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Original Contribution

Attendance at Religious Services, Prayer, Religious Coping, and Religious/Spiritual Identity as Predictors of All-Cause Mortality in the Black Women's Health Study

Tyler J. VanderWeele*, Jeffrey Yu, Yvette C. Cozier, Lauren Wise, M. Austin Argentieri, Lynn Rosenberg, Julie R. Palmer, and Alexandra E. Shields

* Correspondence to Dr. Tyler J. VanderWeele, Departments of Epidemiology and Biostatistics, Harvard T.H. Chan School of Public Health, 677 Huntington Avenue, Boston, MA 02115 (e-mail: tvanderw@hsph.harvard.edu).

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Previous longitudinal studies have consistently shown an association between attendance at religious services and lower all-cause mortality, but the literature on associations between other measures of religion and spirituality (R/S) and mortality is limited. We followed 36,613 respondents from the Black Women's Health Study from 2005 through December 31, 2013 to assess the associations between R/S and incident all-cause mortality using proportional hazards models. After control for numerous demographic and health covariates, together with other R/S variables, attending religious services several times per week was associated with a substantially lower mortality rate ratio (mortality rate ratio = 0.64, 95% confidence interval: 0.51, 0.80) relative to never attending services. Engaging in prayer several times per day was not associated with mortality after control for demographic and health covariates, but the association trended towards a higher mortality rate ratio when control was made for other R/S variables (for >2 times/day vs. weekly or less, mortality rate ratio = 1.28, 95% confidence interval: 0.99, 1.67; *P*-trend < 0.01). Religious coping and self-identification as a very religious/spiritual person were associated with lower mortality when adjustment was made only for age, but the association was attenuated when control was made for demographic and health covariates and was almost entirely eliminated when control was made for other R/S variables. The results indicate that service attendance was the strongest R/S predictor of mortality in this cohort.

coping; mortality; religion; religious service attendance; spirituality

Abbreviations: BWHS, Black Women's Health Study; CES-D, Center for Epidemiologic Studies Depression Scale; CI, confidence interval; DASH, Dietary Approaches to Stop Hypertension; MRR, mortality rate ratio; RCOPE, Religious Coping Activity Scale; R/S, religion/spirituality; SES, socioeconomic status.

Editor's note: *An invited commentary on this article appears on page 523, and the authors' response appears on page 526.*

There is now a large body of literature relating various forms of religion and spirituality (R/S) to health outcomes (1). Religiosity and spirituality likely shape individual behavior, provide a source of social support, and affect beliefs, outlook, and sense of meaning in life and, for these reasons, may be thought to affect health. While much of the early empirical literature on the topic did not have adequate control for confounding and was probably subject to reverse causation by baseline health (2), increasingly better study designs and large longitudinal cohort studies with control for baseline health and other confounders have recently been used in such analyses. The most studied and consistently established association in this literature has been between attendance at religious services and mortality (1, 3–11). By the late 1990s, numerous studies on this topic, including those with good cohort designs and confounding control, had been published, suggesting that religious service attendance was associated with lower all-cause mortality (3–5). Numerous recent studies and systematic reviews

have also suggested evidence for this association (1, 8, 10). The association persists when controlling for demographic and baseline health covariates and persists still, although in somewhat attenuated form, when control is made for social support, smoking, and other health behaviors that may potentially lie on the pathway between service attendance and mortality (3, 4, 7, 11).

The existing literature exploring associations between other forms of R/S and all-cause mortality is more limited and mixed, and these variables may be thought to affect health differently. A large follow-up study by Musick et al. (6) suggested that private religious practices, such as prayer and Scripture reading, had little association with mortality and, if anything, might have been associated with increased mortality. In a large sample of 92,395 women aged 50–79 years from the Women's Health Initiative, positive religious coping was not associated with all-cause mortality (9). Some smaller studies likewise found little association between other measures of religious participation and mortality (12, 13), but the literature is somewhat mixed, and some small studies show that religious coping is associated with lower mortality among clinical populations (14, 15). It is possible that lack of definitive results in the literature on the associations between other measures of R/S and all-cause mortality are due to a lack of large prospective cohort studies with which to examine these associations, with a few exceptions noted above. In most prospective cohort studies, questions on R/S, if they are asked at all, focus almost exclusively on religious service attendance, often as a measure of social integration (16). The studies that do collect data on other R/S measures often tend to have smaller sample sizes.

We aimed to address the current gap in the literature concerning other R/S measures by using data from the Black Women's Health Study (BWHS), which has followed a large cohort of African-American women since 1995 with mailed biennial questionnaires. The 2005 follow-up questionnaire contained 4 R/S questions assessing the frequencies of religious service attendance and prayer, the use of R/S to cope with stressful situations, and self-identification as a religious/spiritual person. We used these data to examine associations between these various aspects of R/S and all-cause mortality and to test our hypothesis that service attendance and religious coping would be associated with lower mortality.

METHODS

The BWHS began in 1995, with 59,000 US black women enrolled through postal health questionnaires. Most of the participants were recruited from subscribers of *Essence* magazine (>95%), with the remainder recruited from selected black women's professional organizations and friends and relatives of early participants. Participants represent all states/regions within the United States and are representative of the 85% of black women in the United States with a high school education or higher, but they underrepresent the 15% of US black women who have not completed high school. Informed consent was indicated by completion of the questionnaire. At baseline, participants were aged 21–69 years (median age, 38 years). Health information was provided by participants every 2 years through questionnaires. Over the course of 9 questionnaire cycles, follow-up of the baseline cohort has been complete for 88% of potential person-years. The Boston University Medical Center Institutional Review Board approved the human subjects' protocol for the current study.

Study population

The start of follow-up ("baseline") for the current analysis was March 2005, when the R/S questions were posed in the 2005 BWHS follow-up questionnaire, which was completed by 43,179 women. Follow-up continued through the most recent completed questionnaire cycle in December 31, 2013. After exclusion of women who did not respond to all R/S questions (n = 6,566), our final analytical sample for this study included 36,613 black women.

Measures of R/S

The 2005 follow-up questionnaire contained 4 questions on R/S. Two questions were drawn from the Duke University Religion Index (17), one of which asked about frequency of religious practices: "How often do you attend religious services?," with response options of "never" (scored as 1), "less than once a month," "about once a month," "2–3 times a month," "once a week," and "several times a day" (scored as 6). The second question, "How often do you pray?," had response options of "rarely or never" (scored as 1), "less than once a week," "once a week," "several times a week," "once or twice a day," and "many times a day" (scored as 6). Attendance at religious services, when self-reported, is often overreported, but the variable may still preserve information on relative ordering. One question, drawn from the Fetzer Institute's Brief Multidimensional Measure of Religiousness/Spirituality (18), asked about religious coping: "To what extent is your religion or spirituality involved in understanding or dealing with stressful situations in any way?" Response options were "not involved at all" (scored as 1), "not very involved," "somewhat involved," and "very involved" (scored as 4). This is a measure of positive religious coping (as distinct from negative religious coping), grounded in Pargament's more comprehensive measure, the Religious Coping Activity Scale (RCOPE) (19). The psychometric properties of this reduced measure, unlike Pargament's RCOPE, have not been assessed. A final question, also drawn from the Brief Multidimensional Measure of Religiousness/Spirituality, measured individuals' overall assessment of themselves as religious or spiritual persons: "To what extent do you consider yourself a religious or spiritual person?" Response options were "not religious/spiritual" (scored as 1), "slightly religious/spiritual," "moderately religious/spiritual," and "very religious/spiritual" (scored as 4).

Mortality

All-cause mortality was assessed between the return of the 2005 questionnaire and the end of follow-up (December 31, 2013). We searched the National Death Index for all

study participants who did not complete mailed questionnaires and were not previously known to be deceased. For each deceased participant, the underlying cause of death was obtained from either a state-issued death certificate or the National Death Index Plus.

Covariates

Age and weight were reported on every follow-up questionnaire; most questionnaires ascertained smoking status and alcohol consumption as well. Geographic region was obtained from the participant's home address. We used data on height, years of education, nativity (birthplace), insurance status, vigorous exercise and walking for exercise, and physical examination in 2005. The short-form National Cancer Institute-Block food frequency questionnaire (20) was included in the 2001 questionnaire; from these data, we calculated the Dietary Approaches to Stop Hypertension (DASH) dietary pattern score (21).

BWHS participants' residential addresses from 2005 to 2011 were geocoded and linked to American Community Survey data at the block group level. Using factor analysis, an index of neighborhood socioeconomic status (SES) was created that included 6 US Census variables (median household income; median housing value; percentage of households receiving interest, dividend, or net rental income; percentage of adults aged ≥25 years who have completed college; percentage of families with children not headed by a single female; and percentage of population not living below the poverty level). Factor analysis regression coefficients were used to weight the variables for a combined neighborhood score.

The 1997 questionnaire asked 7 questions on perceptions and experiences of racism, adapted from an instrument developed by Williams et al. (22). Five questions asked about the frequency of daily experiences of racism, and 3 questions asked about lifetime experience of unfair treatment "due to your race" on the job, in housing, and by the police (lifetime racism); responses were averaged and summed, respectively, to obtain overall scores for daily and lifetime racism.

The 2005 questionnaire included a 4-item Perceived Stress Scale developed by Cohen et al. (23), which measures the degree to which respondents found their lives "unpredictable, uncontrollable, and overloading" in the past month. Data on coping skills were collected on the 2005 questionnaire by use of the Abbreviated Carver Coping Scale (24).

On the 2005 questionnaire, participants were asked questions about abuse victimization. The 9-item abuse instrument was adapted from the Conflict Tactics Scale and the Pregnancy Abuse Assessment Screen (25, 26) and included detailed information on both physical and sexual abuse in childhood (up to age 11 years), in adolescence, in adulthood, and in the past month. Further details on this assessment are provided elsewhere (27–29).

The 1999 questionnaire included administration of the 20-item Center for Epidemiologic Studies Depression Scale (CES-D) for assessment of depressive symptoms (30). The validity and reliability of the CES-D have been documented in the BWHS (31). Total scores range from 0 to 60. Persons scoring 16 or above are generally classified as having a level of depressive symptoms compatible with a diagnosis of clinical depression (32).

Data analysis

Mortality rate ratios and 95% confidence intervals were estimated for categories of each of the R/S variables in relation to all-cause mortality using proportional hazards models. Person-years were calculated from 2005 to death, loss to follow-up, or the end of follow-up (December 31, 2013), whichever occurred first. For frequency of attendance at religious services, a reference category of "never" was selected, following much of the existing literature. With respect to religious coping, the referent was "not involved at all"; for religious/spiritual identity, "not or slightly"; and for frequency of prayer, "≤1 time/week."

Model 1 adjusted for age. Model 2 also adjusted for level of perceived stress (at or below median (≤4) vs. above median (>4)), duration of education (≤12, 13–15, 16, or ≥17 years), body mass index (weight (kg)/height (m)^2; <20, 20–22.4, 22.5–24, 25–29, 30–34, 35–39, or ≥40), pack-years of smoking (never smoked, <5, 5–9, 10–19, or ≥20 pack-years), alcohol consumption (never drank, former drinker, or 1–3, 4–6, or ≥7 drinks/week), neighborhood SES score (in quintiles), vigorous exercise (none, <1, 1–2, or ≥3 hours/week), walking for exercise (none, <1, 1–2, or ≥3 hours/week), DASH diet score (possible range, 8–39; quintiles), health insurance (yes/no), physical examination (yes/no), geographic region (Northeast/South/Midwest/West), nativity (United States, other country), daily racism (quartiles), lifetime racism (0, 1, 2, or 3), CES-D score (<16, ≥16), child abuse (none, mild, moderate, or severe/very severe), history of cancer (yes/no), history of myocardial infarction (yes/no), and history of stroke (yes/no).

In model 3, we also adjusted simultaneously for all R/S measures. We performed additional analyses for service attendance within strata of other R/S variables. We also performed analyses for each R/S variable stratified by perceived stress, neighborhood SES, everyday racism, and education. Likelihood ratio tests for interaction were conducted by comparing models with and without cross-product terms (coded in polytomous form). Tests of trend were conducted by including the relevant R/S variable in the model as an ordinal variable. Sensitivity analyses were performed to examine the extent to which associations could be explained away by an unmeasured confounder (33, 34). We used indicator variables to account for missing covariate data. All P values presented are 2-sided. All analyses were performed using SAS software, version 9.3 (SAS Institute, Inc., Cary, North Carolina).

RESULTS

Table 1 shows the relationships between the various R/S variables and baseline characteristics of the cohort. Persons who attended religious services frequently were slightly older, had a higher body mass index, were more likely to be never smokers, consumed less alcohol, spent more time walking, had a lower neighborhood SES, had lower perceived stress, were more likely to be using other forms of coping, and were less likely to be depressed. Patterns were

Table 1. Baseline Characteristics (%) of Participants According to Their Responses to Questions on Religion/Spirituality (Lower and Upper Categories), Black Women's Health Study, 2005[a]

Characteristic	How Often Do You Attend Religious Services?		How Often Do You Pray?		To What Extent is Religion Involved in Your Coping?		To What Extent Are You a Religious or Spiritual Person?	
	≤1 Time/ Month (n = 9,935)	Several Times/ Week (n = 6,457)	Rarely/Never (n = 1,325)	Several Times/Day (n = 13,796)	Not Involved (n = 2,413)	Very Involved (n = 25,647)	Not/Slightly (n = 3,708)	Very (n = 15,107)
Age, years[b]	47.4 (9.9)	51.5 (10.9)[c]	47.0 (10.7)	50.8 (10.5)[c]	48.3 (11.1)	49.6 (10.5)[c]	46.0 (10.0)	50.0 (10.5)[c]
Body mass index[d] (≥30)	43	47[c]	38	44[c]	41	44	42	43[c]
Education (≤12 years)	14	15	12	15	21	12[c]	17	12[c]
Smoking (never)	59	68[c]	58	65[c]	61	66[c]	61	67[c]
Alcohol (≥4 drinks/week)	13	4[c]	18	7[c]	14	7[c]	14	7[c]
Vigorous exercise (≥3 hours/week)	17	16[c]	21	18[c]	18	18	18	18
Walking (≥3 hours/week)	27	29[c]	24	30[c]	25	29[c]	25	29[c]
DASH dietary pattern (quintile 5)	17	17	22	18[c]	18	18	19	19
Neighborhood SES (quintile 5)	18	11[c]	24	13[c]	20	15[c]	19	15[c]
Health insurance status (yes)	93	92[c]	92	92	93	93	94	92[c]
Physical examination in last 2 years (yes)	82	82	79	83[c]	77	83[c]	79	83[c]
Nativity (born in United States)	89	90[c]	87	90[c]	87	90[c]	89	90[c]
Daily racism (quartile 4)	19	18	18	19[c]	17	18	18	18
Lifetime racism (yes to any)	65	62[c]	64	63	58	64[c]	62	65[c]
Perceived stress (above median (>4))	52	48[c]	50	49	52	48[c]	55	45[c]
Coping (above median (<29))	42	51[c]	32	51[c]	28	50[c]	32	53[c]
Depression (CES-D score ≥16)	24	19[c]	24	21[c]	25	20[c]	25	19[c]
Child abuse (severe or very severe)	19	19	22	18[c]	18	18	19	18
Prevalent cancer	5	6	4	6[c]	5	6	5	6
Prevalent myocardial infarction	2	3[c]	2	2	2	2	2	2
Prevalent stroke	2	2	2	2[c]	2	2	2	2

Abbreviations: CES-D, Center for Epidemiologic Studies Depression Scale; DASH, Dietary Approaches to Stop Hypertension; SES, socioeconomic status.

[a] Values are standardized to the 2005 age distribution of study participants.

[b] Values are presented as mean (standard deviation).

[c] $P < 0.05$ for differences across categories.

[d] Weight (kg)/height $(m)^2$.

fairly similar for those who prayed often, but those who prayed often were also less likely to have healthy dietary patterns, more likely to have had a physical examination in the last 2 years, and less likely to have experienced severe child abuse. Patterns for persons whose R/S was very involved with coping with stressful events or who considered themselves very religious or spiritual were likewise similar to the pattern for persons who attended religious services frequently, but these individuals additionally had lower educational attainment, were more likely to have had a physical examination in the last 2 years, and were more likely to have experienced lifetime racism.

In analyses that considered each R/S variable separately, after multivariate control for numerous demographic and baseline health covariates, attending religious services several times per week was associated with lower mortality (mortality rate ratio (MRR) = 0.68, 95% confidence interval (CI): 0.56, 0.84) during follow-up as compared with never attending (Table 2). The association persisted when control was additionally made for other R/S variables (MRR = 0.64, 95% CI: 0.51, 0.80). Prayer was not significantly associated with mortality when control was made only for age or for demographic and health covariates, but when control was also made for other R/S variables, praying several times per day was associated with increased mortality (MRR = 1.28, 95% CI: 0.99, 1.67; *P* for trend < 0.01).

Being very involved in religious coping was associated with lower mortality (MRR = 0.75, 95% CI: 0.61, 0.91) when control was made only for age, but this association was weakened with multivariate control for demographic and health covariates (MRR = 0.84, 95% CI: 0.69, 1.03) and weakened further when control was also made for other R/S variables (MRR = 0.94, 95% CI: 0.73, 1.20). Likewise, self-identifying as a very religious or spiritual person was associated with lower mortality (MRR = 0.78, 95% CI: 0.65, 0.95) when control was made only for age, but this was weakened with multivariate control for demographic and health covariates (MRR = 0.84, 95% CI: 0.69, 1.02) and weakened further when control was also made for other R/S variables (MRR = 0.91, 95% CI: 0.71, 1.18). Associations between

Table 2. Associations Between Religious and Spiritual Variables and Mortality in the Black Women's Health Study, 2005–2013

Exposure and Category	No. of Cases	Person-Years of Follow-up	Model 1[a]		Model 2[b]		Model 3[c]	
			HR	95% CI	HR	95%	HR	95%
Analytical cohort	1,393	269,943		NA		NA		NA
How often do you attend religious services?								
Never	149	24,713	1.00	Referent	1.00	Referent	1.00	Referent
≤1 time/month	347	72,992	0.81	0.67, 0.99	0.81	0.67, 0.98	0.82	0.67, 1.00
2–3 times/month	250	50,914	0.72	0.58, 0.88	0.76	0.61, 0.93	0.75	0.60, 0.94
1 time/week	371	73,719	0.62	0.51, 0.75	0.67	0.55, 0.81	0.65	0.53, 0.81
Several times/week	276	47,607	0.66	0.54, 0.81	0.68	0.56, 0.84	0.64	0.51, 0.80
P-trend				<0.01		<0.01		<0.01
How often do you pray?								
Rarely or never	52	9,641	1.14	0.80, 1.61	1.23	0.86, 1.74	1.03	0.71, 1.49
≤1 time/week	81	20,253	1.00	Referent	1.00	Referent	1.00	Referent
Several times/week	204	50,327	0.89	0.69, 1.15	0.89	0.69, 1.15	0.98	0.75, 1.29
1–2 times/day	428	88,661	0.89	0.70, 1.13	0.95	0.74, 1.20	1.10	0.85, 1.42
Several times/day	628	101,062	1.04	0.83, 1.31	1.08	0.85, 1.37	1.28	0.99, 1.67
P-trend				0.38		0.28		<0.01
To what extent is your religion/spirituality involved in understanding or dealing with stressful situations in any way?								
Not involved	116	17,537	1.00	Referent	1.00	Referent	1.00	Referent
Somewhat involved	327	63,039	0.82	0.66, 1.01	0.82	0.66, 1.01	0.90	0.71, 1.15
Very involved	950	189,368	0.75	0.61, 0.91	0.84	0.69, 1.03	0.94	0.73, 1.20
P-trend				<0.01		0.31		0.93
To what extent do you consider yourself a religious/spiritual person?								
Not or only slightly religious/spiritual	131	27,221	1.00	Referent	1.00	Referent	1.00	Referent
Moderately religious/spiritual	686	131,477	0.81	0.67, 0.97	0.81	0.67, 0.98	0.89	0.71, 1.13
Very religious/spiritual	576	111,245	0.78	0.65, 0.95	0.84	0.69, 1.02	0.91	0.71, 1.18
P-trend				0.05		0.36		0.82

Abbreviations: CI, confidence interval; DASH, Dietary Approaches to Stop Hypertension; HR, hazard ratio; NA, not applicable.

[a] Model 1 controlled for age and questionnaire cycle.

[b] Model 2 included the model 1 variables plus body mass index, neighborhood socioeconomic status, vigorous exercise, walking for exercise, DASH diet score, education, health insurance, physical examination, smoking (in pack-years), alcohol consumption, immigration status, daily racism, lifetime racism, perceived stress, depression, child abuse, geographic region, prevalent cancer, prevalent myocardial infarction, and prevalent stroke.

[c] Model 3 included the model 2 variables plus responses to the other questions on religion/spirituality.

mortality and each of the R/S variables were also similar when, in model 2, control was additionally made only for service attendance (see Web Table 1, available at http://aje.oxfordjournals.org/). Results were also similar, with slightly larger mortality rate ratios for service attendance, when smoking, alcohol use, and depression—variables which might serve as mediators—were omitted from the models (Web Table 2).

Patterns for the associations of other R/S variables with mortality across levels of service attendance are presented in Web Table 3. Greater service attendance was associated with lower mortality across almost all strata. When results were stratified by attendance, there did not seem to be a strong association between prayer and increased mortality, except for persons who never attended services, though the statistical evidence for interaction was weak ($P = 0.37$). Analyses were also similar when results were stratified by perceived stress, neighborhood SES, everyday racism, and education (Web Tables 4–8), with generally little evidence for heterogeneity, except possibly for stronger associations between prayer and mortality and between R/S identity and mortality for those with higher levels of education.

The strongest R/S predictor of mortality was service attendance. In sensitivity analysis, for an unmeasured confounder to explain away the service attendance mortality rate ratio estimate of 0.64, an unmeasured confounder that was associated with both service attendance and decreased mortality by risk ratios of 2.5-fold each, above and beyond the measured confounders, could suffice to explain away the association, but weaker confounding could not. For an unmeasured confounder to bring the upper confidence limit of 0.80 for this estimate above 1.00, an unmeasured confounder that was associated with both service attendance and decreased mortality by risk ratios of 1.81-fold each could suffice, but weaker confounding could not.

DISCUSSION

In this prospective cohort study of US black women, we found strong inverse associations between attendance at religious services and all-cause mortality which persisted after control for demographic characteristics, baseline health variables, and other R/S measures. We also found age-adjusted inverse associations between religious coping and mortality and between identifying as a religious or spiritual person and mortality, but these associations did not persist after control for demographic and health covariates and were weakened further when simultaneous control was made for other R/S variables. The finding that religious coping was not substantially associated with mortality was contrary to what we had hypothesized. Frequent prayer trended towards being associated with higher mortality after control was made for all R/S variables. It is sometimes thought that frequent prayer is indicative of personal and health problems already being present (1), which might explain the association with higher mortality.

Situating these results in the literature gives rise to a number of important insights and raises various questions for further research. Religious service attendance was the strongest R/S predictor of all-cause mortality in this study. Moreover, control for service attendance weakened the associations between other R/S predictors and mortality. The 2 explanations sometimes given for such weakening are either that the other R/S variables, when used on their own as predictors of mortality, are effectively serving as a proxy for service attendance with regard to effects on mortality or, alternatively, that service attendance itself lies within the pathway from the other R/S variables to mortality (i.e., is most proximal of the measures). Repeated measures of the various R/S constructs over time would be needed to evaluate these explanations (35).

Our results also raise the general question as to whether there are other R/S variables that might be associated with mortality even after control is made for service attendance. We have examined 3 such variables here: identification as a religious/spiritual person, frequency of prayer, and religious/spiritual coping. Future work could also examine whether specific religious beliefs, intrinsic religiosity, practices of forgiveness (18), and personal religious/spiritual experiences (36) are associated with mortality and whether associations persist after control is made for service attendance.

The results observed here pertain only to mortality as an outcome, and the dynamics with other health outcomes may be considerably different. Our analyses here also pertained only to a relatively healthy general cohort. The majority of previous research on longitudinal associations between religious coping and mortality has been carried out with clinical populations (12–15), and thus less is known about the dynamics of this association in nonill populations. In clinical populations it is possible that associations between religious coping and mortality might persist even after control for service attendance, but this would require further research. Religious coping in the general population may also, like prayer, potentially also serve as a marker for health problems or threats already present, thus partially confounding the association. In addition, our measure of religious coping was not Pargament's validated RCOPE scale, which includes several dimension of coping, but rather a single 1-item measure of religious coping developed by Pargament, and our results thus relate only to this abbreviated measure.

The strength of the association between service attendance and mortality, and its strength relative to other R/S variables when they are included simultaneously, raises questions about what it is about service attendance that affects mortality. Prior studies have provided some empirical evidence for a number of potential mechanisms, including social support, smoking, depression, optimism, self-regulation, and meaning/purpose (1, 3, 4, 37).

Some of these mechanisms probably pertain to communal religious participation. One could imagine this being the case with smoking, if communal religious participation created pressure not to smoke. Current research approaches do not allow us to differentiate between religious and social dimensions of religious participation. It is well established, for instance, that black churches play a major role in creating and sustaining the social and political fabric of the African-American community (38). These "public spheres" come together to transform religious meaning into social action and social support (39). Black churches not only provide a

strong foundation of social support through engendering fellowship and enlarging family-like connections, but many also provide a wealth of social services, such as food and clothing programs, substance abuse shelters, and community education programs (38). Scholars have identified these social and material support networks as among the important benefits of church involvement for African Americans (38, 40). Further research is needed to better understand the functional role of church attendance within the African-American community as it relates to health and mortality and to understand the interplay between religious/spiritual and social and material aspects of church attendance.

The results derived here may also not be generalizable to other populations. Prior research indicates that associations between religious service attendance and health may be stronger among African Americans than among other US ethnic groups and may be particularly strong among African-American women (8, 11). According to the U.S. Religious Landscape Survey, conducted by the Pew Research Center in 2007, 84% of black women say religion is very important to them, and 59% of black women (vs. 45% in the BWHS) say that they attend religious services at least once a week; no other group of US men or women from any other racial background showed comparably high levels of religiosity (41). Our results should therefore be interpreted within this context. Further qualitative research might help situate the results of this analysis within the context of the lived experience of African Americans in various churches and religious contexts.

Our results do not imply that health-care providers should "prescribe" service attendance (2, 42, 43). Rather, R/S reflects a deep context of personal beliefs, background and upbringing, history and experiences, systems of meaning and understanding, and resources for resilience and coping. R/S may be an underappreciated resource supporting many patients' health that clinicians might explore with their patients, as appropriate.

Strengths of our study include a large sample size, a long duration of follow-up, a prospective cohort study design, multiple R/S measures, and extensive control for confounding. However, our study was observational. Although we adjusted for a wide range of potential confounders, the results may still have been subject to unmeasured and residual confounding, such as aspects of personality or unmeasured aspects of health status that may result in reverse causation. It is difficult to rule out reverse causation with religious service attendance, in that attendance may simply reflect being in a sufficiently healthy state to be able to attend. While we did control for a number of baseline health conditions (cancer, depression, myocardial infarction, and stroke), other conditions could of course also affect both service attendance and mortality. We used sensitivity analysis techniques to assess how strong unmeasured confounding or reverse causation would have to be to explain away the observed association. For an unmeasured confounder to explain away the association of service attendance and mortality, an unmeasured confounder that was associated with both increased service attendance and decreased mortality by risk ratios of 2.5-fold each, above and beyond the influence of all measured covariates, could suffice, but weaker confounding could not.

Beyond the cultural, social, and material dimensions of community that may be captured in the variable "church attendance," it is also important to examine more closely what takes place at a religious service that may affect health via the religious experience of service attendance itself. Idler et al. (44), in a recent analysis examining numerous aspects of religious service experience, used exploratory factor analysis to derive 7 components of the religious service experience, including frequency, positive worship emotions, devotional activities, belonging, beliefs, purpose and meaning, and sad worship emotions. Clearly service attendance is related to a diverse range of cognitive and affective experiences, but further research is needed to understand which of these components is most strongly related to health and to the more distal mechanisms discussed above. Such research might also help clarify whether associations of service attendance with lower mortality are more substantial than other forms of social participation and what other forms of social participation might also have strong protective associations with mortality. The results seen here, however, do suggest that something about the experience of service attendance is powerfully related to mortality. At a time in which much of life is becoming increasing virtual, face-to-face contact within a shared context of meaning and understanding may, in fact, be quite central to health.

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Author affiliations: Harvard T.H. Chan School of Public Health, Boston, Massachusetts (Tyler J. VanderWeele); School of Public Health, Boston University, Boston, Massachusetts (Jeffrey Yu, Yvette C. Cozier, Lauren Wise, M. Lynn Rosenberg, Julie R. Palmer); and Massachusetts General Hospital and Harvard Medical School, Boston, Massachusetts (Austin Argentieri, Alexandra E. Shields).

J.R.P. and A.E.S. contributed equally to this article.

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