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Intrinsic Religiosity and Hypertension Among Older North American Seventh-Day Adventists

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Abstract

A unique lifestyle based on religious beliefs has been associated with longevity among North American Seventh-day Adventists (SDAs); however, little is known about how religion is directly associated with hypertension in this group. Identifying and understanding the relationship between hypertension and its predictors is important because hypertension is responsible for half of all cardiovascular-related deaths and one in every seven deaths in the USA. The relationship between intrinsic religiosity and hypertension is examined. Cross-sectional data from the Biopsychosocial Religion and Health Study ($N = 9581$) were used. The relationship between intrinsic religiosity and hypertension when controlling for demographics, lifestyle variables, and church attendance was examined using binary logistic regression. While lifestyle factors such as vegetarian diet and regular exercise were important predictors of reduced rates of hypertension, even after controlling for these, intrinsic religiosity was just as strongly related to lower hypertension rates as the lifestyle factors. This study is the first to examine the relationship between intrinsic religiosity and hypertension among North American SDAs and demonstrates that in addition to the positive effects of lifestyle choices on health noted in the group, religion may offer direct salutary effects on hypertension. This finding is particularly important because it suggests that religiosity and not just lifestyle is related to lower risk of hypertension, a leading cause of death in the USA.

Keywords

Seventh-day Adventist (SDA); Hypertension; Intrinsic religiosity; Body mass index (BMI)

Introduction

Seventh-day Adventists are noted for their longevity (Buettner 2005). SDA women have been shown to outlive their non-SDA counterparts by 3.7–4.4 years and men by 6.2–7.3 years (Fraser and Shavlik 2001; Lemon and Kuzma 1969). A lifestyle characterized by a

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Compliance with Ethical Standards

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series of lifestyle choices such as exercise, vegetarian diet, abstinence from smoking, consumption of nuts, and favorable psychosocial functioning (lower depression and authoritarianism, higher time urgency), all hinged on religious beliefs, has been found to predict a longer life among SDAs (Lee et al. 2003).

There is some evidence that of religious predictors, church attendance is significantly associated with longer life among SDAs even after controlling for the above-mentioned lifestyle factors and psychosocial variables (Lee et al. 2003). What is yet to be fully explored is how religion is associated with health in this group. Specifically, little is known of the relationship between religious factors and hypertension.

The relationship between religion and hypertension has received some attention in the literature (Koenig et al. 2012) perhaps because religion has been shown to have some relationship to health and may offer some opportunities for understanding and addressing hypertension. An identification and understanding of the predictors of hypertension are particularly salient given the widespread problem of hypertension (Chobanian et al. 2003; Fischer and Avorn 2004) and the high costs associated with its treatment (Heidenreich et al. 2011). The relationship between religiosity and hypertension is therefore examined.

Intrinsic Religiosity and Hypertension

The relationship between intrinsic religiosity, blood pressure, and hypertension has been studied, but the findings are inconsistent. First, the statistically significant findings are presented followed by the non-significant findings on the topic. Hixson et al. (1998) studied the relationship between religiosity and blood pressure among 112 Christian women, testing both the direct relationship between religiosity and blood pressure and indirect pathways through mediators such as smoking, alcohol consumption, dietary consumption of nutrients related to blood pressure (potassium, sodium, and calcium), and physical activity. Religiosity was measured using Koenig's religiosity instrument which examined intrinsic religiosity and eight other dimensions of religiosity. The intrinsic religiosity dimension involved questions about the value one places on faith and the centrality of religion to meaning and motivation in life. The authors found that intrinsic religiosity was one of two predictors directly and most strongly associated with lower blood pressure.

Tartaro et al. (2005) also looked at religiosity and spirituality and their relationship to blood pressure and cortisol stress response by gender using 60 undergraduate students. Religiosity/spirituality was measured by taking the composite score of the Brief Multidimensional Measurement of Religiousness/Spirituality (Fetzer Institute 1999). Two items from the composite scale were also examined separately: (a) overall religiosity ("To what extent do you consider yourself a religious person?") and (b) overall spirituality and ("To what extent do you consider yourself a spiritual person?") (p. 756). Higher values on both the composite religiosity/spirituality variable and the single-item religiosity variable were associated with lower blood pressure in men and higher blood pressure in women, and higher religiosity was associated with lower cortisol reactivity and decreased systolic blood pressure among men.

Further, Anyfantakis et al. (2013) looked at how religiosity mediated the relationship between stress and hypertension and some other cardio metabolic indicators among 195

subjects. Religiosity/spirituality was operationalized using the following items from the Royal Free Survey (shown in their Appendix 1): (a) “How strongly do you hold to your religious/spiritual view of life?” (b) “How important to you is the practice of your belief in your day-to-day life?” (c) “Do you believe in spiritual power or force other than yourself that can influence what happens to you in day-to-day life?” (d) “Do you believe in a spiritual power or force other than yourself that enables you to cope personally with events in your life?” (e) “Do you believe in spiritual power or force other than yourself that influences world affairs?” and (f) “Do you believe in a spiritual power or force other than yourself that influences natural disasters, like earthquakes and floods?” Responses to the questions were on a 0–10 scale giving a combined range of 0–60 with higher scores indicative of stronger religiosity/spirituality. The proportion of those with hypertension was higher among those with low religiosity/spirituality scores. Multivariate analyses to test the relationship between religiosity/spirituality score and development of hypertension showed a significant inverse relationship with hypertension. This relationship remained significant across unadjusted models, model adjusted only for age and sex, and when controlling for age, gender, family status, smoking habits, and body mass index.

The mediating role of social support in the relationship between religiousness and systolic blood pressure was also investigated among 107 college students. Chen and Contrada (2007) found that high social support mediated the inverse relationship between religiousness and systolic blood pressure. Religiousness was measured using a four-item scale which measured church attendance, prayer, self-rated religiosity, and the strength and comfort religion provided. The items were recoded into one response scale and averaged as a measure of overall religiousness.

Finally, Walsh (1998) examined the relationship between religious commitment and hypertension among 137 US immigrants. Religious commitment was operationalized using two questions about church attendance and religious importance which was then combined into one index. The study results indicated that religious commitment was significantly and inversely related to hypertension.

Although the majority of researchers report significant relationships between religiosity and hypertension, or blood pressure, others found no such relationships. Buck et al. (2009) examined the relationship of various dimensions of religiosity (public religious activity, prayer, and spirituality) with blood pressure and hypertension and whether religious saliency and other religiosity variables mediated that relationship. Religious saliency was measured using a single item which assessed how much participants integrated religion into every aspect of their lives. This measure is very similar to one of the items used in this study to measure intrinsic religiosity which makes its relationship to blood pressure and hypertension relevant. Religious saliency was not found to be related to systolic blood pressure, diastolic blood pressure, or hypertension among their 3105 study participants.

Particularly interesting is a study conducted by Silva et al. (2012) who studied a group of 264 SDAs in Brazil, a group espousing the same religious beliefs as participants in our study. Also noteworthy is that religiosity was measured using the Duke University Religion Index, the same as in our study. Multivariate analyses revealed no significant relationship

between religiosity and hypertension in this sample; however, the sample was small and 20 years younger (mean 41.2 years) compared with our sample.

Aims and Hypotheses

Based on the above literature, we will examine whether intrinsic religiosity is related to hypertension. It is hypothesized that intrinsic religiosity and hypertension will be inversely associated

Methods

Sample

This cross-sectional study was conducting using wave 1 data from the Psychological Manifestations of Religion study (PsyMRS), a sub-study of the institutional review board-approved Biopsychosocial Religion and Health Study (Lee et al. 2009). The 11,052 North American SDAs in this longitudinal study were those who responded out of a 21,000 person random sample from the 96,000 person Adventist Health Study-2 (see Butler et al. 2008 for details on this study). Demographic details are presented in Table 1. A final sample of 9581 was retained for analysis after excluding 13 % of the cases because of small frequencies on some variable categories, missing data on the dependent variable, non-SDA respondents, and participants less than 30 years of age. The mean age of our participants was 61 years of age, 63 % were White and the rest Black, the majority of the participants were female (67 %), and 35 % reported a diagnosis of hypertension. Forty- three percent of our participants had an undergraduate or graduate degree education, and within the last year prior to completing the survey, 29 % had difficulty meeting expenses in the last year.

Measures

Outcome Variable

Self-Reported Hypertension—Hypertension was a dichotomous (*yes/no*) self-reported variable regarding whether participants had ever been diagnosed as hypertensive. Our dependent variable was validated on 495 cases who had complete data on systolic and diastolic blood pressure and on the self-reported high blood pressure diagnosis and who listed medications they were taking. For systolic blood pressure, the mean for those with self-reported high blood pressure diagnosis was 133.8 (SD = 22.1, $n = 223$, 95 % CI 130.9, 136.7) and for those with no such diagnosis was 119.1 (SD = 16.7, $n = 272$, 95 % CI 117.2, 121.1). This difference was statistically significant— $t(493) = 8.43$, $p < 0.0005$. For diastolic blood pressure, the mean for those with self-reported high blood pressure diagnosis was 75.3 (SD = 11.6, $n = 223$, 95 % CI 73.7, 76.8) and for those with no diagnosis was 70.6 (SD = 10.2, $n = 272$, 95 % CI 69.4, 71.8). This was also statistically significant— $t(493) = 4.80$, $p < 0.0005$).

It might be noted that for those who reported a hypertension diagnosis, the mean levels of systolic and diastolic blood pressure would not be considered themselves in the range of high blood pressure (over 140 for systolic and over 90 for diastolic). However, this ignores the fact that those who are diagnosed with high blood pressure are likely to be treated for it

with the intent of bringing their blood pressure within normal limits. Since the most common means of treating hypertension is with medication and all individuals in our validation sample were asked to list the names of all medications they were taking, we can test this point. A cardiologist provided a list of hypertension medications and two workers separately rated each drug listed regarding whether it was used to treat hypertension and any differences were reconciled. Among those who self-reported they were diagnosed with hypertension ($n = 223$), 74.9 % listed a medication that is used to treat hypertension, while of those who did not report a hypertension diagnosis ($n = 272$), only 2.9 % listed such a medication— $\chi^2(n = 495) = 277.5, p < 0.0005$. However, though the treatment was generally successful, it was by no means always successful. Using the criteria of systolic > 140 and diastolic > 90 , among those 223 who reported themselves diagnosed with hypertension, 12.1 % still qualified as having high blood pressure, while for the 272 reporting no hypertension diagnosis, only 2.6 % qualified— $\chi^2(n = 495) = 17.4, p < 0.0005$.

Also, logistic regression analysis revealed that after controlling for hypertensive medication use mean blood pressure in the hypertension range (systolic > 140 and diastolic > 90) (yes/no) was eight times as likely among those reporting self-reported hypertension (OR 8.22; 95 % CI 3.01, 22.42; $p < 0.0005$).

Predictor Variable

Intrinsic Religiosity—Intrinsic religiosity was measured using the scale from the Duke University Religion Index (DUREL) (Koenig et al. 1997). The scale had a Cronbach's alpha of 0.71 in our sample and was composed of the following three items: (a) "I try hard to carry my religion over into all my other dealings in life," (b) "In my life, I experience the presence of the Divine," and (c) "My religious beliefs are what really lie behind my whole approach to life." Response options were on a scale of (1) *not true* to (7) *very true* and were averaged.

Covariates

Church Attendance—The DUREL was used to measure frequency of church attendance (Koenig et al. 1997). Participants were asked the following question: "How often do you attend church or religious meetings?" Response options were on a scale of *never* (1) to *more than once a week* (6).

Body Mass Index—BMI was calculated using self-reported weight and height.

Physical Exercise—Respondents answered *yes* or *no* to the following question: "Do you have a regular exercise program?"

Alcohol Consumption—Respondents responded yes or no to a single question on whether they consumed alcohol beverages at the time of data collection.

Diet—Self-reported frequency of food consumption and serving size relevant to 200 foods consumed the year leading up to the survey was used to create five dietary classifications. These data were collected using a food frequency questionnaire (FFQ) which was part of our

parent study, AHS-2. Respondents were classified as vegan, lacto-ovo vegetarian, pescovegetarian, semi-vegetarian, and non-vegetarian (for details on how each classification was created, see Tantamango-Bartley et al. 2013). The five categories were later collapsed into vegetarian or non-vegetarian categories because of small frequencies in some categories.

Mediator Variables

Perceived Stress—The Perceived Stress Scale short form (Cohen et al. 1983) was used. The scale had a Cronbach's alpha of 0.77 in our sample and was comprised of the following four items: "in the last month, how often have you felt" (a) "that you were unable to control the important things in your life?" (b) "confident about your ability to handle personal problems?" (c) "things were going your way" and (d) "difficulties were piling up so high that you could not overcome them?" Responses were on a five-point scale ranging from (1) *never* to (5) *very often*.

Neuroticism—Neuroticism was measured using the BFI neuroticism scale of Srivastava et al. (1999). The scale had a Cronbach's alpha of 0.81 in our sample and was comprised of the following items: "I see myself as someone who" (a) "is depressed, blue," (b) "is relaxed, handles stress well," (c) "can be tense," (d) "worries a lot," (e) "is emotionally stable, not easily upset," (f) "can be moody," (g) "remains calm in tense situations," and (h) "gets nervous easily." Responses were on a seven-point scale ranging from (1) *not true* to (7) *very true*.

Depression—Depression was measured using the Center for Epidemiological Studies Depression Scale 11-item short form (Kohout et al. 1993). Participants indicated how often during the past week they felt the following: (a) "I did not feel like eating; my appetite was poor," (b) "I felt depressed," (c) "I felt that everything I did was an effort," (d) "my sleep was restless," (e) "I was happy," (f) "I felt lonely," (g) "people were unfriendly," (h) "I enjoyed life," (i) "I felt sad," (j) "I felt that people disliked me," and (k) "I could not get going." The scale had a Cronbach's alpha of 0.80 in our sample. Response scales were coded from 1 to 4 as *rarely or none of the time (<1 day)* and *some or a little of the time (1–2 days)* (0) to *most or all of the time (5–7 days)* (2). Then, each four-point response scale was converted to a three-point scale with the first two categories collapsed into one new category, the positive items reversed, and the items summed resulting in a scale with a range of 0–22.

Spiritual Meaning—Spiritual meaning was measured using the spiritual meaning scale (Mascaro et al. 2004). The scale had a Cronbach's alpha of 0.71 in our sample. Using response scales coded as *not true* (1) to *very true* (7), participants were asked to rate the following statements: (a) "I see a special purpose for myself in the world," (b) "My life is meaningful," (c) "We are each meant to make our own special contribution to the world," (d) "There is no particular reason why I exist," and (e) "There is no reason or meaning underlying human existence."

Statistical Analysis

Binary logistic regression analyses were used to conduct the planned analysis. This approach was appropriate because of the dichotomous nature of the dependent variable. Statistical

analyses were conducted using SPSS 21. Finally, we conducted a multiple imputation procedure as outlined by Graham et al. (2007) to handle missing data while preserving the sample size. The pooled results from 40 imputations are presented in the ensuing section.

Results

Sample Characteristics

On average, our sample rated themselves as very religious (6.35 on a scale with a maximum of 7) with the majority attending church once or more weekly. The average BMI for the sample was 27.32 (SD = 6.12). Very few participants used alcohol, the majority were vegetarian, and nearly half had a regular exercise routine (see Table 1 for further details).

Demographic Variables and Hypertension

Study results are presented in Table 2 and indicated that hypertension was significantly predicted by age, ethnicity, and education. The odds of hypertension increased by 7 % for every year increase in age, and Blacks were 2.46 times more likely to be diagnosed than Whites. The likelihood of hypertension was 16 and 17 % more likely for high school or less and trade school or some college education when compared to those with undergraduate or graduate education. The remaining demographic variables were not significantly associated with hypertension in this study.

Lifestyle Covariates and Hypertension

The odds of hypertension increased by 12 % for every unit increase in BMI, decreased by 11 % among those with a regular exercise program, and decreased by 25 % among vegetarians. There was no significant relationship found between alcohol consumption and hypertension.

Religion and Hypertension

Intrinsic religiosity significantly predicted hypertension. For every unit increase in intrinsic religiosity, the odds of hypertension decreased by 12 %. However, church attendance was not significantly related to hypertension in this sample.

Mediation Tests

Based on the literature presented in the discussion of possible mediators of the relationship between intrinsic religiosity and hypertension, a series of mediation models were tested and are presented in Table 3. First, perceived stress was included in the fully specified model. The results indicated that perceived stress was not significantly ($p = 0.186$; OR 1.05) related to hypertension and intrinsic religiosity continued to significantly ($p = 0.000$; OR 0.89) predict hypertension. In a separate analysis, neuroticism was included in the full model and was shown to be significantly positively ($p = 0.000$; OR 1.15) associated with hypertension; however, intrinsic religiosity remained significant as well.

Two separate mediation models were then tested using depression, and spiritual meaning because of their correlation with neuroticism, perceived stress, and intrinsic religiosity. The results revealed that none of them mediated the relationship between intrinsic religiosity and

hypertension since intrinsic religiosity remained significant in each case ($p = 0.000$; OR 0.89; $p = 0.000$; OR 0.90; $p = 0.001$; OR 0.91). When all these possible mediator variables were included in the model simultaneously, intrinsic religiosity remained significantly related to hypertension with a small reduction in the confidence intervals (0.03–0.05).

Discussion

Strength of the Intrinsic Religiosity to Hypertension Relationship

Intrinsic religiosity was significantly inversely related to hypertension even after controlling for the lifestyle variables noted to be especially strong predictors of hypertension. This finding is consistent with previous research findings (e.g., Hixson et al. 1998; Tartaro et al. 2005) showing direct inverse relationships between religiosity and blood pressure. This finding is an important one and suggests that intrinsic religiosity is associated with lower likelihood of hypertension in this group. Additionally, it appears that intrinsic religiosity lowers the risk of hypertension more than having an exercise program and just as much as having a vegetarian diet. The intrinsic religiosity effect size is in fact considerably larger if you consider that a 1-unit change in religiosity is associated with a 12 % reduction in risk and a 3-unit reduction is associated with a 36 % reduction. This is indicative of the importance of intrinsic religiosity in this sample and suggests that intrinsic religiosity, as one dimension of religion, is at least as important to hypertension as the lifestyle factors of exercise and vegetarian diet and possibly more important.

Possible Mechanisms

Perhaps, one's religiosity provides peace, and resolve in life that is distinct from the absence of stress, or depression for example, that reduces the risk of hypertension. A study conducted by Masters and Knestel (2011) is of particular relevance in an attempt to understand the inverse relationship observed between intrinsic religiosity and hypertension in the present study. Masters and Knestel (2011) examined the relationship between psychological stress and cardiovascular reactivity (blood pressure and heart rate) among three groups in a laboratory setting. The pro-religious group (scored above midpoint on *both* intrinsic and extrinsic scales of religious motivation) exhibited lower cardiovascular reactivity compared with the other groups. Interestingly, the pro-religious group also scored worse on a variety of psychological measures (cynicism, aggression, neuroticism, compassion, sense of coherence). It should be noted that in their original study Allport and Ross (1967) called the "pro-religious" group that Masters and Knestel (2011) examined (high intrinsic and high extrinsic religiosity) *indiscriminately* pro-religious and found them to have the negative characteristic of being intensely prejudiced against various ethnic groups. Masters and Knestel suggest that worse scores on the psychological variables particularly neuroticism may account for what they refer to as less empathetic nature of the pro-religious group. For some explanation of these findings, the authors turned to Chida and Hamer (2008) who speculated that neuroticism may be associated with decreased cardiovascular reactivity because of constant exposure to psychological stress. Although speculative, this may be one possible explanation for the observed relationship between intrinsic religiosity and hypertension.

We suggest that perhaps it is not psychological exhaustion among the religious that leads to decreased reactivity. But instead, based on the operationalization of intrinsic religiosity in this study (strive to integrate their religion into every aspect of their life, experience the presence of the divine, and religious beliefs bolstering one's entire approach to life) and what it may mean among SDAs, higher intrinsic religiosity may mean a greater dependence on God and in His ability to manage and resolve challenges that one faces. This, in turn, may reduce the need for chronically heightened psychological responses to stress which may increase likelihood of hypertension. In fact, Bradshaw and Ellison (2010) found that religious variables buffered the effects of financial hardship on psychological distress, and Beagan et al. (2012) found that spirituality helped middle-aged women of African descent cope with racism-related stress and helped them reframe challenges as trials that God would help them overcome.

Testing Possible Mediators

Based on the above-referenced literature on some of the potential mediators of the relationship between intrinsic religiosity and various health outcomes, a series of mediation models were tested. The findings indicated that perceived stress, neuroticism, depression, and spiritual meaning do not mediate the relationship between intrinsic religiosity and hypertension and suggest that intrinsic religiosity is directly inversely related to hypertension in this sample and is not mediated by any of the tested mediators.

Our finding suggests that faith does directly impact the health of SDAs in this sample. Although other studies have been able to show this, this study is one of the first to help explain the ways in which religion directly affects health among SDAs. This finding is particularly significant because SDAs have been noted for living longer than their non Adventist counterparts (Fraser et al. 2001; Lemon and Kuzma 1969) a phenomenon thought to be predicted by exercise, vegetarian diet, smoking abstinence, nut consumption, and social support all influenced by religious beliefs (Fraser 2003). But for the first time, the link between religiosity and hypertension as one aspect of health in this group that is independent of demographic and lifestyle factors which we controlled has been identified. This finding is significant to SDAs because it suggests that while diet and exercise are important to hypertension, and is vigorously promoted by the church, a sincere effort to integrate religion into all aspects of life is also particularly important to health.

Limitations

A few study limitations should be noted. The study findings may not be applicable to younger persons, persons of races other than Black or White, persons of other denominations or religions, and persons living in other parts of the world because the study conducted on older Black and White SDAs. Our dependent variable was self-reported hypertension. Though the self-report was validated using direct measurement, this was only done in just under 500 cases of the entire sample. Further, only perceived stress, neuroticism, depression, and spiritual meaning were tested as potential mediators in the relationship between intrinsic religiosity and hypertension. It is possible that there are other psychological variables which may mediate this relationship but were not tested.

Conclusions

Most Americans value religion, and the positive effects of religion on health have been shown in several studies. It was found that intrinsic religiosity may offer salutary effects on hypertension in our sample. This finding is particularly relevant to the millions of Americans who strive to integrate their faith into their lives in order to bring about real change. This study offers some hope that a true integration of faith into life's dealings can positively affect the burdening disease of hypertension.

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Table 1

Percentages for study variables

	<u>Whole sample</u>	
	<i>N (9581)</i>	<i>% or M (SD)</i>
Hypertension		
No	6209	65.00
Yes	3372	35.00
Age	9581	61.45 ± 13.57
Race		
Black	3506	37
White	6075	63
Gender		
Female	6431	67
Male	3150	33
Education		
High school or less	1816	19
Trade school or some college	3676	38
Undergraduate or graduate	4089	43
Difficulty meeting expenses		
No	6770	71
Yes	2811	29
Body mass index (BMI)	9581	27.32 ± 6.12
Diet		
Vegetarians	5316	56
Non-vegetarians	4265	44
Regular exercise program		
No	5326	56
Yes (reference)	4255	44
Current alcohol use		
No	9036	94
Yes (reference)	545	6
Intrinsic religiosity	9581	6.35 ± 0.94
Church attendance		
Seldom	900	9
Often	8681	91
Perceived stress	9581	2.13 ± 0.77
Neuroticism	9581	2.90 ± 1.11
Depression	9581	3.79 ± 3.85
Spiritual meaning	9581	6.29 ± 0.86

Only valid percentages are reported. Totals of percentages are not 100 for every variable because of rounding. Hypertension was coded 0 = no, 1 = yes. Age was continuous. Gender was coded as 1 = female, 2 = male. Race was coded as 0 = White, 2 = Black. Education was coded as 1 = high school or less, 2 = trade school or some college, 0 = undergraduate or graduate. Difficulty meeting expenses was coded as 0 = no, 1 = yes. Diet was coded as 1 = vegetarian 0 = non-vegetarian. Regular exercise program was coded as 0 = no, 1 = yes. Church attendance was coded as 0 = seldom, 1

= often. Intrinsic religiosity was coded as (1) not true to (7) very true and was averaged. Perceived stress was coded. Neuroticism was coded as (1) never to (5) very often. Depression was coded as rarely or none of the time (<1 day) and some or a little of the time (1–2 days) (0) to most or all of the time (5–7 days) (2). Spiritual meaning was coded as (1) not true to (7) very true

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Table 2

Logistic regression analysis predicting hypertension

	<i>B</i>	(SE)	OR	95 % CI	<i>p</i>
Age	0.07	0.00	1.07	[1.07, 1.08]	0.000
Race					
Black					
White (reference)	0.90	0.05	2.44	[2.19, 2.71]	0.000
Gender					
Female					
Male (reference)	—0.05	0.05	0.95	[0.86, 1.06]	0.363
Education					
High school or less	0.17	0.07	1.19	[1.04, 1.36]	0.012
Trade school or some college					
Undergraduate or graduate (reference)	0.17	0.06	1.18	[1.06, 1.32]	0.003
Difficulty meeting expenses					
No (reference)					
Yes	0.08	0.06	1.08	[0.97, 1.20]	0.162
BMI	0.11	0.01	1.12	[1.11, 1.13]	0.000
Diet					
Vegetarian					
Non-vegetarian (reference)	—0.29	0.05	0.75	[0.68, 0.83]	0.000
Regular exercise program					
No (reference)					
Yes	—0.12	0.05	0.89	[0.81, 0.98]	0.016
Current alcohol use					
No (reference)					
Yes	0.08	0.11	1.08	[0.87, 1.35]	0.482
Church attendance					
Seldom (reference)					
Often	0.47	0.88	1.05	[0.88, 1.25]	0.594
Intrinsic religiosity	—0.13	0.03	0.88	[0.83, 0.92]	0.000

Age was continuous. Gender was coded as 1 = female, 2 = male. Race was coded as 0 = White, 2 = Black. Education was coded as 1 = high school or less, 2 = trade school or some college, 0 = undergraduate or graduate. Difficulty meeting expenses was coded as 0 = no, 1 = yes. Diet was coded as 1 = vegetarian 0 = non-vegetarian. Regular exercise program was coded as 0 = no, 1 = yes. Church attendance was coded as 0 = seldom 1 = often. Intrinsic religiosity was coded as 1 = not true to 7 = very true

CI confidence interval for odds ratio (OR)

Table 3Logistic regression mediation tests for hypertension ($N=9540$)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Age	0.07 *** (1.07)	0.07 *** (1.07)	0.07 *** (1.07)	0.07 *** (1.07)	0.07 *** (1.07)
Gender					
Female	−0.04 (0.96)	−0.01 (0.99)	−0.03 (0.97)	−0.04 (0.96)	−0.01 (0.99)
Male (reference)					
Race					
Black	0.89 *** (2.44)	0.92 *** (2.52)	0.90 *** (2.45)	0.90 *** (2.47)	0.93 *** (2.52)
White (reference)					
Education					
High school or less	0.17 * (1.18)	0.14 * (1.15)	0.15 * (1.16)	0.16 * (1.17)	0.13 (1.14)
Trade school or some college	0.16 ** (1.18)	0.15 ** (1.16)	0.16 ** (1.17)	0.16 ** (1.17)	0.15 ** (1.16)
Undergraduate or graduate (reference)					
Difficulty meeting expenses					
No (reference)					
Yes	0.06 (1.06)	0.04 (1.04)	0.03 (1.03)	0.07 (1.07)	0.05 (1.05)
Church attendance					
Seldom (reference)					
Often	0.06 (1.06)	0.07 (1.08)	0.08 (1.09)	0.06 (1.06)	0.08 (1.09)
BMI	0.11 *** (1.12)	0.11 *** (1.12)	0.11 *** (1.12)	0.11 *** (1.12)	0.11 *** (1.12)
Diet					
Vegetarian	−0.29 *** (0.75)	−0.29 *** (0.75)	−0.28 *** (0.76)	−0.28 *** (0.75)	−0.28 *** (0.75)
Non-vegetarian (reference)					
Regular exercise program					
No (reference)					
Yes	−0.12 * (0.89)	−0.12 * (0.89)	−0.12 * (0.89)	−0.12 * (0.89)	−0.12 * (0.89)
Current alcohol use					
No (reference)					
Yes	0.09 (1.09)	0.09 (1.10)	0.08 (1.09)	0.08 (1.09)	0.08 (1.09)
Intrinsic religiosity	−0.13 *** (0.88)	−0.10 ** (0.91)	−0.11 *** (0.90)	−0.11 ** (0.90)	−0.09 ** (0.92)
Perceived stress	0.05 (1.05)				−0.10 ** (0.90)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Neuroticism		0.13 *** (1.14)			0.12 *** (1.13)
Depression			0.03 *** (1.03)		0.02 * (1.02)
Spiritual meaning				0.07 * (0.93)	—0.23 (0.97)

Data presented are logistic regression coefficients Odds ratios was coded as 1 = female, 2 = male are presented in parentheses. Age was continuous. Gender Race coded as 0 = White, 2 = Black Education was coded as 1 = high school or less, 2 = trade school or some college, 0 = undergraduate or graduate. Difficulty meeting expenses was coded as 0 = no, 1 = yes. Diet was coded as 1 = vegetarian, 0 = non-vegetarian. Regular exercise program was coded as 0 = no, 1 = yes. Church attendance was coded as 0 = seldom, 1 = often. Intrinsic religiosity was coded as (1) not true to (7) very true and was averaged. Perceived stress was coded. Neuroticism was coded as (1) never to (5) very often. Depression was coded as (0) to (22). Spiritual meaning was coded as (1) not true to (7) very true

*
 $p < 0.05$;

**
 $p < 0.01$;

 $p < 0.001$