

The Impact of Religion on Men's Blood Pressure

DAVID B. LARSON, HAROLD G. KOENIG, BERTON H. KAPLAN, RAYMOND S. GREENBERG, EVERETT LOGUE, and HERMAN A. TYROLER

ABSTRACT: Most clinical studies examining the relation between religion and blood pressure status have focused on church attendance, finding lower pressures among frequent attenders. The present study examines the effect on blood pressure status of a religious meaning variable, importance of religion, both by itself and together with frequency of church attendance. The relation between blood pressure, self-perceived importance of religion, and frequency of church attendance was examined among a rural sample of 407 white men free from hypertension or cardiovascular disease. The data confirmed an interaction between the effects of both religious variables on blood pressure status, with importance of religion having an even greater association with lower pressures than church attendance. Diastolic blood pressures of persons with high church attendance and high religious importance were significantly lower than those in the low attendance, low importance group. These differences persisted after adjusting the analyses for age, socioeconomic status, smoking, and weight-height ratio (Quetelet Index). The difference in mean diastolic pressures based on response to the religious importance variable alone was statistically and clinically significant, particularly among men aged 55 and over (6 mm) and among smokers (5 mm). These findings suggest that both religious attitudes and involvement may interact favorably in their effects on cardiovascular hemodynamics.

David B. Larson, M.D., M.S.P.H., is Research Psychiatrist at the Biometrics and Clinical Applications Branch of the National Institute of Mental Health in Rockville, Maryland.

Harold G. Koenig, M.D., is Geriatric Medicine Fellow at the Center for the Study of Aging and Human Development at Duke University Medical Center in Durham, North Carolina.

Berton H. Kaplan, Ph.D., is a professor in the Department of Epidemiology School of Public Health at the University of North Carolina in Chapel Hill.

Raymond S. Greenberg, M.D., Ph.D., is chairman, Epidemiology and Biostatistics, Emory University School of Medicine, Atlanta, Georgia.

Everett Logue, Ph.D., is with the College of Medicine at Northeastern Ohio University in Rootstown, Ohio.

Herman A. Tyroler, M.D., is a professor in the Department of Epidemiology School of Public Health at the University of North Carolina in Chapel Hill.

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Send all correspondence to David B. Larson, M.D., M.S.P.H., BCAB/DBAS/NIMH, Rm. 18c-14, 5600 Fishers Lane, Rockville, MD, 20857.

Introduction

Jenkins, in his classic review of psychological and social risk factors for coronary disease, encouraged further research to evaluate the suggested association between religious variables and reduced coronary risk.¹ In the 12 years since this publication, there have been few efforts either to confirm or refute that protective association, despite the fact that at least five separate prospective studies have shown lower mortality rates among the more actively religious.²

Systematic analyses of studies published in psychiatric journals and in the family practice literature have only rarely found the inclusion of religious variables.³ Among 2,348 psychiatric articles reviewed between 1978 and 1982, Larson and his co-authors found a religious variable in only 2.5% of these studies.⁴ Craigie and his co-authors, reviewing 1,086 studies published in the *Journal of Family Practice* from 1976 to 1986, found a religious variable included in only 1.9% of these.⁵ In both of these reviews, religious denomination was commonly the religious variable used (63% of psychiatric and 41% of family practice studies). Kaplan noted earlier that many studies have used denomination as representative of one's religious practices, despite the fact that denomination poorly discriminates for such practices which may vary widely among individual members.⁶ Kaplan infers research should move away from denominational variables as religious behavior indicators and move toward scaling and measuring the essence of religious behavior, that is, the beliefs and practices.

The present effort extends previous work done on a similar sample of Evans County, Georgia, white males.⁷ In that work Graham and his co-authors found a consistent association between frequent church attendance and lowered mean age-standardized systolic and diastolic blood pressure levels. This association maintained itself for the two smoking levels, the three levels of socioeconomic status, and two of four quartiles of the Quetelet Index. In addition to evaluating the effect that church attendance has on blood pressure, the present study examined the effect of importance of religion, with and without the attendance variable, on blood pressure levels. The foundation for this work lies on a probable association between blood pressure and social and psychological processes, which may in turn be influenced by powerful cultural forces such as religion.

Support for the hypothesis that importance of religion, a subjective religiosity variable, may have an impact on physiological processes and cardiovascular status comes from the work of Moberg, who notes that a "meaningful and purposeful relationship with God" will improve the nature of one's relationship both with one's self and with one's fellow persons.⁸ Moberg notes that beneficial religious behavior may include: (1) Coming to terms with forgiving oneself; (2) Developing emotionally healthier self concepts; (3) Giving

unselfishly to others; and (4) Coming to terms with forgiving others. Any of these behaviors, acting through psycho-physiologically mediated processes, might influence blood pressure and other cardiovascular processes.

This is not a new conceptualization. William James with his "religion of healthy-mindedness" and Gordon Allport with his "mature religious sentiment" both discuss healthy or mature religion as one that may benefit social and psychological dimensions of one's life.⁹ Hence, there is ample justification for examining how perceived importance of religion affects blood pressure levels in a community-dwelling population. The authors are not aware of any other community study where a subjective religiosity variable has been tested to see what effect it has on cardiovascular status. More specifically, is religious importance (either alone or with church attendance) protective against higher blood pressure?

Support for using the combination of perceived importance of one's religion and frequency of church attendance together as indicators of religious behavior comes from two sources. The first source is Campbell and his co-authors' *Quality of American Life*.¹⁰ In McNamara and St. George's re-analysis of Campbell's original results, they found that the variables, "importance of a strong religious faith" and "frequency of church attendance," were two of the four strongest religious correlates of four of the five main dependent variables measured.¹¹ These dependent variables were indices of: personal life satisfaction, marriage satisfaction, family life satisfaction, and personal competence.¹² High scores on these variables would seem to be conducive to lower blood pressures, given a psycho-physiologically mediated influence on blood pressure levels. Hence, it is reasonable to use a combination of religious importance and frequency of attendance as an index of one's religious beliefs and practices to compare with mean blood pressure levels.

Because of the potential impact of a number of other variables besides religion on blood pressure, an examination of the religion-blood pressure relationship would be incomplete without accounting for their confounding effects. The systolic blood pressure increases linearly with age, while the diastolic blood pressure increases until middle age, plateaus, and then decreases in the later ages.¹³ Socioeconomic status has also been implicated as a potential confounder owing to evidence that increased hypertension¹⁴ or increased hypertension-related deaths¹⁵ occur in the lower social classes. A sizeable correlation has also been demonstrated between blood pressure and the relation of body weight to height in children and adults, suggesting the need to control for this variable.¹⁶ Smoking had been felt for years to influence blood pressure adversely, although recent studies have called this association into question.¹⁷ There is ample evidence that smoking and socioeconomic status are variables that might influence or be influenced by religion; age may also be related to religiosity.¹⁸

In the current study, the answers to four major questions were sought:

1. Do those who attend church frequently or view their religion as very important experience lower systolic and diastolic blood pressures?
2. Do those who both attend church frequently and view their religion as very important experience lower systolic and diastolic blood pressures? Do these differences hold up after controlling for age, socioeconomic status, smoking, and the Quetelet Index (height to weight comparison)?
3. What is the impact of age on the relation between religious attendance, religious importance, and mean systolic and diastolic blood pressures?
4. What influence does smoking status have on the relation between blood pressure and religious factors? All questions were asked prior to the analysis of the data (a priori) with the exception of question #4, which was asked after the analysis was completed (a posteriori).

Methods

Sample. The sample for this study was those white males who were re-examined during the 1967-1969 follow-up of the Evans County (Georgia) Cardiovascular Epidemiologic Study. Previous studies have discussed the initial 1960-1962 prevalence study and its results.¹⁹ The total population originally sampled was 771 white males. In order to eliminate possible confounding effects of diagnosed cardiovascular disorders, 246 participants were excluded from the analysis owing to a present or past history of hypertension or cardiovascular disease (persons with diagnosable heart disease from 1960-1962 through 1967-1969 or taking medicines for either their heart or circulation). An additional 118 persons were excluded for not responding to or giving an invalid response to the religious portion of the sociological questionnaire ($n = 109$) or for being less than 24 years of age ($n = 9$). The final sample size upon which these analyses are reported, then, was 401. The participants were all white males over the age of 25 and were free of diagnosed hypertension or any cardiovascular diseases; 13% were over the age of 65. A more detailed description of participants in this rural sample has been reported elsewhere.²⁰

Procedure. Three blood pressure readings were taken of the left arm with the respondent seated. The second reading was taken between 30 and 60 minutes after the first, while the third reading was taken some 15 to 20 minutes following the second. To determine the diastolic blood pressure, the fifth Korotkoff component was used.²¹

The religious variables were abstracted from a sociological questionnaire, not used in the initial 1960-1962 prevalence study.²² The main items to be used from the sociological questionnaire are related to the frequency of one's church attendance and the importance of one's religion: (1) "Are you a

church-goer?" If yes, "How often do you generally attend?" (with nine response options ranging from daily to never) and (2) "Quite aside from church going, how important in general would you say religion is to you: very important, somewhat important, or not important at all?" Church attendance was then dichotomized into those who attended church at least weekly (64.6%), and those who attended church on a less than weekly basis. Two categories were used for the importance question: those who view their religion as very important to them (75.5%), and those who view their religion either as somewhat important or not important at all to them.

The four covariates were measured and analyzed in the following fashion. Socioeconomic status was measured using the McQuire-White Scale, a scale found especially useful in rural settings.²³ As a covariate in the adjusted analyses, this was treated as a continuous variable. Height to weight comparison was calculated using the Quetelet Index, which is calculated by dividing the weight (pounds) by the height (inches) and multiplying the result by 100.²⁴ Socioeconomic status and the Quetelet Index, as covariates, were treated as continuous variables in the adjusted analyses. For smoking, there were three different levels consisting of those who smoked (29.0%), those who were ex-smokers (21.6%), and those who were non-smokers (49.4%). For the analyses stratified by smoking status, only smokers and non-smokers were considered. The age variable was used as a continuous variable in the adjusted analyses, or else it was dichotomized into those less than or equal to 54 (64.1%) and those 55 or older.

Statistical methods. For the unadjusted analyses, mean systolic and diastolic blood pressures were compared using the Student T-test. For the adjusted analyses, analysis of covariance was employed, using the SAS[®] General Linear Model procedure.²⁵ Because of the a posteriori nature of the evaluation concerning the effect of smoking status on the religion-blood pressure relationship, the unadjusted analysis was performed using the Scheffé's method, a multiple comparisons method permitting the investigator to make post-analytical comparison of means;²⁶ likewise, for the adjusted analysis, the Bonferroni method was used to account for multiple comparisons.²⁷

Results

Do those who attend church frequently or view their religion as very important experience lower blood pressures? Comparison of mean systolic and diastolic blood pressures between frequent and infrequent church attenders revealed a nonsignificant trend toward lower pressures among frequent attenders (Table 1). Both mean systolic and diastolic pressures were also lower for those with high religious importance, with the difference becoming statistically significant for diastolic pressure. For the adjusted analysis (not

TABLE 1
**Unadjusted Mean Systolic and Diastolic Blood Pressure Levels
for Religious Attendance and Religious Importance**

<i>Religious Attendance</i> ¹	Systolic			Diastolic		
	<i>BP</i>	<i>N</i>	<i>SD</i>	<i>BP</i>	<i>N</i>	<i>SD</i>
High	134.1	263	18.6	83.9	263	10.2
Low	136.3	144	11.8	86.4	144	11.8
p-value		ns			ns	
<i>Religious Importance</i> ²						
High	134.0	308	18.3	84.0	308	10.5
Low	137.3	99	20.2	87.2	99	11.7
p-value		.09			.01	

SD = Standard Deviation

¹High indicates high religious attendance (at least weekly); low indicates low religious attendance (less than weekly).

²High indicates high religious importance (very important); low indicates low religious importance (somewhat important or not important at all).

shown), these trends remained but failed to reach statistical significance ($.10 < p < .20$) for either the church attendance or the religious importance.

Do those who both attend church frequently and view their religion as very important experience lower blood pressures? When importance of religion and frequency of attendance were combined in a two-item index, more notable differences in blood pressures were found (Table 2). For those with high importance and high attendance (high-high), mean systolic and diastolic pressures were significantly lower than those of the low importance and low attendance group (low-low). The differences here were substantially greater than for either religious variable examined alone. While the differences did not reach statistical significance for systolic pressure, diastolic pressure was almost 5 mm lower among the high-high group compared with the low-low group. Intermediate diastolic pressures were noted for the high-low and low-high groups. Adjusting for covariates did decrease the magnitude of these differences; however, statistical significance was retained for diastolic pressures. These findings are indicative of an interaction between religious meaning and activity variables in their association with blood pressure.

What is the impact of age on the relation between religious importance and mean blood pressures? Stratification of the sample by age, with 55 years as the cutoff, demonstrated that only in the older age group did the differences in blood pressures between high and low importance groups reach statistical significance (Table 3). In those under the age of 55, little difference was seen.

TABLE 2

Unadjusted and Adjusted Mean Systolic and Diastolic Blood Pressure Levels for Religious Importance by Religious Attendance

<i>Religious Category</i> ¹	<i>Unadjusted</i>					
	Systolic			Diastolic		
	<i>BP</i>	<i>N</i>	<i>SD</i>	<i>BP</i>	<i>N</i>	<i>SD</i>
High-High	133.5	232	18.2	83.8	232	10.0
High-Low	135.6	76	18.4	84.8	76	11.8
Low-High	138.8	31	20.9	85.0	31	11.5
Low-Low	137.2	68	20.0	88.2	68	11.7
p-value ²		ns			<.005	

	<i>Adjusted</i>			
	Systolic		Diastolic	
	<i>BP</i>	<i>SE</i>	<i>BP</i>	<i>SE</i>
High-High	133.5	1.1	83.9	0.6
High-Low	135.1	2.1	85.4	1.1
Low-High	139.9	3.0	85.0	1.6
Low-Low	135.0	2.1	86.8	1.3
p-value		ns		<.05

SD = Standard Deviation

SE = Standard Error

¹High-high indicates high religious importance (very important) and high church attendance (at least weekly); low-low means low importance (somewhat important or not important at all) and low church attendance (less than weekly); high-low means high importance, low attendance; low-high means low importance, high attendance.

²For difference between mean blood pressures in high-high and low-low categories.

For those 55 and over, mean systolic pressure was almost 9mm lower and mean diastolic pressure over 6 mm lower among the high importance group. Once adjusted for smoking, socioeconomic status, and weight to height ratio, the differences lessened and dropped just below statistical significance ($.05 < p < .10$); differences still remained in the 6mm range, a clinically significant quantity.

What is the impact of smoking status on the relation between religious importance and mean blood pressures? As with age, stratification of the sample between smokers and nonsmokers revealed notable differences (Table 4). For the nonsmoker, there was almost no difference in blood pressures between high and low religious importance groups, with or without adjustment for

TABLE 3
Unadjusted and Adjusted Mean Systolic and Diastolic Blood Pressure Levels for Religious Importance Stratified by Age

<i>Religious Importance</i> ¹	<i>Unadjusted</i>					
	Systolic			Diastolic		
	<i>BP</i>	<i>N</i>	<i>SD</i>	<i>BP</i>	<i>N</i>	<i>SD</i>
Under 55						
High	131.2	195	17.4	84.1	195	10.7
Low	133.0	66	18.9	85.6	66	11.6
p-value		ns			ns	
55 and Over						
High	138.9	113	18.8	83.9	113	10.1
Low	147.2	33	19.6	90.3	33	11.5
p-value		<.05			<.005	
	<i>Adjusted</i>					
	Systolic			Diastolic		
	<i>BP</i>		<i>SE</i>	<i>BP</i>		<i>SE</i>
Under 55						
High	134.3		1.6	85.3		0.9
Low	131.7		2.0	85.2		1.2
p-value		ns			ns	
55 and Over						
High	139.7		1.7	82.6		1.3
Low	146.2		3.2	88.5		1.7
p-value		.07			.08	

SE = Standard Error

¹High indicates high importance (very important); low indicates low importance (somewhat or not important at all).

covariates. For the smoker, on the other hand, substantial differences were observed. For the latter group, diastolic pressure was 7 mm lower (adjusting to 5.3 mm) for the high religious importance group, a significant difference, even in the adjusted analysis using the Bonferroni correction (requiring $p < .005$ for significance). Although an even larger difference between groups was observed for systolic pressure (10.3 mm adjusting to 8.9 mm), this was not statistically significant using the conservative Scheffe's method of analysis.

TABLE 4

Unadjusted and adjusted mean systolic and diastolic blood pressure levels for religious importance stratified by smoking

<i>Religious Importance</i> ¹	<i>Unadjusted</i>					
	Systolic			Diastolic		
	<i>BP</i>	<i>N</i>	<i>SD</i>	<i>BP</i>	<i>N</i>	<i>SD</i>
Smoker						
High	131.4	95	16.9	83.8	95	9.0
Low	142.1	23	19.0	90.8	23	10.2
p-value ²		ns			<.05	
Nonsmoker						
High	134.7	147	19.3	83.6	147	11.2
Low	134.0	54	20.4	84.5	54	12.2
p-value		ns			ns	
	<i>Adjusted</i>					
	Systolic			Diastolic		
	<i>BP</i>		<i>SE</i>	<i>BP</i>		<i>SE</i>
Smoker						
High	131.8		1.6	84.0		0.9
Low	140.7		3.3	89.3		2.0
p-value		<.05			<.005	
Nonsmoker						
High	134.7		1.4	84.3		0.8
Low	133.6		2.3	84.3		1.3
p-value		ns			ns	

SD = Standard Deviation

SE = Standard Error

¹High indicates high importance (religion very important); low indicates low importance (religion somewhat or not important at all).

Odds ratios were calculated for the likelihood of having an elevated blood pressure (defined as 140 for systolic and 90 for diastolic) based on importance of religion. Among smokers, those with *low* religious importance had a 4.3 times greater likelihood of having an abnormal systolic and 7.1 times greater likelihood of having an abnormal diastolic pressure than did those with *low* religious importance ($p < .001$ for both ratios, unadjusted). For church attendance, odds ratios neared unity for nonsmokers; for smokers, however, risk of an abnormal diastolic pressure for low attenders was almost 4 times higher

(OR = 3.97, $p < .001$, unadjusted) and abnormal systolic twice as high (OR = 2.0, $p = .06$, unadjusted) as for high attenders.

Discussion

This is the first community-based cardiovascular study where first a religious meaning variable, the importance of religion, and then the same meaning variable and another religious variable, frequency of attendance, were both used to evaluate the association between religion and cardiovascular status. All other studies evaluating the effects of religion in the community context have used what was found in this study to be the less powerful predictor, frequency of (church) attendance as the single religious independent variable.²⁸ None of them included a religious meaning factor, as has this effort. The unadjusted results provided confirmation that the single meaning variable alone and together with the frequency of attendance variable had significant protective effects for the blood pressures of the rural, white male samples studied. When the religious meaning variable was dichotomized and the four covariables, the Quetelet Index, age, smoking status, and socioeconomic status were adjusted for, the very important group was still found to have lower blood pressures than the less important group though the resulting p -values were no longer at levels less than .10 as they were for the crude analyses.

A comparison of the unadjusted and adjusted results obtained from considering the importance and attendance variables together as a "single" exposure variable showed little difference and suggested an interaction between the effects of these religious variables on blood pressure. For both unadjusted and adjusted analyses, a dose-response relationship was observed with the high importance-attendance groups having the lowest blood pressures, the low importance-attendance groups having the highest blood pressures, and the low-high and high-low importance-attendance groups having intermediate blood pressure levels. For the systolic blood pressure, similar trends were observed, but these did not achieve statistical significance. These blood pressure findings support the hypothesis that both religious importance and attendance could be considered as different individual forms of social support that can be accumulated (similar to the conclusion reached by Berkman and Syme).²⁹

The well-established link between psychological and physiological processes provides the basis upon which hypothesized religious effects may be explained. As Weiner describes in his *Psychology of Hypertension*, most of the early studies of patients with hypertension focused on the psychological status or personalities of patients. Some cases emphasized the patients' anxieties, while others focused on their repressed hostility. Some noted their depressive personalities, while others noted their perfectionism.³⁰ Indirect support for anxiety playing a role in the etiology of hypertension comes from

two more recent works.³¹ In both reports, a significantly greater reduction in blood pressure was experienced with the relaxation intervention when compared to placebo or other controls. Increasing the stress level experienced by subjects has been shown to increase the resistance to lowering blood pressure levels.³² Blood pressure levels have also been shown to vary directly with certain stressful conditions and inversely with socioeconomic status.³³ Likewise, death rates from hypertension have been found to be higher in persons from lower socioeconomic groups and in persons with marital instability or involved in crime.³⁴ Several studies have demonstrated hypertensives to have difficulty in coping with and expressing feelings, especially anger in interpersonal situations.³⁵

Other investigators, examining coping style and blood pressure levels, noted that as a result of hypertensives' inability to cope with social stresses, they have little confidence in their interpersonal styles and deficient skills to cope adequately with their interpersonal social stresses.³⁶ Religion has been found to be a commonly reported coping behavior among persons of all ages, but especially among the elderly.³⁷ Because many religious communities often have well-established rules for relating to one another and place a heavy emphasis on positive relationships,³⁸ religiously motivated persons may suffer less stress, anxiety, and conflict in this area, and thus experience lower blood pressure levels. While this effect might seem to be more prominent among frequent church attenders, the actual implementation of such religious prescriptions may be more highly associated with the *meaning* that religion has to the individuals, that is, the importance of their religion to them.

Only recently have investigators explored the effects of age on the relation between blood pressure and religious attitudes and activities. Higher well-being, morale, and coping levels have been associated with religious attitudes and activities in later life.³⁹ Successful adaptation and ability to handle stress might confer protection from increases in blood pressure commonly seen at this time, though admittedly the link between psychosocial stress and hypertension is weak. In a study of older patients attending a geriatric clinic, significantly lower levels of intrinsic religiosity (a subjective religiosity variable akin to importance of religion) was found among older women with depression or anxiety disorders.⁴⁰ While similar differences existed for older men, these did not reach statistical significance. In that study, however, there were no differences in intrinsic religiosity between older women with or without hypertension. In older men, on the other hand, intrinsic religiosity was higher among those who did not have hypertension compared with those who did ($.05 > p < .10$). Both that study (among medical patients) and the present one (among males without diagnosable cardiovascular disease) have found an association between lower blood pressure levels and subjective religiosity among men—older men, in particular.

Turning to the smoking findings, even after adjusting for the confounding effects of other variables and employment of the Bonferroni correction for

multiple comparisons, blood pressures were significantly lower among smokers reporting high religious importance compared to smokers with low religious importance. In fact, the risk of diastolic hypertension among smokers who did not see their religion as important to them was greater than 4.3 times that of smokers with high religious importance. No difference, however, was seen among nonsmokers. These findings are particularly notable given the prevalent presumption that the positive effects of religion on health are mediated through health care practices resulting from religious proscriptions against cigarette smoking, alcohol consumption, and harmful dietary practices.⁴¹ In the present study, however, it was among those who smoked that religious importance made the biggest difference in blood pressure. This may reflect a preferentially greater moderating effect for religion on blood pressure among more tense or nervous individuals who may also be more likely to smoke.

Conclusion

This is the first community-based cardiovascular study where a religious meaning variable, the importance of one's religion, and another religious variable, frequency of attendance, were used separately and then together to evaluate the association between religion and blood pressure. The unadjusted results indicated that the single meaning variable, when examined alone and together with frequency of church attendance, had an inverse association with the blood pressures of rural, white males. The differences were most notable for diastolic blood pressures, for persons over the age of 55, and among those who smoked. Lower blood pressure found among smokers who considered religion very important to them also challenges the widespread presumption that the health effects of religion are due primarily to lifestyle alterations.

What is the clinical significance for the difference in blood pressures noted between the groups in this study? A difference of 5-10 mm of either systolic or diastolic blood pressure may make the difference between blood pressure control and failure of control, and thereby affect the decision of whether or not to add an anti-hypertensive medication whose side-effects may include depression and diminished quality of life. Furthermore, cardiovascular risk increases with even small increases in blood pressure, and the majority of deaths resulting from higher blood pressures occur at pressures below treatment thresholds.⁴² In fact, a reduction of a population's mean blood pressure by as little as 2 to 4 mm Hg could reduce cardiovascular disease by nearly 10% to 20%.⁴³ Awareness by clinicians of the positive association between religion and blood pressure status should engender positive attitudes toward and respect for religious behaviors and attitudes in patients.

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