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Religion/Spirituality and Prevalent Hypertension among Ethnic Cohorts in the Study on Stress, Spirituality, and Health

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ABSTRACT

Background Hypertension is a significant public health issue, particularly for Blacks, Hispanics/Latinos, and South Asians who are at greater risk than whites. Religion and spirituality (R/S) have been shown to be protective, but this has been identified primarily in whites with limited R/S measures examined (i.e., religious service attendance).

Purpose To assess hypertension prevalence (HP) in four racial/ethnic groups while incorporating an array of R/S variables, including individual prayer, group prayer, nontheistic daily spiritual experiences, yoga, gratitude, positive religious coping, and negative religious coping.

Methods Data were drawn from the Study on Stress, Spirituality, and Health, a consortium of ethnically diverse U.S. cohorts. The sample included 994 Black women, 838 Hispanic/Latino men and women, 879 South Asian men and women, and 3681 white women. Using a cross-sectional design, prevalence ratios for R/S and hypertension were reported for each cohort, in addition to pooled analyses. Given differences in R/S among men and women, all models were stratified by gender.

Results Different patterns of associations were found between women and men. Among women: 1) religious attendance was associated with lower HP among Black and white women; 2) gratitude was linked to lower HP among Hispanic/Latino, South Asian, and white women; 3) individual prayer was associated with higher HP among Hispanic/Latino and white women; 4) yoga was associated with higher HP among South Asian women, and 5) negative religious coping was linked to higher HP among Black women. Among men: significant results were only found among Hispanic/Latino men. Religious attendance and individual prayer were associated with higher HP, while group prayer and negative religious coping were associated with lower HP.

Conclusion Religion/spirituality is a multifaceted construct that manifests differently by race/ethnicity and gender. Medical practitioners should avoid a one-size-fits-all approach to this topic when evaluating prevalent hypertension in diverse communities.

Lay Summary

Hypertension is a serious public health issue that affects many Americans, though non-whites are at greater risk than whites. In this study, we examine Black, Hispanic/Latino, and South Asian samples, comparing their hypertension rates to whites. We ask whether one or more aspects of religion and spirituality (R/S) might be associated with prevalent hypertension (i.e., prevalence of hypertension at a single point in time). Religious service attendance is the primary R/S variable examined in relation to hypertension, but we expand this to include individual prayer, prayer in groups, daily spiritual experiences, yoga practice, feelings of gratitude, using God to help cope with problems (positive religious coping), and experiencing doubt or fear about God in the face of challenges (negative religious coping). The results were mixed across racial/ethnic group and gender. Among women, higher religious attendance and gratitude were associated with lower hypertension prevalence, but individual prayer was associated with higher prevalence. Few associations were noted between R/S and hypertension among men. Given these findings, along with extant research, it is important for medical practitioners serving diverse communities to recognize R/S may operate differently for men and women in varied religious and ethnic groups, with differing implications for prevalent hypertension.

Keywords: Religion · Spirituality · Hypertension · Black Women's Health Study · Mediators of Atherosclerosis among South Asians Living in America · Hispanic Community Health Study/Study of Latinos · Nurses' Health Study II

INTRODUCTION

Hypertension (i.e., elevated blood pressure) is a major public health issue in the USA affecting at least one third of U.S. adults, and is associated with increased risk of cardiovascular disease, the leading cause of death in the USA [1, 2]. Racial/ethnic disparities in hypertension prevalence have also been extensively documented. Compared to whites in the USA, South Asians, African Americans, and Hispanic/Latinos see higher rates of incident hypertension [3–6]. Previous studies have identified several social correlates of hypertension prevalence across racial minority groups, including lifestyle factors [7], English-language proficiency [8], and neighborhood dimensions [9–11].

In an attempt to expand knowledge on the social determinants of hypertension, a growing body of research suggests a relationship between several dimensions of religiosity and spirituality (R/S) and hypertension. Since 2000, more than 500 studies have been conducted on the relationship between R/S and hypertension, with the majority reporting a lower risk (or prevalence, if study is cross-sectional) of hypertension for those who are more religiously/spiritually engaged [12, 13]. For example, studies of both population-based and nonrepresentative samples have concluded that frequent religious attendance is a protective factor against cardiovascular disease and hypertension [14–17]. This relationship is attributable, in part, to social-supportive functions performed by religious communities [15], the promotion of healthy behaviors leading to a lower BMI (a summary measure of both biological and lifestyle factors) [18], and vis-à-vis decreased substance use [19].

Importantly, however, the current literature has two significant limitations.

First, the relationship between R/S and hypertension has primarily been assessed in white populations, with minimal or no representation among ethnic minorities. This is a crucial omission, as ethnic minority groups are found to be some of the most religious populations in the USA [20, 21]. Notably, ethnic minorities who are highly engaged in R/S may experience a disproportionate decrease in hypertension risk compared to their white counterparts [22] because they tend to suffer from resource deficits in other domains. Ethnic minorities are especially prone to turn toward R/S to confront minority stress, such as stigma, discrimination, and poverty [23, 24]. Cozier et al. [25], for instance, found that high R/S involvement in coping with stressful events was associated with reduced risk of hypertension in a prospective sample from the Black Women's Health Study.

The second notable limitation of prior work on R/S and hypertension is an overwhelming focus on one dimension of public religiosity—religious service attendance—and to a lesser extent, on the frequency of private prayer. Many studies have concluded that weekly religious attendance is a protective factor against cardiovascular disease and hypertension [14–18]. Prayer tends to be associated with higher hypertension risk, which may be explained by its use as a coping mechanism after the onset of health problems [25, 26]. Existing studies that operationalize religiosity on the basis of service attendance or similar unidimensional measures like prayer do not account for the rich multidimensionality of R/S, and thus fail to enlighten broader pathways between aspects of R/S and hypertension. This is of particular concern in some ethnic minority populations. For instance, many South Asian religions do not mandate weekly public religious attendance from believers. The majority of these faiths (e.g., Hinduism, Buddhism) emphasize nontheistic spiritual beliefs (e.g., achieving inner peace and connecting to nature), which tend to show stronger links to general health outcomes than public expressions of R/S [27]. Moreover, yoga interventions, a form of non-theistic spiritual practice, have generally been associated with decreased blood pressure in clinical samples [28, 29].

At a broader level, there are reasons to expand the compass of R/S variables and their respective associations with hypertension in different ethnic minority groups. For example, positive religious coping (working with God to handle stressful situations) [30] has been linked to lower hypertension prevalence in a sample of white Seventh-Day Adventists in the USA [19]. Many believers seek to cultivate personal friendships with God or divine beings [31] and those who feel close to God may find it easier to cope with stress because they feel supported by a loving, divine entity [32]. Such relationships with a divine power are found to reduce hypertension risk after stress exposure [33]. However, negative spiritual coping, such as struggling with one's faith or feeling abandoned by or disconnected from God or a divine power, have negative consequences for health and well-being [34, 35]. No work to date has examined whether the relationships between these additional dimensions of R/S exist among ethnic minority groups.

Therefore, the current study sought to address these two gaps in the literature by examining the relationship between several dimensions of religiosity and spirituality and hypertension in a series of ethnic specific cohorts. Because of the multi-dimensionality of religiosity [36], several religiosity and spirituality variables were assessed. We evaluated 8 theistic and non-theistic R/S variables available in our source data, the Study on Stress, Spirituality, and Health (SSSH) [37, 38], which encompass a range of beliefs, practices, and experiences reflecting public, private, theistic, and nontheistic aspects of religion and spirituality (e.g., service attendance, individual and group prayer frequency, non-theistic spiritual experiences, yoga practice, positive and negative spiritual coping, and gratitude). These variables have been used in previous work with ethnically diverse cohorts [27, 37, 38]. To facilitate comparisons across several racial and ethnic groups, the relationship between dimensions of R/S and prevalent hypertension were examined in member studies of the SSSH: the Black Women's Health Study, the Hispanic Community Health Study/Study of Latinos, Mediators of Atherosclerosis among South Asians Living in America, and the Nurses' Health Study II (a predominantly white cohort). We considered the R/S variables collectively to assess which ones emerged as the strongest predictors of hypertension in each ethnic cohort. We then assessed the R/S variables in a pooled sample of all the cohorts.

A further consideration when handling these data was inconsistent availability of men and women in the SSSH cohorts as well as marked differences between men and women in religion and spirituality. Not only do men exhibit broad differences in R/S belief, affiliation and practice compared to women [39, 40], but some studies also indicate that differing engagement in R/S by men and women may be associated with divergent health outcomes. For example, prayer has been associated with better mental well-being among women but worse among men [41] and religious coping has been linked to higher odds of hypertension among women but no

association among men [42]. These gender differences have been hypothesized to relate to gender differences in religious and psycho-emotional socialization [41, 43], as well as differing strategies for utilizing religious resources [44]. Prior investigation using these data indicates strong gender differences across a range of R/S beliefs and practices, suggesting gender is a salient feature in the examination of religion and hypertension [38] (see Analytic Strategy).

Because limited research has been done to examine the association between R/S and well-being among racially diverse cohorts, we adopted an "open question" approach to our analyses.

DATA AND METHODS

Sample

This analysis takes advantage of unique data made available through the Spiritualty Survey of the Study on Stress, Spirituality, and Health (SSSH), fielded by the National Consortium on Psychosocial Stress, Spirituality, and Health (cgvh.harvard.edu). The large majority of epidemiologic cohort studies in the U.S. fail to consider religion and spirituality as meaningful psychosocial factors for investigation in relation to health [45], which the SSSH seeks to correct by incorporating its Spirituality Survey into well-regarded epidemiologic studies. The current examination includes four such studies participating in the SSSH: Black Women's Health Study (BWHS, *N* = 994), Hispanic Community Health Study/Study of Latinos (HCHS/SOL, *N* = 838, 529 women, 308 men), Mediators of Atherosclerosis among South Asians Living in America (MASALA, *N* = 879, 413 women, 466 men), and Nurses' Health Study II (NHSII, *N* = 3,681 white women). Brief cohort descriptions and sampling information follow; please see listed websites for further details.

BWHS began in 1995 to investigate breast cancer and other diseases that disproportionately affect Black women. In 2015, approximately 4,000 participants who had completed the most recent wave of data collection were invited to complete the Spirituality Survey; more than 2,400 women responded within the first two weeks of recruitment and enrollment was stopped. A random sample of 1,000 of these participants was included in SSSH. The sample represents a full range of socioeconomic levels and all geographic regions of the USA (bu.edu\bwhs).

HCHS/SOL targets both immigrant and U.S.-born Hispanic/Latinos in four U.S. cities, with the SSSH utilizing the Chicago field site (we use "Hispanic/Latino" in this text since it is the preferred language of HCHS/SOL). The Hispanic/Latino population in Chicago is approximately 73% Mexican/Mexican American, 14% Puerto Rican, 11% Central and South American, and 1% Cuban. To be eligible for the Spirituality Survey at the time of collection in 2018–19, participants must have completed the most recent round of core data collection and participated in HCHS/SOL's Sociocultural Ancillary Study (administered only at the Chicago site; *N* = 900, response rate 754/900 = 83.8%). An additional 244 participants were recruited through letters sent to the broader sample of Chicago site participants (sites.cscc.unc.edu/hchs) to reach the desired study population of 1,000. The SSSH sample is generally comparable to the full HCHS/SOL cohort, though variations occur on the handful of comparison items available (i.e., SSSH sample has a slightly higher proportion of religious affiliates) [21].

MASALA examines risk factors for atherosclerosis among South Asians, with participants drawn from the Chicago and San Francisco Bay areas. To be eligible for MASALA, respondents must have had at least 3 grandparents born in India, Pakistan, Bangladesh, Nepal, or Sri Lanka. All participants (total cohort *N* = 990) were invited to complete the Spirituality Survey in 2016–18, and only one declined (masalastudy.org).

NHSII was established in 1989 among 116,429 women who responded to the baseline and subsequent biennial follow-up questionnaires to investigate risk factors for major chronic diseases in women, and is comprised of nurses from 14 states who are predominantly white. R/S data collection occurred from 2015 to 2016, and eligibility included provision of at least two blood samples, being age 45–75 at the time of the most recent blood draw (2010–13), completion of four questionnaires (2001 violence, 2008 trauma, and 2013 and 2015 main questionnaires), and no active participation in an ongoing ancillary study. Approximately the first 3,800 women who completed the survey were enrolled. Comparisons to the larger cohort indicate almost identical levels of religiosity [18] (nurseshealthstudy.org).

SSSH Survey data were collected using the established procedures for data collection within each cohort. BWHS and NHSII participants completed a web-based version of the survey accessed through an emailed link. Participants from MASALA completed the survey during an in-person clinical visit, or by mail, if they had already completed their most recent clinical visit. Participants from HCHS/SOL and SHS completed the survey either via mail, over the telephone, or in person.

Outcome variable

Prevalent hypertension (cases of hypertension co-occurring with other assessed variables) was determined according to each cohort's established procedures. BWHS and NHSII utilized self-reports of physician diagnosis with follow-up validity checks. NHSII obtained medical records from samples of women in the original Nurses' Health Study, and of the 51 women who reported hypertension for whom medical records were obtained, hypertension (blood pressure greater than 140/90) was confirmed in all cases [46]. A second validation study measured blood pressure in a sample of Boston-area NHSII participants [47]. Among the 161 participants who did not report hypertension, none had a blood pressure greater than 160/95 and 6.8% had values between 140/70 and 160/95. In the BWHS, hypertension was defined as use of an antihypertensive medication or self-reported hypertension and use of a diuretic. Self-report was confirmed in 99% of cases for whom medical records or physician checklists were obtained [48]. MASALA and HCHS/SOL utilized clinical visits and seated blood pressure of 140/90 to classify respondents as hypertensive. Respondents taking anti-hypertensive medication were further classified as hypertensive in all cohorts. Prevalent hypertension was available in BWHS through 2018, in HCHS/SOL through 2017, in MASALA through 2018, and in NHSII through 2013. Timing of the Spirituality Survey administration varied by cohort and was essentially concurrent with hypertension data. Incident hypertension, cases occurring after completion of the R/S survey, was not evaluated due to insufficient follow-up.

Key predictor R/S variables

Religious service attendance asked, "How often do you attend religious services?" and was categorized in a dummy system as "never or rarely," "one to three times a month," and "once a week or more."

Individual prayer asked, "How often do you pray by yourself?" and was categorized in a dummy system as "never or several times a year," "several times a month to several times a week," "once a day," and "more than once a day."

Group prayer asked, "How often do you pray in a group other than at a religious service?" and was organized into a dummy system with "never," "several times a year to several times a month," and "once a week or more."

The *Non-Theistic Daily Spiritual Experience Scale* (NTDSES, $\alpha = 0.74$) contained four items measuring non-theistic daily spiritual experiences from Underwood's Daily Spiritual Experiences Scale [49] (i.e., "I experience a connection to all of life"; "I feel deep inner peace or harmony"; "I am touched by the beauty of creation"; and "I feel a selfless caring for others") rated on a 5-point scale ("never" to "many times a day").

Yoga was assessed as a binary variable comparing those who practiced once a week or more against those who practiced less than once a week.

Gratitude ($\alpha = 0.76$) was assessed with two items from the Gratitude Questionnaire [50] ("I have so much in life to be grateful for" and "If I listed everything that I felt grateful for, it would be a very long list"). The items were rated on a 5-point scale ("strongly disagree," "somewhat disagree," "neutral," "somewhat agree," and "strongly agree").

Positive religious coping ($\alpha = 0.94$) assessed use of religious coping in dealing with stressful events. Eight items were selected from Pargament's RCOPE Scale [51] (i.e., "I saw my situation as part of God's plan," "I trusted that God would be by my side," "I sought God's love or care," etc.). Items were rated on a 4-point scale ("not at all," "somewhat," "quite a bit," and "a great deal").

Negative religious coping ($\alpha = 0.80$), also from Pargament's RCOPE Scale, captured negative religious experiences in the face of stressful events using six items (i.e., "I wondered what I did for God to punish me," "I wondered whether God had abandoned me," "I believed the devil or evil spirits were responsible for my situation," etc.). Items were rated on the same 4-point scale as positive coping.

Covariates included *age* (years), *marital status* (1=married), *income* (<$25,000, $25,001–$50,000, $50,001–$100,000, >$100,000), *body mass index* (kg/m^2), *smoking status* (never, former, current), *physical activity* (MET-hours/week), and the Alternative Healthy Eating Index (including alcohol consumption). We also adjusted for *religious affiliation,* which was assessed using a combination of first order self-select descriptors (i.e., Catholic, Hindu, non-denominational Christian, atheist, etc.) and optional denominational affiliations. We began with the Steensland et al. [52] RELTRAD scheme, then branched out to include additional religious traditions where the N was sufficient to classify. If multiple religious traditions were selected, they were classified as "other." Since represented religious groups varied in each cohort, cohort-specific dummy systems were coded (i.e., Christian affiliation would be considered "other" in MASALA, but as Evangelical Protestant, Mainline Protestant, Catholic, or Black Protestant in other cohorts). The pooled analysis included all 14 religious traditions (listed in Table 1).

ANALYTIC STRATEGY

The total available sample size was 7,201. Respondents who were missing data on hypertension, marital status, smoking status, or any R/S variables were removed from the sample, as were the 101 non-white women from NHSII to retain four racially/ethnically distinct cohorts, leaving 6,392 respondents. Of these, 1,318 were missing income, AHEI, BMI, or physical activity, and multiple imputation (SAS 9.4) was used to recover these cases. Listwise deletion and multiple imputation produced comparable results.

Most R/S questions in the Spirituality Survey were asked of all participants. However, a skip pattern was set so that questions presuming belief in God's existence would not be asked of those without belief in God. This included two variables used in this analysis: positive religious coping and negative religious coping. In order to maximize respondents, we constructed two logistic regression models for each cohort. Model 1 included covariates plus all the R/S variables asked of the full sample; Model 2 assessed theists only and included covariates plus all the R/S variables. Eliminating non-theists in Model 2 reduced the sample size for each cohort as follows: BWHS (18, 1.8%), HCHS/SOL (54, 6.4%), MASALA (93, 10.6%), and NHSII (359, 9.8%). Each of these models was assessed in individual cohorts stratified by sex (if applicable). After stratification, all women and all men were pooled separately and analyzed. For the sake of parsimony in our presentation of results, covariates were included in all analyses but not shown in our tables. Covariates performed the same across different subsamples (e.g., smoking and low physical activity were linked to a greater prevalence of hypertension).

A number of R/S variables were assessed, and issues related to multicollinearity and multiple testing were of some concern. However, evaluation of zero-order correlations indicated that most R/S variables were modestly correlated, with only two correlating above .50 (prayer and positive coping, $r = .66$). Sensitivity tests were conducted inserting R/S variables independently into the models and no substantial differences in results were found. Given this, we elected to include all R/S variables concurrently in the models while applying a Bonferroni correction to adjust for multiple testing.

Odds ratios were converted to prevalence ratios since odds ratios "inflate" the reported statistic as prevalence increases, commonly leading to interpretation errors on the part of the reader. Odds ratios should not be used when the prevalence of the outcome is high, as it is in our study (43%–62%) [53].

Finally, due to notable differences in R/S belief and practice between men and women [40]—as well as the absence of men in two of the four cohorts—we elected to examine men and women separately. Importantly for our selected outcome of prevalent hypertension, women tend to participate in religious activities at higher levels regardless of stress, while men more often turn to religion and spirituality as a coping response [43]. We saw this pattern on display in these data, with volatility among men driving results for those cohorts that included them. This further supported our decision to sex stratify.

RESULTS

Table 1 presents characteristics of study participants according to each R/S measure and demographic characteristic, stratified by sex. The percentage of respondents with prevalent

Table 1. Descriptive Statistics by Race/Ethnicity and Gender

	BWHS		HCHS/SOL				MASALA				NHSII		POOLED		
	Women		Women		Men		Women		Men		Women				
Variables	m/prop	(SD)	m/prop	(SD)	m/prop	(SD)	m/prop	(SD)	m/prop	(SD)	m/prop	(SD)	m/prop	(SD)	Range
Prevalent hypertension	.56	-	.44	-	.46	-	.43	-	.62	-	.45	-	.48	-	-
Age	57.56	(7.48)	56.86	(12.32)	56.83	(12.50)	59.55	(8.25)	61.95	(9.25)	63.02	(4.36)	61.06	(7.55)	26-89
Married	.46	-	.56	-	.69	-	.85	-	.95	-	.81	-	.74	-	-
Income															
<$25,000	.14	-	.81	-	.68	-	.14	-	.09	-	.02	-	.15	-	-
$25,001 to $50,000	.19	-	.11	-	.16	-	.07	-	.06	-	.11	-	.12	-	-
$50,001 to $100,000	.44	-	.07	-	.16	-	.25	-	.22	-	.48	-	.39	-	-
>$100,000	.22	-	.01	-	.01	-	.54	-	.63	-	.39	-	.34	-	-
Body Mass Index	30.69	(7.01)	30.81	(6.61)	29.21	(5.25)	26.22	(4.24)	25.77	(3.44)	26.65	(5.83)	27.65	(6.12)	14.04-68.38
Smoking status															
Never	.72	-	.78	-	.46	-	.98	-	.70	-	.68	-	.71	-	-
Former	.22	-	.14	-	.33	-	.02	-	.24	-	.29	-	.25	-	-
Current	.06	-	.07	-	.21	-	.01	-	.05	-	.03	-	.05	-	-
Physical activity (MET-hrs/week)	10.81	(12.72)	6.96	(11.49)	14.11	(18.80)	21.89	(22.99)	23.64	(22.86)	26.24	(28.55)	21.93	(25.93)	0-289.60
AHEI	42.18	(10.45)	51.88	(7.17)	53.40	(7.46)	71.08	(6.06)	69.39	(7.17)	66.28	(12.94)	61.23	(14.76)	14.88-101.24
Religious service attendance															
Never or rarely	.32	-	.30	-	.40	-	.06	-	.07	-	.40	-	.33	-	-
One to three times a month	.24	-	.28	-	.27	-	.67	-	.70	-	.16	-	.26	-	-
Once a week or more	.44	-	.42	-	.33	-	.27	-	.24	-	.43	-	.40	-	-
Individual prayer															
Never or several times a year	.08	-	.07	-	.10	-	.14	-	.30	-	.19	-	.16	-	-
Several/month to several/week	.15	-	.12	-	.22	-	.14	-	.13	-	.22	-	.19	-	-
Once a day	.20	-	.39	-	.41	-	.42	-	.40	-	.21	-	.26	-	-
More than once a day	.57	-	.42	-	.27	-	.30	-	.17	-	.38	-	.39	-	-
Group prayer															
Never	.30	-	.53	-	.56	-	.39	-	.41	-	.46	-	.44	-	-
Several/year to several/month	.40	-	.18	-	.21	-	.37	-	.36	-	.32	-	.32	-	-
Once a week or more	.30	-	.29	-	.23	-	.24	-	.23	-	.22	-	.24	-	-
NTDSES	3.84	(.70)	3.65	(.75)	3.49	(.79)	3.71	(.77)	3.54	(.80)	3.75	(.66)	3.73	(.71)	1-5
Yoga (once a week or more)	.12	-	.07	-	.04	-	.45	-	.31	-	.17	-	.17	-	-
Gratitude Scale	4.90	(.36)	4.87	(.39)	4.81	(.52)	4.76	(.48)	4.67	(.56)	4.89	(.37)	4.86	(.41)	1-5
Positive religious coping	3.14	(.75)	3.67	(.52)	3.52	(.64)	2.88	(.84)	2.62	(.91)	2.75	(.94)	2.93	(.91)	1-4
Negative religious coping	1.43	(.51)	1.79	(.75)	1.87	(.77)	1.48	(.60)	1.44	(.60)	1.21	(.34)	1.36	(.53)	1-4

Table 1. Continued

Variables	BWHS		HCHS/SOL			MASALA				NHSII		POOLED		
	Women		Women		Men		Women		Men		Women			
	m/prop	(SD)	m/prop	(SD)	m/prop	(SD)	m/prop	(SD)	m/prop	(SD)	m/prop	(SD)	m/prop	(SD)	Range
Religious affiliation															
Evangelical Protestant	.02	-	.25	-	.22	-	.00	-	.00	-	.22	-	.16	-	-
Mainline Protestant	.05	-	.02	-	.02	-	.02	-	.02	-	.28	-	.18	-	-
Black Protestant	.68	-	.00	-	.00	-	.00	-	.00	-	.00	-	.11	-	-
Catholic	.07	-	.67	-	.68	-	.01	-	.01	-	.29	-	.27	-	-
Jewish	.01	-	.00	-	.00	-	.00	-	.00	-	.02	-	.01	-	-
Buddhist	.00	-	.00	-	.00	-	.00	-	.01	-	.01	-	.01	-	-
Hindu	.00	-	.00	-	.00	-	.60	-	.62	-	.00	-	.08	-	-
Muslim	.01	-	.00	-	.00	-	.09	-	.06	-	.00	-	.01	-	-
Sikh	.00	-	.00	-	.00	-	.06	-	.05	-	.00	-	.01	-	-
Jain	.00	-	.00	-	.00	-	.06	-	.04	-	.00	-	.01	-	-
Other	.04	-	.02	-	.02	-	.08	-	.07	-	.02	-	.03	-	-
No affiliation	.10	-	.04	-	.06	-	.02	-	.05	-	.07	-	.07	-	-
Agnostic	.01	-	.00	-	.01	-	.03	-	.04	-	.06	-	.04	-	-
Atheist	.01	-	.00	-	.00	-	.02	-	.03	-	.03	-	.02	-	-
N	994		529		309		413		466		3681		6392		

Note: Means and standard deviations are based on unweighted, non-imputed data. N is the total after imputation of missing covariates. AHEI=Alternative Healthy Eating Index. NTDSES=Non-theistic Daily Spiritual Experience Scale.

hypertension ranged from a low of 43% (women, MASALA study) to 56% and 62% among women in the BWHS and men in the MASALA sample, respectively.

Findings on the relation of R/S variables to hypertension prevalence are presented in Table 2 (women) and Table 3 (men). All associations referenced represent the partial effects of each dimension of R/S, controlling for all other R/S indicators. Coefficients are reported both with and without correction for multiple testing of R/S indicators, and readers are advised to bear this in mind when evaluating the strength of each reported association. Failure to hold up to correction for multiple testing does not necessarily invalidate pre-correction results, as the Bonferroni method used is quite conservative [54], but it does suggest closer examination is in order.

Beginning with the results for women, Model 1 shows that in the BWHS, attending religious services one to three times a month (Prevalence Ratio [PR] = 0.72, 95% CI: 0.54, 0.90) or once a week (PR = 0.79, 95% CI: 0.61, 0.98) are both associated with lower hypertension prevalence compared to never attending services. Results from Model 2 in the BWHS sample show that negative spiritual coping is associated with higher prevalence (PR = 1.17, 95% CI: 1.03, 1.29) among African American women. Moving to the HCHS/SOL sample, Model 1 shows that individual prayer once a day (PR = 1.89, 95% CI: 1.27, 2.16) or several times a day (PR = 1.75, 95% CI: 1.05, 2.11) is associated with higher prevalence relative to those who never pray or pray several times a year. Higher gratitude scores are associated with lower hypertension prevalence (PR = 0.53, 95% CI: 0.31, 0.87).

Results from the MASALA sample for women presented in Model 1 show that practicing yoga once a week is associated with higher hypertension prevalence (PR= 1.33, 95% CI: 1.02, 1.61), while those with higher gratitude evince lower prevalence (PR = 0.68, 95% CI: 0.46, 0.95). In the NHSII, Model 1 shows that attendance once a week is associated with lower prevalence (PR = 0.89, 95% CI: 0.78, 0.99); individual prayer several times a month or several times a week is associated with higher prevalence (PR = 1.14, 95% CI: 1.01, 1.29); and higher levels of gratitude are associated with lower hypertension prevalence (PR = 0.81, 95% CI: 0.71, 0.92). Finally, the pooled sample of all female respondents across the four cohorts studies shows that weekly religious attendance is associated with lower hypertension prevalence (PR = 0.90, 95% CI: 0.81, 0.98), while all frequencies of individual prayer, relative to never praying, are associated with greater prevalence. Higher gratitude levels are also associated with lower prevalence (PR = 0.83, 95% CI.: 0.75, 0.92).

Results for the two cohorts with a male sample (HCHS/SOL and MASALA) are presented in Table 3. In the HSHS/SOL, results from Model 1 show that religious attendance once a week or more is associated with increased hypertension prevalence compared to men never attending (PR = 1.31, 95% CI: 1.46, 1.98). Individual prayer once a day (PR = 1.76, 95% CI: 1.17, 2.04) or more than once a day (PR = 1.72, 95% CI: 1.07, 2.04) are associated with greater prevalent hypertension relative to those who never pray or pray a few times a year. Group prayer once a week is associated with lower prevalence (PR = 0.50, 95% CI: 0.26, 0.85) relative to men who never engage in group prayer. In Model 2, negative spiritual coping is associated with lower hypertension prevalence (PR = 0.72, 95% CI: 0.53, 0.94). In the MASALA study, there is no association of any R/S measure with prevalent hypertension. In the pooled male sample, Model 1 shows that

Table 2. Regression of Prevalent Hypertension Diagnosis on Religious and Spiritual Factors—Women

	BWHS				HCHS/SOL				MASALA			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)
Religious attendance												
Never or rarely (REF)	-	- -	-	- -			-	- -	-	- -	-	- -
1 to 3x/mo	.72***	(.54, .90)	.66***	(.50, .85)	.77	(.43, 1.16)	.81	(.46, 1.23)	.76	(.31, 1.43)	.56	(.18, 1.27)
≥Once/wk	.79*	(.61, .98)	.72***	(.55, .91)	.88	(.52, 1.30)	.90	(.52, 1.33)	.64	(.21, 1.37)	.45	(.12, 1.17)
p-trend	†		*									
Individual prayer												
Never or several/yr (REF)	-	- -	-	- -	-	- -	-	- -	-	- -	-	- -
Several/mo to several/wk	.93	(.64, 1.22)	.88	(.57, 1.20)	1.39	(.60, 1.98)	1.46	(.67, 2.02)	.80	(.39, 1.32)	.80	(.37, 1.37)
Once/day	1.03	(.74, 1.30)	.97	(.64, 1.28)	1.89**	(1.27, 2.16)	1.95***	(1.37, 2.18)	.95	(.55, 1.41)	.96	(.50, 1.48)
>Once/day	.93	(.65, 1.21)	.83	(.52, 1.16)	1.75*	(1.05, 2.11)	1.85*	(1.19, 2.15)	.67	(.33, 1.18)	.69	(.30, 1.28)
p-trend					*		*					
Group prayer												
Never (REF)	-	- -	-	- -	-	- -	-	- -	-	- -	-	- -
Several/yr to several/mo	1.11	(.94, 1.26)	1.13	(.96, 1.28)	.95	(.56, 1.38)	1.02	(.61, 1.46)	.95	(.66, 1.26)	1.02	(.71, 1.34)
≥Once/wk	1.14	(.95, 1.31)	1.16†	(.97, 1.33)	1.16	(.77, 1.55)	1.15	(.75, 1.55)	.92	(.55, 1.35)	.98	(.58, 1.41)
p-trend												
NTDSES	.98	(.88, 1.08)	.97	(.86, 1.07)	.99	(.79, 1.21)	1.02	(.81, 1.24)	1.16	(.97, 1.35)	1.14	(.94, 1.34)
Yoga	.85	(.67, 1.05)	.86	(.66, 1.06)	1.13	(.53, 1.73)	1.09	(.51, 1.71)	1.33*	(1.02, 1.61)	1.27†	(.96, 1.55)
Gratitude	1.04	(.85, 1.22)	1.12	(.89, 1.32)	.53**	(.31, .87)	.67	(.37 ,1.07)	.68*	(.46, .95)	.66*	(.43, .94)
Positive coping	-	- -	1.09	(.97, 1.20)	-	- -	.69†	(.42, 1.03)	-	- -	.98	(.77, 1.21)
Negative coping	-	- -	1.17*	(1.03, 1.29)	-	- -	1.12	(.90, 1.34)	-	- -	.97	(.74, 1.22)
pseudo-R^2	.18		.19		.26		.26		.24		.24	
N	994		976		529		491		413		386	

Table 2. Continued

	NHSII				POOLED			
	Model 1		Model 2		Model 1		Model 2	
	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)
Religious attendance								
Never or rarely (REF)	-	- -	-	- -			-	- -
1 to 3x/mo	.97	(.85, 1.09)	.97	(.84, 1.10)	.92†	(.83, 1.01)	.91†	(.82, 1.01)
≥Once/wk	.89*	(.78, .99)	.87*	(.76, .99)	.90*	(.81, .98)	.88**	(.79, .97)
p-trend	*		*		*		**	
Individual prayer								
Never or several/yr (REF)	-	- -	-	- -	-	- -	-	- -
Several/mo to several/wk	1.14*	(1.01, 1.29)	1.20*	(1.04, 1.35)	1.14*	(1.03, 1.24)	1.16*	(1.04, 1.29)
Once/day	1.06	(.91, 1.21)	1.16†	(.98, 1.33)	1.15**	(1.04, 1.26)	1.21**	(1.07, 1.34)
>Once/day	1.10	(.94, 1.25)	1.19*	(1.01, 1.37)	1.12*	(1.01, 1.23)	1.16*	(1.02, 1.30)
p-trend								
Group prayer								
Never (REF)								
Several/yr to several/mo	1.04	(.94, 1.14)	1.03	(.93, 1.14)	1.05	(.97, 1.13)	1.05	(.97, 1.14)
≥Once/wk	1.06	(.94, 1.18)	1.07	(.94, 1.20)	1.07	(.98, 1.16)	1.08†	(.98, 1.18)
p-trend					†		†	
NTDSES	1.04	(.98, 1.11)	1.04	(.97, 1.11)	1.03	(.98, 1.07)	1.02	(.97, 1.07)
Yoga	.96	(.85, 1.07)	.94	(.82, 1.05)	.97	(.88, 1.05)	.94	(.86, 1.04)
Gratitude	.81***	(.71, .92)	.81***	(.69, .94)	.83***	(.75, .92)	.83***	(.74, .92)
Positive coping	-	- -	.97	(.90, 1.04)	-	- -	1.00	(.94, 1.06)
Negative coping	-	- -	1.02	(.89, 1.14)	-	- -	1.07	(.99, 1.14)
pseudo-R^2	.14		.14		.16		.16	
N	3681		3322		5617		5175	

Notes: PR=prevalence ratio. NTDSES=Non-theistic Daily Spiritual Experience Scale. Weighted and imputed data. †$p < .10$, *$p < .05$, **$p < .01$ uncorrected for multiple testing; ***$p < .05$ corrected for multiple testing. All models control for age, marital status, income, religious affiliation, BMI, smoking status, physical activity, and diet (including alcohol). Pooled model additionally controls for race/ethnicity. P-trend indicates the presence of a linear trend when R/S (i.e., religious attendance) inserted as a continuous variable.

Table 3. Regression of Prevalent Hypertension Diagnosis on Religious and Spiritual Factors—Men

	HCHS/SOL				MASALA				POOLED			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)	PR	(95%CI)
Religious attendance												
Never or rarely (REF)	-	- -	-	- -	-	- -	-	- -	-	- -	-	- -
1 to 3x/mo	1.33†	(.95, 1.66)	1.39†	(1.00, 1.72)	.74	(.38, 1.13)	.77	(.31, 1.25)	1.12	(.91, 1.31)	1.23*	(1.01, 1.42)
≥Once/wk	1.31***	(1.46, 1.98)	1.82***	(1.49, 2.01)	.63	(.26, 1.10)	.65	(.21, 1.21)	1.29*	(1.07, 1.47)	1.40***	(1.16, 1.56)
p-trend	***		***						*		**	
Individual prayer												
Never or several/yr (REF)	-	- -	-	- -	-	- -	-	- -	-	- -	-	- -
Several/mo to several/wk	1.62†	(.94, 1.99)	1.61	(.87, 2.01)	.85	(.55, 1.13)	.91	(.59, 1.20)	.89	(.65, 1.13)	1.02	(.74, 1.28)
Once/day	1.76*	(1.17, 2.04)	1.73*	(1.05, 2.05)	.89	(.66, 1.12)	1.05	(.78, 1.27)	.99	(.78, 1.20)	1.15	(.90, 1.37)
>Once/day	1.72*	(1.07, 2.04)	1.73*	(1.00, 2.06)	.79	(.49, 1.10)	.98	(.62, 1.27)	.94	(.69, 1.18)	1.09	(.80, 1.35)
p-trend	†											
Group prayer												
Never (REF)	-	- -	-	- -	-	- -	-	- -	-	- -	-	- -
Several/yr to several/mo	1.20	(.83, 1.54)	1.24	(.85, 1.59)	1.06	(.85, 1.24)	1.00	(.78, 1.19)	1.05	(.87, 1.21)	1.01	(.83, 1.20)
≥Once/wk	.50**	(.26, .85)	.44*	(.23, .80)	1.03	(.74, 1.26)	1.03	(.73, 1.27)	.80†	(.59, 1.02)	.78†	(.57, 1.01)
p-trend	†		†									
NTDSES	1.14	(.92, 1.35)	1.15	(.93, 1.37)	1.10†	(.99, 1.20)	1.08	(.95, 1.19)	1.14***	(1.05, 1.23)	1.13*	(1.02, 1.23)
Yoga	.33	(.04, 1.35)	.44	(.05, 1.56)	1.09	(.89, 1.25)	1.08	(.88, 1.25)	.99	(.80, 1.18)	.97	(.76, 1.18)
Gratitude	1.03	(.70, 1.38)	.93	(.57, 1.32)	1.02	(.87, 1.16)	1.06	(.89, 1.21)	1.02	(.88, 1.16)	1.03	(.87, 1.18)
Positive coping	-	- -	1.16	(.81, 1.50)	-	- -	.91	(.75, 1.06)	-	- -	.97	(.83, 1.10)
Negative coping	-	- -	.72*	(.53, .94)	-	- -	.98	(.80, 1.14)	-	- -	.86*	(.74, .99)
pseudo-R^2	.38		.40		.21		.21		.31		.31	
N	309		293		466		399		775		693	

Notes: PR=prevalence ratio. NTDSES=Non-theistic Daily Spiritual Experience Scale. Weighted and imputed data. †$p < .10$, *$p < .05$, **$p < .01$ uncorrected for multiple testing; ***$p < .05$ corrected for multiple testing. All models control for age, marital status, income, religious affiliation, BMI, smoking status, physical activity, and diet (including alcohol). Pooled model additionally controls for race/ethnicity. P-trend indicates the presence of a linear trend when R/S (i.e., religious attendance) inserted as a continuous variable.

attendance more than once a week is associated with greater hypertension prevalence (PR = 1.29, 95% CI: 1.07, 1.47), as are higher scores on the non-theistic daily spiritual experiences scale (PR = 1.14, 95% CI: 1.05, 1.23). Model 2 shows that negative spiritual coping is associated with lower prevalent hypertension (PR = 0.86, 95% CI: 0.74, 0.99).

DISCUSSION

This is the first study to consider religion and spirituality (R/S) and hypertension across four racial/ethnic cohorts representing African American, South Asian, Hispanic/Latino, and white individuals in the United States. R/S is a multidimensional phenomenon (Idler et al. 2003) and the findings of the current study suggest a complex relationship between various aspects of R/S and hypertension prevalence.

Women

For women, R/S was associated in several cases with lower prevalent hypertension. In the pooled sample, higher religious attendance and gratitude were associated with lower prevalence, but individual prayer indicated an inverse association. Across cohorts there were important ethnic-specific differences.

Among African American women in the BWHS, religious attendance was associated with lower hypertension prevalence, consistent with prior cross-sectional research from population-based studies [16, 17] and with research performed on specific religious subgroups, such as Seventh-Day Adventists [15].

Negative spiritual coping—a marker of religious struggle and doubt—was associated with higher hypertension prevalence. African American women tend to exhibit strong beliefs that God is in control of their lives [32], and while feeling abandoned by or disconnected from God can be distressing for believers regardless of race/ethnicity [34, 55, 56], such feelings may be of greater consequence for African American women due to the high salience of relationship with God [57].

In contrast to prior work with the BWHS, we did not observe that more frequent prayer was associated with a higher prevalence of hypertension. However, compared to the current study using cross-sectional data, Cozier and colleagues [25] used prospective data spanning 8 years modeling the risk of incident hypertension.

Among Hispanic/Latina women in the HCHS/SOL and white nurses in the NHSII, a higher frequency of individual prayer was associated with greater hypertension prevalence. This finding corroborates a prior cross-sectional study which showed that more frequent prayer is associated with higher prevalence [26]. Because of its role as a coping behavior, health problems may cause people to engage in more frequent prayer. Ellison and colleagues [58] found that people tend to pray more frequently out of desperation when they have exhausted other coping resources. This pattern also extends to general health-related situations [59] and in situations following a serious diagnosis, such as HIV [60].

A similar result was found in the MASALA sample looking at non-theistic spiritual practice, where weekly yoga was associated with greater hypertension prevalence. This finding is inconsistent with previous work which has found the practice of yoga to reduce hypertension [28, 29], but these studies were prospective interventions with clinical samples rather than community-based samples. With cross-sectional data, issues of temporality cannot be established between hypertension and the practice of yoga or prayer, so future research is needed to clarify this relationship.

Finally, across three of the four female samples of our cohorts (HCHS/SOL, MASALA, and NHSII), gratitude was associated with lower hypertension prevalence. Gratitude is part of a broader dispositional orientation towards seeing and appreciating the good in life [61]. While not typically considered in definitions of R/S, people who are more religiously and spiritually involved tend to be more grateful [62–64]. Indeed, there is a sacred quality to gratitude, as most major R/S traditions emphasize the importance of giving thanks or expressing gratitude towards a divine power for what has been bestowed on them [65, 66]. Prior research from a clinical sample of patients with heart disease has documented salubrious associations of gratitude with health-related outcomes, including lower levels of inflammatory biomarkers [67]. A national sample of Swiss adults also found that gratitude is associated with more favorable self-rated health [68]. The results of our study show that gratitude is the most consistent predictor of lower hypertension across our female samples, even after adjustment for several other R/S variables and several known risk factors of hypertension.

Men

The results for men show that, with few exceptions, dimensions of R/S were not associated with lower hypertension. In the MASALA study, we found null associations between elements of R/S and hypertension prevalence for men. This is not surprising given that religion/spirituality tends to figure more prominently in the lives of women versus men [40, 43], and this is borne out descriptively in the MASALA cohort, where women are more religious than men on every R/S indicator.

In some instances, R/S was associated with an enhanced likelihood of being hypertensive. Hispanic/Latino men had higher rates of prevalent hypertension if they attended religious services weekly or engaged in high frequencies of individual prayer. Past work has found a null association [22], but the current study diverges from this work in that our sample was gender stratified in order to account for the different religious proclivities of men and women (finding that higher religious attendance was not significantly associated with hypertension in either direction for women in HCHS/SOL).

Though the evidence base is quite thin, prior work in a Mexican/Mexican American sample has shown that higher religiosity (more frequent attendance and prayer) is associated with a negative attitude toward mental health services [69]. This may encourage men to avoid seeking help in the formal health care system, perhaps allowing initially small medical problems to compound over time. While no existing research has considered whether R/S is associated with the avoidance of formal medical care for Latino men, higher levels of R/S have been found to predict more negative attitudes towards the mental health care system among this group [69]. Prior cross-sectional evidence that is now several decades old [70] has also suggested that older Hispanics/Latinos with higher self-rated religiosity had higher levels of prevalent hypertension, lending credence to the idea that religiosity may be a coping response to stress. Indeed, Hispanics/Latinos use prayer when dealing with health issues more than white Americans do [71]. Future research is therefore needed to clarify why more

regular religious practice may pose a hypertension risk for Hispanic/Latino men.

Two beneficial associations of R/S and hypertension were found for Hispanic/Latino men. Those engaging in group prayer at least once a week had lower prevalent hypertension. Prayer in small groups of individuals who know each other personally is positively associated with happiness and life satisfaction [72]. Typically, these small groups pray for individual needs of group members. Since men tend to be less intrinsically inclined towards R/S than women, sharing a social connection with likeminded individuals may illuminate the positive aspects of R/S, such as feeling supported in one's religious convictions [73].

The pooled sample of men presents a challenge of interpretation, particularly given: a) the consistent nonfindings from MASALA, and b) the fact that only two groups were pooled together. That said, three results are of note. First, the pooled analysis offers evidence for a positive association between religious attendance and hypertension. This may reflect a broader trend, or it may simply reflect the highly significant HCHS/SOL model exerting influence over the nonsignificant MASALA sample. Second, nontheistic daily spiritual experiences were not significant in either sample but emerged as significant in the pooled sample. Each individual sample exhibited probability ratios greater than 1, and it is possible this result reflects a trend that takes advantage of increased analytical power. Third, negative spiritual coping was associated with a lower risk of prevalent hypertension. It is possible that the resolution of spiritual tensions brought about by negative religious coping may lead men to a deeper faith that may later be health protective [74], but we are hesitant to speculate further. We leave these tasks to future research.

Study Limitations

Study limitations include the following. First, we relied on cross-sectional data across the four ethnic cohorts considered in our study, and therefore could not assess changes in R/S in relation to hypertension. We would therefore urge caution in interpreting the findings of our study, which assess only the concurrent correlations between several dimensions of R/S and hypertension. Follow-up data is not yet available after the initial SSSH data collection, though future data collection efforts are planned. Second, none of our samples were representative of the population of the United States. For instance, the HCHS/SOL sample was comprised of respondents primarily from the Chicago area and MASALA surveyed South Asians living in Chicago and San Francisco. Third, Black and white men are not represented in cohorts participating in the SSSH, and their absence limits the contribution this study is able to offer. These types of heterogeneity between cohorts (including varying size) suggest the pooled samples need to be carefully interpreted in light of the makeup and demographics of the cohorts. Fourth, though these cohorts are well-designed for the study of hypertension, there may still be unmeasured covariates that are important confounders, such as family history of hypertension. Finally, we did not have an exhaustive list of R/S measures in our data. Additional measures of R/S that were not measured may also be important to the health profiles of some of our ethnic cohorts, such as beliefs individuals hold about religious texts, divine locus of control, or interactions with religious/spiritual leaders.

Despite these limitations, our study has a number of strengths. This is the first study to assess prevalent hypertension across four racially and ethnically diverse cohorts in the United States, controlling for a host of known risk factors. We also gain purchase on how a wide range of R/S variables are associated with hypertension over existing literature, which has overwhelmingly centered on service attendance and prayer. Gratitude, for instance, is typically not considered as a predictor of hypertension in studies of R/S, but was a consistent predictor of lower prevalent hypertension among women. Incorporating non-theistic spiritual experiences is also an advancement over previous measures of R/S, and were generally associated with a greater hypertension among South Asians.

Given the divergent findings across ethnic groups and gender, it is important for medical practitioners serving ethnically diverse communities to recognize that R/S may be beneficially associated with hypertension in some groups (e.g., white or African American women) but perhaps not others (Hispanic/Latino men). Further, and fundamentally, we need to better understand if R/S measures "work" similarly in different racial and ethnic groups, a question for which there is no body of sufficient research (i.e., studies of measurement invariance across racial/ethnic groups). A deeper awareness of the role of R/S and how it might impact their health risk and future adherence to treatment is needed, especially given the nuanced relationships between various aspects of R/S and hypertension prevalence that we showed in the current study. Due to the significant burden that hypertension places on the American public health system, our study demonstrates the value of understanding how multiple dimensions of R/S affect prevalent hypertension across ethnic groups. Future research should continue to pursue these questions using prospective studies that can sort out issues of temporal ordering and offer tests of explanatory mechanisms.

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Compliance with Ethical Standards

Authors' Statement of Conflict of Interest and Adherence to Ethical Standards Authors: Blake Victor Kent, Laura Upenieks, Alka M. Kanaya, Erica T. Warner, Yvette C. Cozier, Martha L. Daviglus, Heather Eliassen, Daniel Y. Jang, and Alexandra E. Shields declare that they have no conflict of interest. All procedures, including the informed consent process, were conducted in accordance with the ethical standards of the responsible committee on human experimentation

(institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

Author contributions

Blake Victor Kent (conceptualization, methodology, formal analysis, writing-original draft), Laura Upenieks (writing-original draft), Alka Kanaya (conceptualization, funding acquisition, methodology, supervision, writing-review & editing), Erica Warner (conceptualization, writing—review & editing), Yvette Cozier (writing—review & editing), Martha Daviglus (funding acquisition, writing—review & editing), Heather Eliassen (writing—review & editing), Daniel Jang (writing—review & editing), Alexandra Shields (funding acquisition, project administration, resources, supervision, writing—review & editing)

Transparency Statements

This study was not formally registered.

The analysis plan was not formally pre-registered.

De-identified data from this study are not available in a public archive.

Analytic code are available from the corresponding author.

The SSSH survey is available at https://mdpi-res.com/d_attachment/religions/religions-12-00150/article_deploy/religions-12-00150-s001.pdf?version=1614843089.

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