Claims About Religious Involvement and Health Outcomes

Richard P. Sloan, Ph.D.
Columbia-Presbyterian Medical Center; Department of Psychiatry, Columbia University;
and New York State Psychiatric Institute

Emilia Bagiella, Ph.D.
Mailman School of Public Health
Columbia University

ABSTRACT

Claims about religion, spirituality, and health have recently appeared with increasing frequency, in both the popular media and professional journals. These claims have asserted that there are a great many studies in the literature that have examined relations between religious involvement and health outcomes and that the majority of them have shown that religious people are healthier. We examined the validity of these claims in two ways: (a) To determine the percentage of articles in the literature that were potentially relevant to such a claim, we identified all English-language articles with published abstracts identified by a Medline search using the search term religion in the year 2000, and (b) to examine the quality of the data in articles cited as providing support for such a claim, we examined all articles in the area of cardiovascular disease and hypertension cited by two comprehensive reviews of the literature.

Of the 266 articles published in the year 2000 and identified by the Medline search, only 17% were relevant to claims of health benefits associated with religious involvement. About half of the articles cited in the comprehensive reviews were irrelevant to these claims. Of those that actually were relevant, many either had significant methodological flaws or were misrepresented, leaving only a few articles that could truly be described as demonstrating beneficial effects of religious involvement. We conclude that there is little empirical basis for assertions that religious involvement or activity is associated with beneficial health outcomes.

(**Ann Behav Med** 2002, *24*(1):14–21)

INTRODUCTION

Claims about religion, spirituality, and health have recently appeared with increasing frequency, in both the popular media and professional journals. This trend is based in part on evidence that patients want to consider broad alternatives to conventional medical practice and on published studies linking religion and health outcomes. Regarding the latter, it has been asserted frequently that there have been a great many studies in the literature that have examined relations between religious involvement and health outcomes and that the majority of them have shown that religious people are healthier (1–3). These studies, it has been suggested, have demonstrated the beneficial impact of religious activities on those who practice them.

Corresponding to the rise in these beliefs have been increasing calls to incorporate religious and spiritual activities into clinical practice. For example, in December 2000, the Harvard Medical School Department of Continuing Education offered a program on spirituality and healing entitled "Mainstreaming Spirituality." Harris et al. recommended exploration of the potential of prayer as an adjunct to standard medical care (4). Nearly 30 U.S. medical schools now include courses on religion, spirituality, and health for medical students (5). According to a recent article in *USA Today,* a Denver-based HMO offers spiritual counseling.

Numerous authors have claimed an abundance of literature supporting the positive health effects or religious involvement. Koenig reported that there are more than 850 articles on religious involvement and mental health, with more than two thirds showing an advantage to the religiously active, and more than 350 articles on religious involvement and physical health, with over half showing an advantage to the religious (2). An earlier claim asserted the existence of 325 studies in the area, of which over 75% showed benefits of religious involvement (6). Luskin reported that "almost all studies that evaluate the effect of religious experience show a positive health value" (7). Puchalski wrote that "a number of studies show that having spiritual beliefs is beneficial to patients, particularly those with serious illness" (8). Ellison and Levin asserted that "a substantial body of literature reports what appear to be generally desirable effects of other aspects of religious involvement (e.g., frequency of attendance, subjective religiosity) on a wide range of health outcomes" (1).

In this article, we examine two elements of these assertions: (a) there are a substantial number of articles that address the relation between religious involvement and health and (b) of those articles relevant to this issue, a substantial fraction demonstrate positive associations between religious involvement and beneficial health outcomes. For the former, we describe how studies about religion and health nevertheless may be about topics unrelated to a relation between religious involvement and health. For the latter, we selected two recent literature reviews of this relation and examined the data cited in these reviews to determine if they justified claims of beneficial associations.

Reprint Address: R. P. Sloan, Ph.D., Columbia University, Box 427, 622 West 168th Street, New York, NY 10032. E-mail: rps7@columbia.edu

STUDIES OF RELIGION AND HEALTH

It is indeed true that in the literature, at least the literature available through Medline, there are numerous articles in which a variables measuring religion or religious activity and health appear together. Nonetheless, many are irrelevant to claims of a health advantage associated with religious involvement. They include studies of denominational differences, articles only remotely about religious matters, studies examining how religious factors influence medical decision making, and studies in which religious activity functions as a dependent variable.

Denominational Differences

Many articles about religion and health have been those about denominational differences in health. Authors of these articles have examined the differences between Protestants and Catholics, Jews and Christians, and Orthodox and secular Jews on various indexes of health and illness. For example, the incidence of myocardial infarction was greater among Protestant than Catholic men in Middlesex County, Connecticut (9). Walden, Schaefer, Lemon, Sunshine, and Wynder (10) compared serum lipid levels of Seventh-Day Adventists (SDAs) with an age-matched sample of healthy men and women from New York City. Eklund, Belchak, Lapidos, Raha-Chowdhury, and Ober recently reported on genetic polymorphisms in Hutterites (11).

For two reasons, these studies of denominational differences in health have conveyed no information on the health value of religious involvement. First, most denomination studies have been conducted to take advantage of denominational differences in genetic endowment, health behaviors, or ethnicity. For example, studies of SDAs often have been conducted precisely because of behavioral codes proscribing smoking and alcohol consumption. Thus, for example, total cholesterol levels were lower across all age groups for a cohort of SDAs compared to age-matched healthy New York City men and women (10). Similarly, a study of the Amish was conducted to examine genetic contributions to congenital glaucoma (12).

Second, studies of denominational differences cannot be used to demonstrate the beneficial effects of religion on health because they have always contrasted the prevalence of disease in one group to the prevalence in another. Thus, comparisons of Catholics and Protestants in Middlesex County, Connecticut, revealed an advantage to Catholic men in rates of myocardial infarction (9). However, unless it was implied that these denominational differences were associated with differences in religiosity, these studies are irrelevant to assertions of health advantages of religious involvement.

Studies Only Remotely About Religion

Some articles in which measures of health and religion appeared were only remotely about religious matters. For example, among the articles cited in comprehensive reviews of religion and health was one by Friedman and Hellerstein (13). In this study, the fraction of the study sample that was Jewish was measured, but this was only one of many variables collected, and the title of the article was "Occupational Stress, Law School Hierarchy, and Coronary Artery Diseases in Cleveland Attorneys." As the title suggests, this was not an article about religion and health. Similarly, Comstock reported data on church attendance in an article entitled "Fatal Arteriosclerotic Heart Disease, Water Hardness at Home, and Socioeconomic Characteristics" (14). Again, church attendance was only one of many variables measured. The same was true of many of these articles.

Several specific problems arise from attempting to draw conclusions from articles not explicitly about religion and health. First, because the interests of the authors were elsewhere, an examination of an association between a religious variable and a health outcome was only one of many comparisons reported, even if tests of statistical significance were conducted. This raises the problem of the failure to control for multiple comparisons. Searching through articles to find a positive statistical test for a religion–health comparison among dozens of tests conducted violates accepted standards of methodology.

Similarly, because an association between a religious variable and a health outcome was not the primary focus of these articles, these analyses lacked controls for confounders and covariates. As we indicated (15), this feature is common in many studies. Even if, for example, a study showed a univariate association between church attendance and a health outcome, without a control for the important covariate of functional status, it is impossible to rule out the possibility that church attendance was a product of, rather than the cause of, poor health.

Studies of Medical Decision Making

Many articles addressed such issues as attitudes toward organ donation in the Sikh community (16), ethical issues in transfusions of children of Jehovah's Witnesses (17), and religious attitudes toward organ transplantation (18). Studies such as these are relevant to an examination of the relation between religion and health only insofar as they documented the influence of religious beliefs on making difficult medical decisions.

Articles on the influence of religious orientation toward health practices or procedures (e.g., transfusion and organ transplantation) and articles demonstrating the religious consequences of having medical problems have no direct bearing on the relation between religious involvement and health outcomes.

Religious Activity as a Dependent Variable

Others studies about religion and health examined the religious consequences of having medical problems. For example, Levin, Lyons, and Larson examined the association between subjective assessments of poorer health and frequency of prayer during pregnancy (19). In studies such as these, religious activities function as a dependent variable, the product of difficult life circumstances. Another study examined the changes in spiritual beliefs after traumatic disability (20). Although articles such as these illustrate how many people turn to religious practices under the threat of medical problems, they are irrelevant to an empirical foundation for the introduction of religious interventions in medical practice.

Therefore, even if there were many studies in the literature in which both religious and health variables appeared, many had

no relevance to putative beneficial effects of religious involvement in health outcomes. The question then becomes, What fraction of the great many articles on religion and health are relevant to this matter?

Literature on Religion and Health in the Year 2000

One way to examine the fraction of articles on religion and health that are relevant to claims about the benefits of religious activities is to search the current literature. We conducted a Medline search for all articles identified by the keyword *religion.* We limited the search to English-language articles with abstracts in the year 2000. This search yielded 266 articles. Each of us then reviewed all of the abstracts independently and classified them according to whether they were relevant to claims of health benefits of religious activities. After reconciling differences between the two sets of reviews, we determined that only 42 of 266 (i.e., 17%) were relevant to these claims. Many studies were about denominational differences. Some were about the impact of health conditions on religious activities. Others were about physician behavior. Some described health fairs conducted in churches, and even this low number was inflated by the inclusion as relevant studies of sexual behavior and yoga.

EXAMINATION OF STUDIES THAT SUPPORTED CLAIMS OF BENEFITS ASSOCIATED WITH RELIGIOUS INVOLVEMENT

We examined two recent reviews of the literature (3,7). To make this task manageable, we focused on only cardiovascular disease and hypertension and evaluated them for relevance to recommendations to make religious activities adjunctive medical treatments.

Luskin (7) reported that "evidence continues to mount that demonstrates the positive value of spiritual and religious factors in maintaining health" (p. 8). In the section reviewing cardiovascular disease, 12 studies were cited. One (21) was itself a review of other studies. Two cited articles were denominational studies (22,23).

One was published only as an abstract (24). Generally, it is inappropriate to consider abstracts of presentations at scientific meetings because as abstracts only, sufficient information generally is unavailable for critical review. In this case, however, even the abstract made it clear that there was no control for multiple comparisons. Many studies in the literature on religion and health failed to make adjustments for the greater likelihood of finding a statistically significant result when conducting multiple statistical tests.

Two other cited studies also failed to control for multiple comparisons. The famous Byrd study (25) of the impact of intercessory prayer on coronary care unit (CCU) patients has been roundly criticized (15). In this double blind study, patients in a CCU were assigned randomly either to standard care or to receive daily intercessory prayer by three to seven born-again Christians. Patients and their doctors did not know which patients were receiving prayer. Twenty-nine outcome variables were measured, and on 6, the prayer group had fewer newly diagnosed problems, but there was no control for multiple comparisons. Moreover, the 6 significant outcomes were not independent: The prayer group had less newly diagnosed heart failure and fewer newly prescribed diuretics and less newly diagnosed pneumonia and fewer newly prescribed antibiotics.

Similarly, in an article by Koenig et al. (26), at least 126 statistical tests were conducted with no control whatsoever for multiple comparisons. A simple Bonferroni correction for multiple comparisons (i.e., dividing the standard 5% level by the number of comparisons) yielded a critical significance level of .0004. None of the comparisons in this article achieved this level of statistical significance.

Luskin reported that an article by Harris et al. (27) "found that heart transplant patients who had stronger religious beliefs and religious commitment showed improved functioning, adherence to treatment, and diminished health concerns a year after surgery" (p. 10). Several problems with this study existed. For example, these findings were selected from among 42 correlation coefficients computed by the authors, again with no control for multiple comparisons. In addition, improved functioning and adherence to treatment were based solely on self-report, with no independent assessment.

Another article was cited as showing that religious coping was "protective" (28), suggesting some documented benefit to patients. In fact, the primary focus of this article was about the relation between health locus of control and responses on the Helpfulness of Prayer Scale. Contrary to the hypotheses, there was no relation between these two indexes. There was nothing whatsoever in the article about protection.

Two more studies (29,30) were cited as demonstrating beneficial effects of organized religious activity on blood pressure (BP). As we indicated previously (15), both these articles had significant methodological flaws. Graham et al. reported that religious attendance and importance of religion interacted such that those high in both had lower diastolic blood pressure (DBP; but not systolic blood pressure [SBP]) than those low in both. The report contained no statistics on this interaction, and although potential covariates such as socioeconomic status, age, smoking status, and body mass index were measured, the absence of the statistical model made it difficult to evaluate the findings. Based on the same data set, Larson et al. (30) reported that the frequency of church attendance was positively related to SBP (but not DBP) after controlling for Quetelet Index, smoking and socioeconomic status. The data, the multivariate model, and the amount of variance accounted for by the religious variable were not presented. Moreover, neither study contained a measure of health status, which, as many have indicated, can influence the capacity to attend church.

In an article by McSherry, Ciulla, Salisbury, and Tsuang (31), patients admitted for coronary artery bypass graft surgery and acute spinal cord injury were evaluated for religiosity and followed throughout their hospital stay. Those rating themselves as moderately to highly religious had significantly shorter lengths of stay, but no analysis of the effects of confounders or covariates was conducted.

Finally, an article by Oxman, Freeman, and Manheimer (32) was cited. In this article, the impact of religious activity on mortality after elective cardiac surgery was examined in 232 patients. In a multivariate analysis, one item ("strength or comfort from religion") from a 5-item scale of religiosity was found to be associated with mortality independent of history of cardiac surgery, functional status, age, and a measure of social participation. However, neither the other items of this scale nor the composite score itself, which has been used in many other studies (e.g., 33), was related to mortality.

Thus, of the 12 studies considered by Luskin to support the claim of a beneficial impact of religious activity on cardiovascular health, all had significant problems. This evidence provided no basis for such a claim.

A much more comprehensive review of the literature appeared in the recently published *Handbook of Religion and Health* (3). The comprehensive list of studies on heart disease and hypertension (pp. 555–558) included 89 different citations. Of these, 33 were studies of denominational differences in health. An additional 11 were reviews of other studies, case reports, or mere descriptions of projects. Three were published only in abstract form and, as indicated previously, could not be critically reviewed. By the criteria of the *Handbook,* 8 additional studies showed no association between religious activity and health. This left 34 (38%) articles that could be the basis of claims about the direction and strength of the religion–health relation.

In the comprehensive summary of studies on heart disease and hypertension, 39 of the 89 (44%) articles listed carried the indication "positive." That is, there was at least one positive association with a better health outcome. The difference between the 39 studies rated as positive and our determination of 34 relevant to the question at hand arose because some of those we called irrelevant were rated as positive.

Like the studies cited by Luskin, most had significant problems that limited their value as evidence of associations between religious activities and beneficial health outcomes. Indeed, five of the same studies (25,26,29,30,32) are cited by the *Handbook.*

Studies With Methodological Problems

Among the 34 positive studies not cited by Luskin, studies by Scotch (34) and Comstock (14) failed to control for multiple comparisons. Of course, as we pointed out previously, because neither Scotch nor Comstock were principally concerned with the health benefits of religious activities, there was no reason for them to make adjustments of alpha levels. However, reviewers using these studies to claim associations between religious involvement and health must do so.

One such "positive" article, by Leserman, Stuart, Mamish, and Benson (35), reported the results of a small trial of the relaxation response on cardiac surgery patients. Postoperative supraventricular tachycardia (SVT) was lower in the treatment group than in the control group ($p = .04$). However, this was the only difference between the groups. They did not differ in postoperative SBP or DBP, heart rate, incidence of ventricular arrhythmias greater than Grade 3 on the Lown scale, incisional pain, incisional distress, or length of postoperative stay. If one corrected for multiple comparisons, the significant SVT finding would disappear.

Several of the articles failed to control for confounding. The treatment of the study by Sudsaung, Chentanez, and Veluvan (36) was especially enlightening. The *Handbook* reported that 52 male college students were taught Buddhist meditation and were compared to 30 control students who were not. Meditation participants but not controls had lower BP at 3- and 6-week follow-ups compared to their levels at study entry. What the original article made clear, however, and the *Handbook* did not, was that the groups were not randomly assigned. Rather, they were self-selected, with meditation participants volunteering to be cloistered with monks for 2 months during their summer vacation, during which time they engaged in no activities other than "walking about 1 km to receive food from people in the morning" (36, p. 544). Control participants stayed at home for summer vacation. Similarly, Timio et al. (37) found that Roman Catholic nuns had lower BP than a control group but these nuns were cloistered for 20 years. Needless to say, the control group was not. Both of these studies were hopelessly confounded with respect to drawing conclusions about the health benefits of a religious practice. Comstock's finding of an inverse association between church attendance and mortality (14) also appeared to be confounded by functional status (38).

Two articles by Medalie and colleagues (39,41) were cited. Both the text of the chapter on heart disease and the summary table in chapter 34 indicated that these articles compared orthodox versus secular Jews and that the results showed an advantage to the orthodox. In fact, these articles, although reporting on data collected in Israel, had nothing to do with religion, except for a single sentence in which the authors reported, with no supporting evidence, a finding of an inverse relation between religiosity and incidence of myocardial infarction.

Two other articles had inadequate or nonexistent control groups. Cooper and Aygen (41) reported on the effect of transcendental meditation (TM) on blood lipids. Only the intervention participants showed a significant decline in blood cholesterol. However, the number of participants was small (12 in the treatment group and 11 in the control group), and assignment to treatment condition was not random. Treatment participants volunteered to participate in the study while attending lectures on TM. Control participants were recruited from a medical outpatient clinic. Four of the participants originally in the treatment group deemed insufficiently active in meditation were reassigned to the control group. Another study by Blackwell et al. (42) also had no control group.

In another article cited as positive (43), a multivariate model predicting coronary heart disease mortality included standard risk factors but omitted religion, and no information on risk ratio or confidence intervals or even level of statistical significance was provided. Thus, like the articles by Graham and Larson, this article lacked complete statistical information.

In a study by Wenneberg et al. (44), the impact of TM on reactivity to laboratory stressors (mental arithmetic, mirror tracing, and public speaking) and ambulatory blood pressure (ABP) was examined. In this clinical trial, although participants were

randomly assigned to a TM or health education condition, there was substantial dropout. Among those who remained in the study, no differences were found between pretreatment and posttreatment reactivity to laboratory stressors. When only high-compliance participants (in both conditions) were examined, the TM participants had higher SBP reactivity to the preparation for the speech task and to the speech task itself. Similarly, there were no treatment differences in ABP when all participants were considered. When high compliers only were analyzed, TM participants had lower posttreatment diastolic ABP than control participants.

This study, even as presented, was at best equivocal with respect to an advantage to the TM group because analyses of data from all participants showed no differences between groups in the laboratory or the field. When analyses were restricted to high-compliance participants, the TM group had greater posttreatment SBP reactivity to the speech task and lower diastolic ABP. More broadly, however, restricting analyses only to high-compliance participants or to those who did not drop out violated the intention-to-treat requirement of randomized clinical trials.

Finally, a study by Miller on the impact of remote healing was cited (45). This study reported that hypertensive patients who were the recipients of remote healing had a greater reduction in SBP than those in the control group. No information about the patients, except that there were 96 of them, was presented. There were eight "healers." The interval length between preintervention and postintervention data collection was unclear. Moreover, the SBP finding was the only one that achieved statistical significance. DBP, pulse rate, weight, and health status, a poorly defined composite measure, did not change. In addition, data were presented only for the patients of four of the healers "who had the highest number of returned patients" (45, p. 486). Assuming that "returned patients" means patients who did not drop out, this means that statistical analysis was conducted on an incomplete data set.

Studies That Were Misrepresented

Several of the studies cited as positive by the *Handbook* were methodologically adequate. They failed to provide support for claims about the health benefits of religious activities because they were not fundamentally about religion or, contrary to claims, had no significant effects. For example, the three studies by Patel and colleagues described a multicomponent intervention including health education, breathing exercises, deep muscle relaxation, biofeedback, and yoga (46–48). Like the studies by Patel, the report of Burell (49) was about a multicomponent intervention delivered to patients after coronary artery bypass graft surgery. It was impossible to attribute the benefits of these programs to any one component.

The weight control program described by Kumanyika and Charleston qualified as a study of religion and health only because it was conducted in a church (50). The program itself had nothing to do with religion. The articles by Scotch and by Stavig, Igra, and Leonard were studies of the impact of assimilation into new societies, either by immigration or by moving from rural to urban life; religious affiliation was used merely as an index of assimilation into the new society (34,51). One article was a study of denominational comparisons (52).

Two studies, although about religious activities, were cited as positive when in fact they reported no significant effects. Hixson, Gruchow, and Morgan (53) was cited as a study with one or more positive associations between a religious variable and a health outcome with $p < .05$. In this study of religiosity, health behaviors and BP data were obtained for 112 women. There was not a single p value less than .05 in the article. In fact, the authors reported that the results of the one-way analyses of variance that they conducted examining the influence of religiosity on BP for all participants did not reveal any statistically significant findings. An article by Koenig (54) was cited in the summaries as marginally positive. In fact, this article reported no significant associations between a religious variable and a health outcome.

An article by Alexander et al. (55) was included in the summary table as a positive study, although it was described as a supplementary analysis of data presented in another article already in the table (56). Listing both studies was misleading.

The *Handbook* cited as a positive study a report by Friedlander, Kark, and Stein (57) in which the religiosity of parents was related to the blood lipids of their adolescent children in Israel. Even after adjustment for sex, ethnic origin, social class, body mass, and season of the year, total cholesterol, LDL cholesterol, and triglycerides were lowest in the children of orthodox parents and highest in those of secular parents. This study did not examine the relations between religiosity among adolescents and their risk of disease.

A study by Lapane, Lasater, Allan, and Carleton (58) cited as positive by the *Handbook* examined two cross-sectional surveys of the Pawtucket Heart Health Program. Multivariate analyses of the differences between church members and nonmembers were carried out, but no statistical models were presented. After controls for age, sex, and Portuguese ethnicity, there was a significant advantage in cigarette smoking to church members. However, church members also were more likely to have greater body mass indexes. After adjustment, there was a small DBP advantage for church members. The authors concluded, "Overall, we found that church members were not different from non-members with respect to most CVD [cardiovascular disease] risk factors. With the exception of cigarette-smoking status, majority-church members may actually have more adverse CVD-risk–factor profiles" (58, p. 162).

Two articles by Walsh were cited as independent, but they appeared to be reports from overlapping samples of participants (59,60). In the first, unspecified relations between BP and church attendance were reported to be .17 and .09, with neither achieving statistical significance (60). In the second, church attendance and importance of religion were combined in some unspecified manner to create an index of "religious commitment" and then entered into several analyses. Although it was unclear in the first article, it became clear in the second that all data were collected by Walsh himself, raising concerns about lack of blindness (59).

Some studies cited as positive at best present equivocal evidence. For example, Hutchinson (61) examined the association of stress and BP in a Caribbean population. She found that men but not women who never attended church had higher BPs than frequent attenders. However, these analyses were at the univariate level, and there was no control for confounders or covariates. In another positive study, Gupta, Prakash, Gupta, and Gupta (62) found that prayer habits were associated with lower prevalence of coronary heart disease among men (p = .04) in a multivariate analysis. Prayer habit was entirely undefined, and no relation was found among women.

Unpublished Studies

Three studies cited in the summary as positive were available only in abstract form (63–65). Until they are published, they are impossible to review critically. However, the abstract by Thoresen was about the Recurrent Coronary Prevention Program (RCPP), a multicomponent intervention based originally on the Type A behavior pattern literature and designed to reduce recurrent coronary events (65). Because several articles on the RCPP have been published, there is no need to rely on a 1990 abstract presented at a meeting in Sweden. None of the published reports from the RCPP indicated anything about religion.

Articles That Could Reasonably Be Called Positive

The strongest study among those identified as positive was by Schneider et al. (56), who, in a randomized clinical trial, showed that both a TM and a progressive relaxation intervention significantly reduced BP in a group of African Americans, 55 years of age and older. The TM condition led to a greater BP reduction than the progressive relaxation condition.

In a study, the aim of which was primarily to explore information about social integration and BP in Black Americans, Livingston et al. (66) found that church affiliation (undefined) was associated with lower SBP and DBP in both men and women in a multivariate model. With the qualification that the meaning of church affiliation was unclear and that it was used as an index of social integration, this appeared indeed to be a positive study showing an advantage to the religiously active.

In a case control study by Friedlander, Kark, and Stein (67), the risk of myocardial infarction was significantly greater among secular compared to orthodox Jews in Israel, even after control for covariates. A study by Zamarra, Schneider, Besseghini, Robinson, and Salerno (68) was cited as demonstrating the benefits of TM in patients with documented coronary heart disease. In this study, 10 intervention participants showed significantly greater improvements in exercise duration, maximal workload, and delay of onset of ST-segment depression compared to 6 wait-list control participants. This study was unambiguously positive, but the number of participants was small, and because data from 2 experimental participants and 3 control participants who withdrew from the study were not included in the analysis, the intention-to-treat principle was not followed.

CONCLUSIONS

Using two different approaches, we examined the claim that the empirical literature on religion and health provides a basis for the assertion of the existence of substantial support for a beneficial effect of religious activities on health outcomes. After reviewing the abstracts from 266 articles identified by a Medline search of publications appearing in 2000 and meeting criteria for a search of *religion* as a major MESH term, we determined that only 17% of these studies were relevant to an association of religious activities and positive health outcomes.

Next, we examined two secondary sources reviewing the empirical literature on religion and health, focusing on the literature on heart disease and hypertension. One review was dedicated to this topic (7). The second reviewed the literature on heart disease and hypertension as part of a comprehensive review of the entire literature on religion and health (3).

Although both secondary sources claimed to identify empirical evidence supporting the benefits of religious activities on heart disease and hypertension, a review of the articles cited revealed that the majority were either flawed or misinterpreted. Virtually none of the 12 articles cited by Luskin could provide support for the claim that religious activity or religious involvement is associated with beneficial heart disease outcomes. Of the 39 studies on heart disease and hypertension listed as positive by the *Handbook,* only 4 could reasonably be claimed to support this assertion.

Thus, there is little evidence to support claims that health benefits derive from religious activity. However, this analysis was limited in several potentially significant ways. With regard to the review of studies appearing in Medline, we established their relevance to claims about beneficial effects of religious involvement based only on the contents of the abstracts. Although it is difficult to evaluate the methodology or conclusions of a study from material presented only in the abstract, the relevance of a study to claims about the benefits of religious involvement generally can be ascertained. However, it is conceivable that reviewing the entire articles would lead to different conclusions.

Restricting the examination of secondary sources to heart disease and hypertension is justified only if the treatment of the literature on these topics is representative of the larger literature examining religious activity as it relates to other health outcomes. We know of no studies that shed light on this matter but have no reason to believe that the literature in general is any more supportive of claims of benefits of religious involvement for other health outcomes.

To conclude, it is indeed true that there are many studies in which religious variables and health outcomes appear together. It is not true, however, that most of these studies are relevant to putative health benefits deriving from religious involvement. In fact, most are irrelevant to this claim.

Among those that are relevant, two general problems arise: methodological deficiencies of the studies themselves and inaccurate accounts appearing in secondary sources. Examination of these studies in the area of heart disease and hypertension revealed that there is little empirical support for claims of health

benefits deriving from religious involvement. To suggest otherwise is inconsistent with the literature.

REFERENCES

(1) Ellison CG, Levin JS: The religion–health connection: Evidence, theory, and future directions. *Health Education and Behavior.* 1998, *25:*700–720.

(2) Koenig HG: Religion, spirituality, and medicine: Application to clinical practice. *Journal of the American Medical Association.* 2000, *284:*1708.

(3) Koenig HG, McCullough ME, Larson DB: *Handbook of Religion and Health.* New York: Oxford University Press, 2001.

(4) Harris WS, Gowda M, Kolb JW, et al.: A randomized, controlled trial of the effects of remote, intercessory prayer on outcomes in patients admitted to the coronary care unit. *Archives of Internal Medicine.* 1999, *159:*2273–2278.

(5) Levin JS, Larson DB, Puchalski CM: Religion and spirituality in medicine: Research and education. *Journal of the American Medical Association.* 1997, *278:*792–793.

(6) Matthews DA, Clark C: *The Faith Factor.* New York: Viking, 1998.

(7) Luskin F: Review of the effect of spiritual and religious factors on mortality and morbidity with a focus on cardiovascular and pulmonary disease. *Journal of Cardiopulmonary Rehabilitation.* 2000, *20:*8–15.

(8) Puchalski CM: Spirituality and health: The art of compassionate medicine. *Hospital Physician.* 2001, *Mar.*:30–36.

(9) Wardwell WI, Bahnson CB, Caron HS: Social and psychological factors in coronary heart disease. *Journal of Health and Human Behavior.* 1963, *4:*154–165.

(10) Walden RT, Schaefer LE, Lemon FR, Sunshine A, Wynder EL: Effect of environment on the serum cholesterol–triglyceride distribution among Seventh-Day Adventists. *American Journal of Medicine.* 1964, *36:*269–276.

(11) Eklund AC, Belchak MM, Lapidos K, Raha-Chowdhury R, Ober C: Polymorphisms in the HLA-linked olfactory receptor genes in the Hutterites. *Human Immunology.* 2000, *61:*711–717.

(12) Martin SN, Sutherland J, Levin AV, et al.: Molecular characterisation of congenital glaucoma in a consanguineous Canadian community: A step towards preventing glaucoma related blindness. *Journal of Medical Genetics.* 2000, *37:*422–427.

(13) Friedman EH, Hellerstein HK: Occupational stress, law school hierarchy, and coronary artery diseases in Cleveland attorneys. *Psychosomatic Medicine.* 1968, *30:*72–86.

(14) Comstock GW: Fatal arteriosclerotic heart disease, water hardness at home, and socioeconomic characteristics. *American Journal of Epidemiology.* 1971, *94:*1–10.

(15) Sloan R, Bagiella E, Powell T: Religion, spirituality, and medicine. *Lancet.* 1999, *353:*664–667.

(16) Exley C, Sim J, Reid N, Jackson S, West N: Attitudes and beliefs within the Sikh community regarding organ donation: A pilot study. *Social Science and Medicine.* 1996, *43:*23–28.

(17) Sheldon M: Ethical issues in the forced transfusion of Jehovah's Witness children. *Journal of Emergency Medicine.* 1996, *14:*251–257.

(18) Gallagher C: Religious attitudes regarding organ donation. *Journal of Transplantation Coordinators.* 1996, *6:*186–190.

(19) Levin JS, Lyons JS, Larson DB: Prayer and health during pregnancy: Findings from the Galveston Low Birthweight Survey. *Southern Medical Journal.* 1993, *86:*1022–1027.

(20) McColl MA, Bickenbach J, Johnston J, et al.: Spiritual issues associated with traumatic-onset disability. *Disability and Rehabilitation.* 2000, *22:*555–564.

(21) Levin JS, Vanderpool HY: Is religion therapeutically significant for hypertension? *Social Science and Medicine.* 1989, *29:*69–78.

(22) Berkel J, de Waard F: Mortality pattern and life expectancy of Seventh-Day Adventists in the Netherlands. *International Journal of Epidemiology.* 1983, *12:*455–459.

(23) Enstrom JE: Health practices and cancer mortality among active California Mormons. *Journal of the National Cancer Institute.* 1989, *81:*1807–1814.

(24) Krucoff MW, Crater SW, Green CL, et al.: Randomized integrative therapies in interventional patients with unstable angina: The Monitoring & Actualization of Noetic Training (MANTRA) feasibility pilot. *Circulation.* 1998, *98:*I–280.

(25) Byrd RC: Positive therapeutic effects of intercessory prayer in a coronary care unit population. *Southern Medical Journal.* 1988, *81:*826–829.

(26) Koenig HG, George LK, Hays JC, et al.: The relationship between religious activities and blood pressure in older adults. *International Journal of Psychiatry in Medicine.* 1998, *28:*189–213.

(27) Harris RC, Dew MA, Lee A, et al.: The role of religion in heart-transplant recipients' long-term health and well-being. *Journal of Religion and Health.* 1995, *34:*17–32.

(28) Saudia TL, Kinney MR, Brown KC, Young-Ward L: Health locus of control and helpfulness of prayer. *Heart and Lung.* 1991, *20:*60–65.

(29) Graham TW, Kaplan BH, Cornoni-Huntley J, et al.: Frequency of church attendance and blood pressure elevation. *Journal of Behavioral Medicine.* 1978, *1:*37–43.

(30) Larson DB, Koenig HG, Kaplan BH, et al.: The impact of religion on men's blood pressure. *Journal of Religion and Health.* 1989, *28:*265–278.

(31) McSherry E, Ciulla M, Salisbury S, Tsuang D: Spiritual resources in older hospitalized men. *Social Compass.* 1987, *35:*515–537.

(32) Oxman TE, Freeman DH, Manheimer ED: Lack of social participation or religious strength and comfort as risk factors for death after cardiac surgery in the elderly. *Psychosomatic Medicine.* 1995, *57:*5–15.

(33) Idler EL, Kasl SV: Religion among disabled and nondisabled persons: II. Attendance at religious services as a predictor of the course of disability. *Journal of Gerontology.* 1997, *52B:*S306–S316.

(34) Scotch NA: Sociocultural factors in the epidemiology of Zulu hypertension. *American Journal of Public Health.* 1963, *53:*1205–1213.

(35) Leserman J, Stuart EM, Mamish ME, Benson H: The efficacy of the relaxation response in preparing for cardiac surgery. *Behavioral Medicine.* 1989, *15:*111–117.

(36) Sudsuang R, Chentanez V, Veluvan K: Effect of Buddhist meditation on serum cortisol and total protein levels, blood pressure, pulse rate, lung volume and reaction time. *Physiology and Behavior.* 1991, *50:*543–548.

(37) Timio M, Verdecchia P, Venanzi S, et al.: Age and blood pressure changes. A 20-year follow-up study in nuns in a secluded order. *Hypertension.* 1988, *12:*457–461.

(38) Comstock GW, Tonascia JA: Education and mortality in Washington County, Maryland. *Journal of Health and Social Behavior.* 1977, *18:*54–61.

(39) Medalie JH, Kahn HA, Neufeld HN, et al.: Myocardial infarction over a five-year period—I. Prevalence, incidence and mortality experience. *Journal of Chronic Diseases.* 1973, *26:*63–81.

(40) Medalie JH, Kahn HA, Neufeld HN, Riss E, Goldbourt U: Five-year myocardial infarction incidence—II. Association of single variables to age and birthplace. *Journal of Chronic Diseases.* 1973, *26:*329–349.

(41) Cooper MJ, Aygen MM: A relaxation technique in the management of hypercholesterolemia. *Journal of Human Stress.* 1979, *5:*24–27.

(42) Blackwell B, Bloomfield S, Gartside P, et al.: Transcendental meditation in hypertension. Individual response patterns. *Lancet.* 1976, *1:*223–226.

(43) Goldbourt U, Yaari S, Medalie JH: Factors predictive of long-term coronary heart disease mortality among 10,059 male Israeli civil servants and municipal employees. *Cardiology.* 1993, *82:*100–121.

(44) Wenneberg SR, Schneider RH, Walton KG, et al.: A controlled study of the effects of the transcendental meditation program on cardiovascular reactivity and ambulatory blood pressure. *International Journal of Neuroscience.* 1997, *89:*15–28.

(45) Miller RN: Study on the effectiveness of remote mental healing. *Medical Hypotheses.* 1982, *8:*481–490.

(46) Patel C, North WR: Randomised controlled trial of yoga and bio-feedback in management of hypertension. *Lancet.* 1975, *2:*93–95.

(47) Patel C, Carruthers M: Coronary risk factor reduction through biofeedback-aided relaxation and meditation. *Journal of the Royal College of General Practitioners.* 1977, *27:*401–405.

(48) Patel C, Datey KK: Relaxation and biofeedback techniques in the management of hypertension. *Angiology.* 1976, *27:*106–113.

(49) Burell G: Group psychotherapy in project New Life: Treatment of coronary-prone behaviors for patients who have had coronary artery bypass graft surgery. In Allan R, Scheidt S (eds), *Heart and Mind.* Washington DC: American Psychological Association, 1996, 291–310.

(50) Kumanyika SK, Charleston JB: Lose weight and win: A church-based weight loss program for blood pressure control among black women. *Patient Education and Counseling.* 1992, *19:*19–32.

(51) Stavig GR, Igra A, Leonard AR: Hypertension among Asians and Pacific islanders in California. *American Journal of Epidemiology.* 1984, *119:*677–691.

(52) Wardwell WI, Hyman M, Bahnson CB: Socio-environmental antecedents to coronary heart disease in 87 white males. *Social Science and Medicine.* 1968, *2:*165–183.

(53) Hixson KA, Gruchow HW, Morgan DW: The relation between religiosity, selected health behaviors, and blood pressure among adult females. *Preventive Medicine.* 1998, *27:*545–552.

(54) Koenig HG: Religion and death anxiety in later life. *Hospice Journal.* 1988, *4:*3–24.

(55) Alexander CN, Schneider RH, Staggers F, et al.: Trial of stress reduction for hypertension in older African Americans. *Hypertension.* 1996, *28:*228–237.

(56) Schneider RH, Staggers F, Alexander CN, et al.: A randomised controlled trial of stress reduction for hypertension in older African Americans. *Hypertension.* 1995, *26:*820–827.

(57) Friedlander Y, Kark JD, Stein Y: Religious observance and plasma lipids and lipoproteins among 17-year- old Jewish residents of Jerusalem. *Preventive Medicine.* 1987, *16:*70–79.

(58) Lapane KL, Lasater TM, Allan C, Carleton RA: Religion and cardiovascular disease risk. *Journal of Religion and Health.* 1997, *36:*155–163.

(59) Walsh A: Religion and hypertension: Testing alternative explanations among immigrants. *Behavioral Medicine.* 1998, *24:*122–130.

(60) Walsh A: The prophylactic effect of religion on blood pressure levels among a sample of immigrants. *Social Science and Medicine [Medical Anthropology].* 1980, *14B:*59–63.

(61) Hutchinson J: Association between stress and blood pressure variation in a Caribbean population. *American Journal of Physical Anthropology.* 1986, *71:*69–79.

(62) Gupta R, Prakash H, Gupta VP, Gupta KD: Prevalence and determinants of coronary heart disease in a rural population of India. *Journal of Clinical Epidemiology.* 1997, *50:*203–209.

(63) Steffen PR, Alumenthal J, Sherwood A: Religious coping, ethnicity, and ambulatory blood pressure. *Psychosomatic Medicine.* 2000, *62:*148.

(64) Merritt MM, Bennett GG, Williams RB: Religiosity enhances cardiovascular reactivity among Black males with low education. *Psychosomatic Medicine.* 2000, *62:*139.

(65) Thoresen CE: Long-term, 8-year follow-up of Recurrent Coronary Prevention Program. Meeting of the International Society of Behavioral Medicine. Uppsala, Sweden: 1990.

(66) Livingston IL, Levine DM, Moore RD: Social integration and Black intraracial variation in blood pressure. *Ethnicity & Disease.* 1991, *1:*135–149.

(67) Friedlander Y, Kark JD, Stein Y: Religious orthodoxy and myocardial infarction in Jerusalem: A case control study. *International Journal of Cardiology.* 1986, *10:*33–41.

(68) Zamarra JW, Schneider RH, Besseghini I, Robinson DK, Salerno JW: Usefulness of the transcendental meditation program in the treatment of patients with coronary artery disease. *American Journal of Cardiology.* 1996, *77:*867–870.