. (2013). Race and ethnicity, religion involvement, church-based social support, and subjective health in United States: A case of moderated mediation. *International Journal of Preventive Medicine*, *4*(2), 208–217.

Balboni, T. A., VanderWeele, T. J., Doan-Soares, S. D., Long, K. N. G., Ferrell, B. R., Fitchett, G., Koenig, H. G., Bain, P. A., Puchalski, C., Steinhauser, K. E., Sulmasy, D. P., & Koh, H. K. (2022). Spirituality in Serious Illness and Health. *JAMA*, *328*(2), 184–197. https://doi.org/10.1001/jama.2022.11086

Box, G.E.P. & Tidwell, P.W. (1962). Transformation of Independent Variables. *Technometrics, 4*, 531–550. https://doi.org/10.1080/00401706.1962.10490038

Chen, Y., Kim, E. S., & VanderWeele, T. J. (2020). Religious-service attendance and subsequent health and well-being throughout adulthood: Evidence from three prospective cohorts. *International Journal of Epidemiology, 49(*6), 2030–2040. https://doi.org/10.1093/ije/dyaa120

Choi, Y., Park, S., Cho, K. H., Chun, S. Y., & Park, E. C. (2016). A change in social activity affect cognitive function in middle-aged and older Koreans: Analysis of a Korean longitudinal study on aging (2006–2012). *International Journal of Geriatric Psychiatry, 31*(8), 912–919. https://doi.org/10.1002/gps.4408

Corsentino, E. A., Collins, N., Sachs-Ericsson, N., & Blazer, D. G. (2009). Religious attendance reduces cognitive decline among older women with high levels of depressive symptoms. *Journals of Gerontology Series A: Biological Sciences & Medical Sciences, 64A*(12), 1283–1289. https://doi.org/10.1093/gerona/glp116

Das, A. (2022). Religious attendance and global cognitive function: A fixed-effects cross-lagged panel modeling study of older U.S. adults. *Social Science and Medicine, 292*, 114580. https://doi.org/10.1016/j.socscimed.2021.114580

Ellison, C. G, & Flannelly, K. J. (2009). Religious involvement and risk of major depression in a prospective nationwide study of African American adults. *Journal of Nervous and Mental Disease, 197*(8), 568–573.

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. https://doi.org/10.3758/bf03193146

Fukai, H., Ying, S., Yuandai, L., Peng, W., Xue, H., Xiaohui, T., Xingyi, L., Lifang, Z., Xianda, H., Huang, F., Shang, Y., Luo, Y., Wu, P., Huang, X., Tan, X., Lu, X., Zhen, L., & Hu, X. (2016). Lower prevalence of Alzheimer's disease among Tibetans: Association with religious and genetic factors. *Journal of Alzheimer's Disease, 50*(3), 659–667. https://doi.org/10.3233/JAD-150697

Fung, A. W., & Lam, L. C. (2013). Spiritual activity is associated with better cognitive function in old age. *East Asian Archives in Psychiatry, 23*(3), 102–107.

Gauthier, S., Albert, M., Fox, N., Goedert, M., Kivipelto, M., Mestre-Ferrandiz, J., & Middleton, L. T. (2016). Why has therapy development for dementia failed in the last two decades? *Alzheimer's & Dementia*, *12*(1), 60–64. https://doi.org/10.1016/j.jalz.2015.12.003

Gervais, W. M., & Norenzayan, A. (2012). Analytic thinking promotes religious disbelief. *Science*, *336*(6080), 493–496. https://doi.org/10.1126/science.1215647

Gillis, C., Mirzaei, F., Potashman, M., Ikram, M. A., & Maserejian, N. (2019). The incidence of mild cognitive impairment: A systematic review and data synthesis. *Alzheimer's & dementia (Amsterdam, Netherlands)*, *11*, 248–256. https://doi.org/10.1016/j.dadm.2019.01.004

Global Burden of Disease 2016 Dementia Collaborators. (2019). Global, regional, and national burden of Alzheimer's disease and other dementias, 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016. *Lancet Neurology, 18*(1), 88–106. https://doi.org/10.1016/S1474-4422(18)30403-4

Heeringa, S. G., Fisher, G. G., Hurd, M., Langa, K. M., Ofstedal, M. B., Plassman, B. L., Rodgers, W. L., & Weir, D. R. (2009). *Aging, Demographics and Memory Study (ADAMS): Sample design, weighting and analysis for ADAMS.*

Hill, T. D., Burdette, A. M., Angel, J. L., & Angel, R. J. (2006). Religious attendance and cognitive functioning among older Mexican Americans. *Journals of Gerontology Series B: Psychological Sciences & Social Sciences, 61*(1), P3–9. https://doi.org/10.1093/geronb/61.1.p3

Hill, T., Carr, D. C., & Dowd-Arrow, B. (2020). Life-Course religious and cognitive functioning in later life. *Research on Aging, 42*(7–8), 217–225. https://doi.org/10.1177/0164027520917059

Hosmer, D. W., Lemeshow, S., & Sturdivant, R. X. (2013). *Applied logistic regression* (3rd ed.). Wiley.

Hosseini, S., Chaurasia, A., & Oremus, M. (2019). The effect of religion and spirituality on cognitive function: A systematic review. *Gerontologist*, *59*(2): e76–e85. https://doi.org/10.1093/geront/gnx024

Howrey, B. T., Al Snih, S., Middleton, J. A., & Ottenbacher, K. J. (2020). Trajectories of frailty and cognitive decline among older Mexican Americans. *The Journals of Gerontology. Series A: Biological Sciences and Medical Sciences, 75*(8), 1551–1557. https://doi.org/10.1093/gerona/glz295

Jorm, A. F., & Jolley, D. (1998). The incidence of dementia: A meta-analysis. *Neurology, 51*(3), 728–733. https://doi.org/10.1212/wnl.51.3.728

Kelly, M. E., Duff, H., Kelly, S., McHugh, Power, J. E., Brennan, S., Lawlor, B. A., & Loughrey, D. G. (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. https://doi.org/10.1186/s13643-017-0632-2

Koenig, H., Parkerson, G. R., Jr., & Meador, K. G. (1997). Religion index for psychiatric research. *American Journal of Psychiatry, 154*(6), 885–886. https://doi.org/10.1176/ajp.154.6.885b

Koenig, H. G. (2012). Religion, spirituality, and health: The research and clinical implications. *ISRN Psychiatry, 2012*, 278730. https://doi.org/10.5402/2012/278730

Koenig, H. G. (2015). Religion, spirituality, and health: A review and update. *Advances in Mind and Body Medicine*, *29*(3), 19–26.

Koenig, H. G., King, D. E., & Carson, V. B. (2012). *Handbook of religion and health* (2nd ed.). Oxford University Press.

Kraal, A. Z., Sharifian, N., Zaheed, A. B., Sol, K., & Zahodne, L. B. (2019). Dimensions of religious involvement represent positive pathways in cognitive aging. *Research on Aging, 41*(9), 868–890. https://doi.org/10.1177/0164027519862745

Krause, N. (2009). Religious involvement, gratitude, and change in depressive symptoms over time. *International Journal for the Psychology of Religion, 19*(3), 155–172.

Langa, K. M., Plassman, B. L., Wallace, R. B., Herzog, A. R., Heeringa, S. G., Ofstedal, M. B., Burke, J. R., Fisher, G. G., Fultz, N. H., Hurd, M. D., Potter, G. G., Rodgers, W. L., Steffens, D. C., Weir, D. R., & Willis, R. J. (2005). The Aging, Demographics, and Memory Study: Study design and methods. *Neuroepidemiology, 25*(4), 181–191. https://doi.org/10.1159/000087448

Lee, S., Charles, S. T., & Almeida, D. M. (2021). Change is good for the brain: activity diversity and cognitive functioning across adulthood. *The Journals of Gerontology: Series B*, *76*(6) 1036–1048. https://doi.org/10.1093/geronb/gbaa020

Levin, J. S. (2003). Private religious practices. In N. W. Group (Ed.), *Multidimensional measurement of religiousness/spirituality for use in health research: A report of the Fetzer Institute/National Institute on Aging Working Group* (2nd ed., pp. 39–42). John E. Fetzer Institute.

Lin, K.-P., Chou, Y.-C., Chen, J.-H., Chen, C.-D., Yang, S.-Y., Chen, T.-F., Sun, Y., Wen, L.-L., Yip, P.-K., Chu, Y.-M., & Chen, Y.-C. (2015). Religious affiliation and the risk of dementia in Taiwanese elderly. *Archives of Gerontology and Geriatrics, 60*(3), 501–506. https://doi.org/10.1016/j.archger.2015.01.009

Livingston, G., Huntley, J., Sommerlad, A., Ames, D., Ballard, C., Banerjee, S., Brayne, C., Burns, A., Cohen-Mansfield, J., Cooper, C., Costafreda, S. G., Dias, A., Fox, N., Gitlin, L. N., Howard, R., Kales, H. C., Kivimäki, M., Larson, E. B., Ogunniyi, A., Orgeta, V., … & Mukadam, N. (2020). Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. *Lancet*, *396*(10248), 413–446. https://doi.org/10.1016/S0140-6736(20)30367-6

Nye, E., Lamont, H., & Anderson, L. (2022, May 19). *Federal efforts to address racial and ethnic disparities in Alzheimer's disease and related dementias (Issue Brief)*. Washington, DC: Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services. May 19, 2022. https://aspe.hhs.gov/sites/default/files/documents/5f3fc5aa6ae780f739265d40f20fc456/federal-racial-ethnic-disparities-adrd.pdf

Obisesan, T., Livingston, I., Trulear, H. D., & Gillum, F. (2006). Frequency of attendance at religious services, cardiovascular disease, metabolic risk factors and dietary intake in Americans: An age-stratified exploratory analysis. *International Journal of Psychiatry in Medicine*, *36*(4), 435–448. https://doi.org/10.2190/9W22-00H1-362K-0279

Petersen, R. C., Smith, G. E., Waring, S. C., Ivnik, R. J., Kokmen, E., & Tangelos, E. G. (1997). Aging, memory, and mild cognitive impairment. *International Psychogeriatrics*, *9*(1), 65–69. https://doi.org/10.1017/s1041610297004717

Pennycook G., Ross R. M., Koehler D. J., & Fugelsang J. A. (2016). Atheists and agnostics are more reflective than religious believers: Four empirical studies and a meta-analysis. *PLOS ONE, 11*(4), 1–18. https://doi.org/10.1371/journal.pone.0153039

Pew Research Center. (2014). *Religious landscape study*. Pew Forum on Religious and Public Life. https://www.pewresearch.org/religion/religious-landscape-study/

Plassman, B. L., Langa, K. M., Fisher, G. G., Heeringa, S. G., Weir, D. R., Ofstedal, M. B., Burke, J. R., Hurd, M. D., Potter, G. G., Rodgers, W. L., Steffens, D. C., Willis, R. J., & Wallace, R. B. (2007). Prevalence of dementia in the United States: The Aging, Demographics, and Memory Study. *Neuroepidemiology, 29*(1–2), 125–132. https://doi.org/10.1159/000109998

Plassman, B. L., Langa, K. M., McCammon, R. J., Fisher, G. G., Potter, G. G., Burke, J. R., Steffens, D. C., Foster, N. L., Giordani, B., Unverzagt, F. W., Welsh-Bohmer, K. A., Heeringa, S. G., Weir, D. R., & Wallace, R. B. (2011). Incidence of dementia and cognitive impairment, not dementia in the United States. *Annals of Neurology, 70*(3): 418–426. https://doi.org/10.1002/ana.22362

Rajkumar, R. P. (2021). The relationship between four measures of religiosity and cross-national variations in the burden of dementia. *Cureus*, *13*(8), e17034. https://doi.org/10.7759/cureus.17034

Reuter-Lorenz, P. A., & Park, D. C. (2014). How does it STAC up? Revisiting the scaffolding theory of aging and cognition. *Neuropsychology Review, 24*(3), 355–370. https://doi.org/10.1007/s11065-014-9270-9

Scarmeas, N., & Stern, Y. (2003). Cognitive reserve and lifestyle. *Journal of Clinical and Experimental Neuropsychology, 25*(5), 625–633. https://doi.org/10.1076/jcen.25.5.625.14576

Shenhav, A., Rand, D. G., & Greene, J. D. (2012). Divine intuition: Cognitive style influences belief in God. *Journal of Experimental Psychology: General, 141*(3), 423–428. https://doi.org/10.1037/a0025391

Vance D. E. (2004). Spiritual activities for adults with Alzheimer's disease: The cognitive components of dementia and religion.

Journal of Religion, Spirituality & Aging, 17(1–2), 109–130. https://doi.org/10.1300/J496v17n01_06

Wolters, F. J., Chibnik, L. B., Waziry, R., Anderson, R., Berr, C., Beiser, A., Bis, J. C., Blacker, D., Bos, D., Brayne, C., Dartigues, J. F., Darweesh, S. K. L., Davis-Plourde, K. L., de Wolf, F., Debette, S., Dufouil, C., Fornage, M., Goudsmit, J., Grasset, L., Gudnason, V., … Hofman, A. (2020). Twenty-seven-year time trends in dementia incidence in Europe and the United States: The Alzheimer Cohorts Consortium. *Neurology*, *95*(5), e519–e531. https://doi.org/10.1212/WNL.0000000000010022

Yeager, D. M., Glei, D. A., Au, M., Lin, H.-S., Sloan, R. P., & Weinstein, M. (2006). Religious involvement and health outcomes among older persons in Taiwan. *Social Science & Medicine, 63*(8), 2228–2241. https://doi.org/10.1016/j.socscimed.2006.05.007

Zhang, W. (2010). Religious participation, gender differences, and cognitive impairment among the oldest-old in China. *Journal of Aging Research, 2010*, 160294–160210. https://doi.org/10.4061/2010/160294

Zwingmann, C., Klein, C., & Büssing, A. (2011). Measuring religiosity/spirituality: theoretical differentiations and categorization of instruments. *Religions, 2*(3), 345-357. https://www.mdpi.com/2077-1444/2/3/345

Received: 1.25.2023
Revised: 5.17.2023
Accepted: 5.18.2023