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Stress, Religious Involvement, and Cholesterol:  
Is it Better to Give than to Receive?

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Short Title: Social Support and Cholesterol

**Abstract**

**Purpose:** The purpose of this study is to see if social support that is exchanged in religious institutions moderates the relationship between stressful life events and cholesterol.

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**Methods:** The data come from a nationwide survey of adults of all ages (N = 816). Based on data from blood samples, cholesterol was measured by subtracting high-density lipoprotein from total cholesterol. Questions were administered to assess how often study participants provide and receive spiritual support from fellow church members. Spiritual support is assistance that is exchanged with the explicit purpose of increasing the religious beliefs and behaviors of the recipient. Controls were established in the analyses for a number of health behaviors (e.g., exercise), other types of religious involvement (e.g., church attendance), and demographic characteristics (e.g., age, sex, education). The study variables were assessed with ordinary least squares regression procedures.

**Results:** The data suggest that providing spiritual support tends to reduce the magnitude of the relationship between stress and cholesterol. In contrast, similar stress-buffering effects were not observed with the measure of receiving spiritual support at church.

**Conclusions:** The findings contribute to mounting evidence on the relationship between religion and health because they are based on biological measures.

Key words: religion, cholesterol, stress, social support

Researchers have been arguing for some time that high levels of cholesterol (i.e., low-density lipoprotein cholesterol - LDL) are associated with an elevated risk of cardiovascular disease (Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, 2001). These insights have led a number of investigators to search for the factors that promote high LDL levels. Although a number of potential explanatory variables have been identified, research reveals that exposure to stress may play an important role in this process. For example, Steptoe and Brydon (2005) report the results of an experiment in which participants in the highest stress condition had greater odds of having clinically elevated cholesterol than study participants in the lowest stress condition. Similar results have been reported by Bachen et al. (2002), Bacon, Ring, Lip and Carroll (2004), and Stony, Niaura and Bausserman (1997).

Focusing on the potentially important role of stress is important because it allows researchers to take advantage of a vast literature which indicates that greater exposure to stress is associated with a wide range of physical and mental health problems (e.g., Rice, 2012). Moreover, this literature reveals that people often rely on an array of coping resources in an

effort to reduce or avoid the unwanted effects of stress (Folkman, 2011). A broad range of coping resources have been studied including strong feelings of personal control (Elliott & Lowman, 2015) and an elevated sense of self-esteem (Mossakowski, 2015). It is especially important for the purposes of the current study to note that a rapidly growing literature also indicates that many people turn to religion when stressors arise in their lives (Pargament, 1997). Even so, there only appears to be one study that examines the relationship between stress, religion, and cholesterol (Maselko et al., 2007). These investigators report that indicators of allostatic load are lower among people with more frequent church attendance. Unfortunately, there are two limitations in this study. First, the measure of cholesterol was embedded in a larger allostatic load index, making it difficult to determine the nature of the relationship between church attendance and cholesterol specifically. Second, church attendance was the only measure of religion that was assessed in this study. Researchers have known for some time that religion is a complex phenomenon that involves much more than attendance at worship services (Fetzer Institute/National Institute on Aging Working Group, 1999).

The purpose of the current study is to examine the relationship between stress, religious involvement, and elevated cholesterol levels. An effort is made to contribute to the literature in two potentially important ways. First, an emphasis is placed on assessing the potential stress-buffering properties of social support systems that tend to thrive in religious institutions (Krause, 2008). This focus is justified because research reveals that strong social support systems in the secular world tend to offset the effects of stress on cholesterol levels (Thomas, Godwin, & Goodwin, 1985). Second, both giving and receiving church-based social support are examined below. This approach is noteworthy because research reveals that providing assistance to fellow church members tends to offset the effects of stress on mortality while receiving support at church fails to provide a similar stress buffering effect (Krause, 2006). This study was based on a nationally representative sample of 1,500 older people who were followed for a period of three years. Brown, Nesse, Vinokur, and Smith (2003) report similar results in their study of giving and receiving social support in secular networks.

Before turning to the mechanics of this study, it is important to explain why helping others at church may be a more effective coping resource than receiving assistance from them. This hypothesis is consistent with observations that were made some time ago by Reissman

(1965) in his classic discussion of the helper principle. In order to see why giving support may be more beneficial than receiving it, it is necessary to reflect more deeply on the nature of social support. Social support is a vast conceptual domain in its own right (Roy, 2011). Although people may help each other in a number of ways, an emphasis in the current study is placed on one type of support that is unique in religious life - spiritual support. Spiritual support is defined as assistance that is given with the explicit purpose of bolstering the religious beliefs and behaviors of the recipient. There are two reasons why providing spiritual support to fellow church members may help support providers cope more effectively with the stressors that arise in their own lives. First, virtually every major faith tradition extols the virtues of helping people who are in need (Lundberg, 2010). It follows from this that providing support to people at church should enhance the self-esteem of support providers because they are engaging in behavior that is valued and encouraged by their faith. This is important because a number of studies reveal that a stronger sense of self-worth is associated with better health (Wickrama, O'Neal, Lee, & Wickrama, 2015).

The second reason why giving support to others may be associated with better health (i.e., lower cholesterol levels) is found in Berger's (1967) classic sociological theory of religion. He argues that developing and maintaining religious beliefs is an ongoing social process that is sustained through continued interaction with like-minded others. Cast within the context of the current study, this means that when study participants strive to increase the religious beliefs and behaviors of others, they tend to bolster their own beliefs, as well. Turning to the way in which spiritual support is measured in the current study shows how this might happen.

Taken as a whole, the discussion that has been provided up to this point leads to the following study hypotheses: (1) providing spiritual support to fellow church members will offset the effects of stress on cholesterol levels of support providers; (2) the stress-buffering relationship between giving spiritual support and cholesterol will be stronger than the corresponding relationship between receiving spiritual support and cholesterol.

## **Methods**

### **Sample**

The data for this study come from the Landmark Spirituality and Health Survey (LSHS), a nationwide face-to-face survey of adults age 18 and older who reside in the coterminous United

States (i.e., residents of Alaska and Hawaii were excluded). This survey, which was completed in 2014, were conducted by the National Opinion Research Center (NORC) in Chicago. This research was reviewed and approved by the Institutional Review Boards at the University of Chicago and the University of Michigan. Interviewers read a full description of the study to each participant, answered any questions they might have, and asked them to sign the informed consent document.

The NORC 2010 National Sampling Frame served as the basis for the sampling procedures. This sampling frame is based on two sources. First, the bulk of this data base comes from postal address lists that are compiled by the United States Postal Service (USPS). Second, field employees were sent to enumerate all house in areas where USPS address lists were unavailable. Sampling was done in three stages. First, National Frame Areas (NFAs) were constructed. In essence, NFAs are formed from pooling counties and metropolitan areas into blocks of designated sizes. A total of 44 NFAs were selected with probabilities proportional to size. Then, in the second stage, NFAs were partitioned into segments consisting of Census tracts and block groups. Segments were selected with probabilities proportional to size. In the third stage housing units were sampled with equal probabilities of selection within each segment and the occupants of these dwellings were recruited for the interviews. A more detailed description of the sampling procedures is found on the study website:

<http://landmarkspirituality.sph.umich.edu/>.

The response rate for the study was 50 percent. The total number of completed interviews was 3,010. The sample was broken down into three age groups: 18-40 (N = 1,000), 41-64 (N = 1,002), and age 65 and older (N = 1,008).

There are three reasons why the analyses that are presented below are based on a subset of participants in the LSHS interviews. First, when the questionnaire for this study was developed, the members of the research team felt it did not make sense to ask questions about providing spiritual support to fellow church members if a study participant either never attends worship services or if they go to church only one or two times a year. Consequently, 1,215 low-church attenders were excluded from the analyses presented below. Second, blood samples were taken to assess cholesterol levels. As in any study, some participants declined to give a sample of their blood (N = 1,291 declined). This refusal rate is comparable to the refusal rates for other

major surveys, such as the widely-cited Health and Retirement Survey (Crimmons, 2015, personal communication). Third, questions on providing and receiving spiritual support were not administered to study participants who self-identified as atheists ( $N = 78$ ). Consequently, after using listwise deletion to deal with item non-response, complete data were available for 816 individuals. The exclusion categories are not mutually exclusive (e.g., some people who refused to give a blood sample also did not attend church). As a result, subtracting the sum of the cases in exclusion criteria from the original sample size does not equal 816.

Preliminary analyses revealed that the average age of the study participants is 46.9 years ( $SD = 17.8$ ), approximately 39 percent are men, 47.3% were married at the time of the interview, and the average level of education was 13.5 years ( $SD = 3.1$  years).

Following standard practice in the analysis of large nationwide surveys, the data for the analyses presented below were weighted (see Groves et al., 2004). A major goal in nationwide sampling is to obtain data that are representative. Unfortunately, this is rarely the case because all targeted participants are not included in the study. This may be due to factors like non-response (e.g., refusals). Consequently, the data are adjusted to take these factors into account. The data for the sample are compared with a “gold standard” data base and weights are assigned to each case so that the sample is brought in line with known population estimates (see the study website for a more detailed discussion of the sample weighting procedures).

## Measures

Table 1 contains the core measures that are used in this study. The procedures that were used to code these indicators are provided in the footnotes of this table.

<Insert Table 1 about here>

*Cholesterol.* As noted earlier, blood samples were taken from study participants. Measures of total cholesterol and high-density lipoprotein cholesterol (i.e., HDL) were derived from these samples. Then, following the recommendations of the Emerging Risk Factors Collaboration (2009), the HDL measure was subtracted from the measure of total cholesterol. The authors report that this procedure helps reduce bias that is encountered in attempts to measure LDL directly in survey research (see also, Lakshmy et al., 2010; Huang, Kao, & Tsai, 1997). Also, as this distinguished team of investigators report, this measure of cholesterol can be obtained without the need to fast, which is an important consideration in large nationwide

surveys. A high score on this outcome denotes higher levels of undesirable cholesterol ( $M = 103.7$ ;  $SD = 40.3$ ).

*Stressful Life Events.* Exposure to stressful life events was assessed with a checklist of 12 undesirable stressors that was devised by Moos, Cronkite, Billings, and Finney (1984). A simple count was created of the number of undesirable events that study participants experienced in the 18 month period prior to the interview. The average number of events that were encountered by the participants in this study was 2.7 ( $SD = 2.0$  events).

*Spiritual Support.* The amount of spiritual support that was received from and provided to fellow church members was assessed with the measures that were developed by Krause (2008). Two features of these items are noteworthy. First, when the indicators were administered, study participants were told not to count spiritual support that was exchanged in Bible study groups, prayer groups, and worship services. This helps insure that informal spiritual support among fellow church members is being assessed. Second, other than the fact that the items referred to giving and receiving support respectively, the question stems for both types of exchanges were identical. This makes it easier to compare and contrast the effects of giving and receiving spiritual support.

A high score on the spiritual support measures stands for giving or receiving spiritual support more often. The mean of the measure of received spiritual support is 7.9 ( $SD = 2.5$ ) and the mean of the measure of spiritual support that was provided is 7.2 ( $SD = 2.7$ ). The estimate of Cronbach's alpha for the received support index is .842 while the corresponding estimate for the measure of spiritual support provided to others is .918.

*Health Behavior Control Variables.* Four indicators were included in the analyses to control for the effects of well-known correlates of high cholesterol: the number of days per week in which study participants engage in at least 15 minutes of moderate exercise, the number of days per week in which study participants engage in at least 15 minutes of strenuous exercise and the number of days per week in which respondents consume red meat. These specific health behaviors were selected because research reveals that more frequent exercise (Rupper, Conn, Chase, & Phillips, 2014) and avoiding red meat (Truswell, 2007) are associated with lower cholesterol levels. A question was also administered to assess whether study participants are taking prescribed medications for cholesterol (i.e., statins).

*Religion Control Variables.* Three additional measures of religion were included in the study model to help insure that the observed effects were due to spiritual support per se rather than some other dimension of religion that is associated with it. These religion control variables include indicators of the frequency of church attendance, the frequency of private prayer, as well as an indicator of religious preference. Religious preference was classified with a modified version of the scheme proposed by Steensland and his colleagues (Steensland et al., 2000). These researchers drew a distinction between Evangelical Protestants and Black Protestants on the grounds that although these groups are doctrinally similar, their political views differ significantly. However, because the current study is not concerned with political views, Black Protestants and Evangelicals were combined in the analyses presented below. This resulted in a binary measure that contrasts Evangelicals with all others. Approximately 49% indicated they affiliate with an Evangelical denomination.

*Demographic Control Variables.* The relationships among the measures in Table 1 were assessed after the effects of age, sex, education, marital status, and race were controlled statistically. Age and education were scored continuously in years whereas sex (1= men; 0 = women), marital status (1= married; 0 = otherwise), and race (1= Black; 0 = others) were coded in a binary format. It should be emphasized that the “other” category in the race variables contains Whites, Hispanics, and Asians.

### **Data Analysis Strategy**

According to the theoretical rationale that was developed for this study, the unwanted effects of stressful life events on cholesterol levels should be reduced for people who give and receive more spiritual support. This specification calls for a statistical interaction effect between stress and spiritual support on cholesterol levels. The proposed interactions were evaluated with ordinary least squares multiple regression. The procedures recommended by Aiken and West (1991) were followed in these analyses. First, all independent variables were centered on their means. Then, two multiplicative terms were formed by multiplying the centered values of stress by the centered values giving and receiving spiritual support, respectively. Following this, tests for the interaction effects were performed in two steps. The additive effects of the independent variables were entered into the equation first. Then the multiplicative terms were added to the equation in step two.



Once the estimates described above been obtained, a formula provided by Aiken and West (1991; see p. 12) was used to determine if the interaction effects are in the predicated direction. Support for the study hypothesis would be found if the effects of stress become progressively weaker at successively higher levels of spiritual support. The formula provided by Aiken and West (1991) produces estimates of the relationship between stress and the study outcome at select values of spiritual support. Although any value of spiritual support could be used for this purpose, the following levels were used below: the lowest observed support score, minus one standard deviation below the mean, the mean, plus one standard deviation above the mean, and the highest observed spiritual support score. There are two reasons why these particular values were selected. First, they provide estimates of the stress-buffering properties of spiritual support across the full spectrum of spiritual support scores. Second, a significant number of study participants had the highest and lowest scores. More specifically, 102 respondents had the lowest possible score on the index of providing spiritual support (12.5% of the sample) whereas 88 (10.7%) had the highest possible score on the measure of providing spiritual support. Having a relatively large number of cases at a given data point is important because it helps researchers avoid problems that might be created by data sparseness (see Cohen, Cohen, West & Aiken, 2003, for a discussion of data sparseness). Once these estimates have been calculated, tests of statistical significance are computed with an additional formula provided by Aiken and West (1991; see p. 16).

## Results

The substantive findings from this study are presented in Table 2. Model 1 denotes the first step in the test for the hypothesized interaction effects whereas Model 2 represents the results from step two (i.e., when the multiplicative terms were added to the model).

<Insert Table 2 about here>

The data in the first column of Table 2 represent the additive effects of the independent variables on cholesterol levels. These data initially create the impression that neither stress ( $\beta = .006$ ; *ns.*), spiritual support provided ( $\beta = .091$ ; *ns.*), nor spiritual support received ( $\beta = .020$ ; *ns.*) are significantly associated with the cholesterol outcome measure.

A different picture emerges from the data when the interaction between stress and spiritual support is assessed (see Model 2). Two important findings emerge from this step in the

analyses. First, the data indicate that the statistical interaction effect between giving spiritual support to fellow church members and stress is statistically significant ( $b = -.977$ ;  $p < .01$ ) whereas the corresponding interaction that involves receiving spiritual support from coreligionists is not significant at the .05 level ( $b = .384$ ; *ns.*; unstandardized estimates are presented when discussing the results from tests for interaction effects because standardized estimates are not meaningful in this context). Based on the data analysis strategy that was discussed above, additional calculations were performed to see if the direction of the interaction effect between stress and giving spiritual support is in the expected direction. These additional computations provide support for the main study hypothesis. Among individuals who do not provide spiritual support to others (i.e., those with the lowest observed score), greater exposure to stress is associated with significantly higher levels of cholesterol ( $\beta = .208$ ;  $b = 4.181$ ;  $p < .05$ ; not shown in Table 2). However, the effect of stress on cholesterol is not as great for study participants with giving spiritual support scores that are one standard deviation below the mean ( $\beta = .104$ ;  $b = 2.097$ ;  $p < .05$ ; not shown in Table 2). The additional calculations suggest that stress is not significantly associated with cholesterol among study participants with average scores on the measure of giving spiritual support to others ( $\beta = .007$ ;  $b = .136$ ; *ns.*; not shown in Table 2). The same is true for respondents with spiritual support scores that are one standard deviation above the mean ( $\beta = -.090$ ;  $b = -1.826$ ; *ns.*; not shown in Table 2). However, an interesting relationship is observed for study participants with the highest possible score on the measure of providing spiritual support to others. At this level, the data reveal that giving a good deal of spiritual support to fellow church members is associated with significantly *lower* levels of cholesterol ( $\beta = -.230$ ;  $b = -4.612$ ;  $p < .05$ ; not shown in Table 2).

### **Discussion**

Two important findings emerged from this study. First, the data contribute to the growing literature on religion and health by showing that spiritual support that was provided by study in the place where they worship tends to offset the effects of stress on cholesterol levels. But rather than associating religion with self-reports of health, the data in the current study assess measures of cholesterol that were obtained from blood samples. The use of biological outcome measures in the literature on religion and health is relatively rare, but it helps bolster confidence in the studies that have been conducted in this area. Second, the results suggest that the potentially beneficial

effects involve providing spiritual support to fellow church members but not receiving spiritual support from them. The notion that it is better to give than to receive is an integral part of many faith traditions (Lundberg, 2010). Moreover, these findings add to several studies which also indicate that giving support is more beneficial for support providers than receiving assistance from others (Brown et al., 2003; Krause, 2006).

It is important to reflect more deeply on two aspects of the findings that are reported above. First, it is not entirely clear why receiving spiritual support from others fails to perform a significant stress-buffering effect. Eckenrode and Whethington (1990) provide some insight into this issue. They maintain that when people are confronted by a stressful event, they initially try to resolve the problem on their own. Doing so avoids becoming a burden to others and it helps individuals avoid problems that are associated with certain stigmatizing stressors (e.g., divorce). However, Eckenrode and Whethington (1990) go on to point out that if individual coping responses prove to be ineffective, then people will turn to significant others. Viewed from this perspective, receiving support may be viewed as a marker of failed individual coping efforts. To the extent that this is true, receiving support may be a stressor in its own right.

The second study finding that merits further reflection has to do with the relationship between stress and cholesterol at the highest level of providing spiritual support to others. The findings indicate that among those who help others the most, greater exposure to stress is associated with *lower* levels of cholesterol. At first glance, it may not be evident why this may be so. However, some insight is provided by the literature on growth through adversity. According to this perspective, some individuals find that their sense of psychological well-being actually increases as they negotiate the stress process (Joseph & Linley, 2005). This is noteworthy because some investigators maintain that religion may play an especially important role in this respect (O'Rourke, Tallman, & Altmaier, 2008). Perhaps individuals who provide a good deal of spiritual support to others are more likely to find they have grown when stressors arise in their own lives. Although data are not available to identify the intervening mechanisms in the current study, perhaps becoming deeply involved in helping others provides a significant respite from one's own difficulties. This is important because research with some kinds of stressors (e.g., caregiving) suggests that finding respite greatly enhances feelings of well-being (Rose, Noelker, & Kagan, 2015). Regardless of the underlying mechanisms that may be at work, the current

study appears to be the first to show report the potential health-protective effects of helping others on a biological outcome.

Clearly, a considerable amount of research remains to be done on the interface between religion and cholesterol. Four issues that are especially in need of attention are reviewed briefly here. First, members of all faith traditions were evaluated together. But it is important to see if the relationships we observed hold in some faiths, but not others. Second, it is also important to see if the relationship between giving spiritual support and cholesterol varies across different racial and ethnic groups. Third, research is needed to see if other dimensions of religion are associated with cholesterol levels (e.g., religious coping responses). Fourth, much has been written about the differences between religion and spirituality (Zinnbauer et al., 1997). We focused solely on religion, but research is needed to see if various aspects of spirituality are associated with cholesterol levels.

As this work progresses, it is important to address two limitations in the current study. First, the data were gathered at a single point in time and as a result, the direction of causality among the core study constructs was based on theoretical considerations alone. A more convincing argument could be made with longitudinal data that assess the effects of stress and spiritual support on changes in cholesterol levels over time. Second, researchers have been concerned for some time about the influence of social desirability response bias on self-reports of religiousness (Rowatt et al., 2002). Data were not available in the current study to assess the potential effect of social desirability on self-reports of helping others, but ways must be found to identify the extent of the problem and correct it.

Researchers have argued about the nature of the interface between mind and body for centuries (Godman & Kingma, 2013). This debate is especially relevant for research on religion and health. By showing that religious experiences (i.e., giving spiritual support to others) have a measurable effect on biological functioning, we hope to provide an additional modest step toward resolving this age old quandary.

### **References**

- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.
- Bachen, E. A., Muldoon, M. F., Matthews, K. A., & Manuck, S. B. (2002). Effects of

- hemoconcentration and sympathetic activation on serum lipid responses to brief mental stress. *Psychosomatic Medicine*, 64, 587-594.
- Bacon, S. L., Ring, C. Lip, G.Y., & Carroll, D. (2004). Increases in lipids and immune cells in response to exercise and mental stress in patients with suspected coronary artery disease: Effects of adjustments for shifts in plasma volume. *Biological Psychology*, 65, 237-250.
- Berger, P. L. (1967). *The sacred sanopy: Elements of a sociological theory*. New York: Doubleday.
- Brown, S. L., Nesse, R. M., Vinokur, A. D., & Smith, D. M. (2003). Providing social support may be more beneficial than receiving it: Results from a prospective study of mortality. *Psychological Science*, 14, 320-327.
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences, 3<sup>rd</sup> edition*. Mahwah, NJ: Lawrence Erlbaum.
- Eckenrode, J. & Wethington, E. (1990). The process and outcome of mobilizing social support. In S. Duck (Ed.), *Personal relationships and social support* (pp. 83-103). Newbury Park: Sage.
- Elliott, M. & Lowman, J. (2015). Education, income, and alcohol misuse: A stress process model. *Social Psychiatry and Psychiatric Epidemiology*, 50, 19-26.
- Emerging Risk Factor Collaboration. (2009). Major lipids, apolipoproteins, and risk of vascular disease FREE. *Journal of the American Medical Association*, 302, 1993-2000.
- Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. (2001). Executive summary of the Third Report of the National Cholesterol Education Program (NCEP). *Journal of the American Medical Association*, 285, 2486-2497.
- Fetzer Institute/National Institute on Aging Working Group. (1999). *Multidimensional measurement of religiousness/spirituality for use in health research*. Kalamazoo, MI: John E. Fetzer Institute.
- Folkman, S. (2011). Stress, health, and coping: An overview. In S. Folkman (Ed.), *Oxford handbook of stress, health, and coping* (pp. 3-14). New York: Oxford.
- Godman, M., & Kingma, E. (2013). Interdisciplinary workshop in the philosophy of medicine: Bodies and minds in medicine. *Journal of Evaluation in Clinical Practice*, 19, 564-571.
- Groves, R. M., Fowler, F. J., Couper, M. P., Lepkowski, J. M., Singer, E., & Tourangeau.

- (2004). *Survey methodology*. New York: Wiley.
- Huang YC, Kao JT, & Tsai KS. (1997). Evaluation of two homogeneous methods for measuring high-density lipoprotein cholesterol. *Clinical Chemistry*, 43, 1048-55.
- Joseph, S., & Linley, P. A. (2005). Positive adjustment to threatening events” An organismic valuing theory of growth through adversity. *Review of General Psychology*, 9, 262-280.
- Krause, N. (2006). Church-based social support and mortality. *Journal of Gerontology: Social Sciences*, 61B, S140-S146.
- Krause, N. (2008). *Aging in the church: How social relationships affect health*. West Conshohocken, PA: Templeton Foundation Press.
- Lakshmy R, Gupta R, Prabhakaran D, Snehi U, Reddy KS. (2010). Utility of dried blood spots for measurement of cholesterol and triglycerides in a surveillance study. *Journal of Diabetes Science Technology*, 4, 258–262.
- Lundberg, G. D. (2010). *Unifying truths of the world’s religions*. New Fairfield, CT: Heavenlight Press.
- Maselko, J., Kubzansky, L., Kawachi, I., Seeman, T., & Berkman, L. (2007). Religious service attendance and allostatic load among highly-functioning elderly. *Psychosomatic Medicine*, 69, 464-472.
- Moos, R. H., Cronkite, R. C., Billings, A. G., & Finney, J. W. (1984). *Health and daily living form manual*. Social Ecology Laboratory, Department of Psychiatry, Stanford University.
- Mossakowski, K. N. (2015). Disadvantaged family background and depression among young adults in the United States: The role of chronic stress and self-esteem. *Stress and Health: Journal of the International Society for the Investigation of Stress*, 31, 52-62.
- O’Rourke, J. J., Tallman, B. A., & Altmaier, E. M., (2008). Measuring post-traumatic changes in spirituality/religiousness. *Mental Health, Religion & Culture*, 11, 719-728.
- Pargament, K. I. (1997). *The psychology of religious coping: Theory, research, and practice*. New York: Guilford.
- Reissman, F. (1965). The “helper” therapy principle. *Social Work*, 10, 27-32.
- Rice, V. H. (2012). *Handbook of stress, coping, and health: Implications for nursing research*,

- theory, and practice*. Thousand Oaks, CA: Sage.
- Rose, M. S., Noelker, L. S., & Kagen, J. (2015). Improving policies for caregiver respite services. *The Gerontologist, 55*, 302-308.
- Rowatt, W. C., Ottenbreit, A., Nesselroade, K. P., & Cunningham, P. A. (2002). On being holier-than-thou or humbler-than-thee: A social-psychological perspective on religiousness and humility. *Journal for the Scientific Study of Religion, 41*, 227-237.
- Roy, R. (2011). *Social support, health, and illness: A complicated relationship*. Toronto: University of Toronto Press.
- Rupper, T. M., Conn, V. S., Chase, J. D., & Phillips, L. J. (2014). Lipid outcomes from supervised interventions in health adults. *American Journal of Health Behavior, 38*, 823-830.
- Steensland, B., Park, J. Z., Regnerus, M. D., Robinson, L. S., Wilcox, W. B., & Woodberry, R. D. (2000). The measure of American religion: Toward improving the state of the art. *Social Forces, 79*, 291-318.
- Steptoe, A., & Brydon, L. (2005). Associations between acute lipid stress responses and fasting lipid levels three years later. *Health Psychology, 24*, 601-607.
- Stoney, C. M., Niaura, R., & Bausserman, L. (1997). Temporal stability of lipid responses to acute psychological distress in middle-aged men. *Psychophysiology, 34*, 285-291.
- Thomas, P. D., Goodman, J. M., & Goodman, J. S. (1985). Effect of social support on stress-related changes in cholesterol level, uric acid level, and immune function in an elderly sample. *American Journal of Psychiatry, 142*, 735-737.
- Tuswel, A. S. (2007). Cardiovascular disease and red meat. *Nutrition & Dietetics, 64*, S162-S168.
- Wickrama, K., O'Neal, C. W., Lee, T. K., & Wickrama, T. (2015). Early socioeconomic adversity, youth positive development, and young adults cardio-metabolic disease risk. *Health Psychology, 34*, 905-914.
- Zinnbauer, B. J., Pargament, K. I., Cole, B., Rye, M. S., Butter, E. M., Belavich, T. G., Hipp, K. M., Scott, A. B., & Kadar, J. L. (1997). Religion and spirituality: Unfuzzifying the fuzzy. *Journal for the Scientific Study of Religion, 36*, 549-564.

Table 1. Core Study Measures

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1. Cholesterol - Measure computed by subtracting high density lipoprotein cholesterol from total cholesterol.

2. Stress Life Events<sup>a</sup>

- A. Moved to a new residence.
- B. Death of a close friend.
- C. Separation or divorce.
- D. Trouble with family members.
- E. Trouble with friends or neighbors.
- F. Your own serious illness or injury.
- G. Serious illness or injury of family member
- H. Death of a spouse
- I. Death of an immediate family member (other than spouse).
- J. Income decreased substantially (20% or more).
- K. Assaulted or robbed.

3. Spiritual Support Received from Others<sup>b</sup>

- A. Not counting Bible study groups, prayer groups, or church services, how often does someone in your congregation share their own religious experiences with you?
- B. Not counting Bible study groups, prayer groups, or church services, how often do the examples set by others in your congregation help you lead a better religious life?
- C. Not counting Bible study groups, prayer groups, or church services, how often does someone in your congregation help you know God better?

4. Spiritual Support Provided to Others<sup>b</sup>

- A. Not counting Bible study groups, prayer groups, or church services, how often do you share your own religious experiences with someone in your congregation?
- B. Not counting Bible study groups, prayer groups, or church services, how often do you try to help someone in your congregation lead a better religious life?
- C. Not counting Bible study groups, prayer groups, or church services, how often do you try to help someone in your congregation know God better?



<sup>a</sup> A summary stress score was created by summing the number of events that occurred during the 18 months preceding the survey.

<sup>b</sup> These items were scored in the following manner (coding in parenthesis): never (1), once in a while (2), fairly often (3), very often (4).

Table 2. Assessing the Relationships among Stress, Church-Based Social Support and Cholesterol  
(N = 816)

<u>Independent Variables</u>	<u>Model 1</u>	<u>Model 2</u>
Age	.155 <sup>a</sup> *** (.352) <sup>b</sup>	.154*** (.348)
Sex	.015 (1.206)	.020 (1.629)
Education	-.025 (-.322)	-.023 (-.304)
Marital Status	.009 (.720)	-.001 (-.039)
Race	-.073* (-7.791)	-.076* (-8.052)
Cholesterol Medication	-.107** (-11.356)	-.102** (-10.885)
Moderate Exercise	.036 (.590)	.037 (.612)
Strenuous Exercise	.014 (.255)	.013 (.241)
Eat Red Meat	.007 (.159)	.007 (.170)

Church Attendance	-.094*	-.093*
	(-2.234)	(-2.209)
Private Prayer	-.016	-.005
	(-.408)	(-.125)
Evangelical	-.108**	-.111**
	(-8.736)	(-8.913)
Stressful Life Evens	.006	.007
	(.125)	(.136)
Giving Spiritual Support	.091	.104*
	(1.360)	(1.554)
Receiving Spiritual Support	.020	.001
	(.312)	(.016)
(Stress X Giving Spiritual Support	-----	-----
	-----	(-.977)**
(Stress X Receiving Spiritual Support)	-----	-----
	-----	(.384)
Multiple R <sup>2</sup>	.048	.058

<sup>a</sup> standardized regression coefficient

<sup>b</sup> metric (unstandardized) coefficient

\* =  $p < .05$ ; \*\* =  $p < .01$ ; \*\*\* =  $p < .001$