

**The Link between
Religion and Health:
Psychoneuroimmunology
and the Faith Factor**

*Harold G. Koenig
Harvey Jay Cohen,
Editors*

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Psychoneuroimmunology and the Faith Factor

EDITED BY

Harold G. Koenig

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To Sir John Templeton

whose vision and generosity made this possible

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Foreword

Psychoneuroimmunology and the Faith Factor—what an interesting subtitle and combination of concepts for a book! Psychoneuroimmunology (PNI) is the study of the relationship between the mind, the immune system, and health. Eleven chapters of this book discuss various aspects of PNI. They suggest that when the brain perceives an event as unpleasant or stress evoking, specific areas of the brain are activated, which initiate the release of hormones from nerve terminals in lymphoid tissue, while other hormones associated with the hypothalamic-pituitary-adrenal axis are released into plasma. If the cells that comprise the immune system have receptors for these hormones, the activity of the immune cells may be modified. The summative effect of the multiple hormones that bind to receptors will either increase or decrease the function of a cell. Depending on the biological function of the cells whose function is altered, the activity of the immune system will be modified. The clinical and epidemiological data presented in chapters 5 through 11 suggest that the net effect is decreased immune system function and increased susceptibility to those diseases in which the immune system is related to the disease etiology, pathogenesis, or both.

The obvious intent of this book, as implied by the title, is to suggest that faith may affect the quality of health through pathways being defined by research in the science of PNI. What could be the basis of the relationship? It is unlikely that faith can modify hormone receptors. It is more likely that faith can affect the concentration of hormones released by nerve terminals and produced by the hypothalamic-pituitary-adrenal axis. How? If faith can ameliorate the activation of the brain areas involved with activation of the nerves and release of the hormones associated with altered immune function, a more efficient and effective immune system would result, with decreased development of immune-related disease.

How could faith influence the activity of the brain? Possibly, there are areas of the brain that are activated when individuals invoke their faith-associated belief system or engage in activities that they relate to faith. Activation of these areas may inhibit activation of the stress-responsive brain areas. Possibly, individuals who have high levels of faith interpret events that are potentially high in stress differently than individuals who have low levels of faith—with their belief that God will help them through the difficult time. Possibly, the social relationships that are often associated with sharing one's faith with others may alter an individual's perception of a highly stressful situation, minimizing the activation of stress-related areas of the brain.

Obviously, the mechanisms are not known and can only be speculated upon. As epidemiological data support an association between faith and health, an understanding of the mechanism responsible for the association may provide a means to activate the mechanism through emotional modalities other than those associated with faith. The studies reported in this book suggest that a logical mechanism by which faith can be associated with a better quality of health is through the brain-immune system pathways that are being defined by the discipline of psychoneuroimmunology. The authors hope this book will excite others to pursue studies in this area. The public health impact may be enormous.

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The Link between Religion and Health

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Introduction

HAROLD G. KOENIG & HARVEY JAY COHEN

On July 12, 1999, twelve of the world's leading psychoneuroimmunologists, theologians, and physicians were brought together at Duke University to review the effects of stress on the immune system and to see how this knowledge might inform us about the religion-health relationship. During the past three decades, hundreds of separate research studies conducted by different investigators studying different populations throughout the world have reported a relationship between religious involvement, better physical health, and greater longevity. Why this connection between religion and physical health exists, however, remains largely a mystery. Because of the close connection between religion and mental health and the increasingly understood connection between mental health and immune functioning, we proposed the possibility that religious involvement might affect physical health through neuroendocrine and immune mechanisms. The Duke conference, entitled Psychoneuroimmunology and the Faith Factor in Human Health, became the first attempt to address this question within the mainstream scientific community.

Who should read this book? Scientists and academic researchers will find here a gold mine of ideas and possible projects, as well as a wealth of information about study methodologies and research instruments. Educators will discover plentiful information to update their students about the newest advances in psychoneuroimmunology (PNI) and to stimulate thinking about how religious beliefs and practices might influence health through known physiological mechanisms. They will also find here thoughtful discussions by eminent theologians and sociologists about the religious and societal implications of such research. Students will learn how

the mind, body, and spirit are intimately connected through a host of neurological, endocrine, and immune pathways. The general reader will discover in this book a fascinating exposé of the mind-body relationship—a relationship that may help provide a rational explanation of how devout religious beliefs and practices might affect not only their sense of well-being and quality of life but also their physical health and longevity. Although even the most ardent skeptic may admit the emotional benefits of faith, the physical health ramifications of religious belief, ritual, and community—acting through established physiological pathways—may not have been fully considered. Even if they have pondered these possible health effects of religion, both skeptic and believer may not have thought through the theological and societal implications that such research might have.

This book not only documents the discussions in the Duke conference among this group of highly skeptical scientists but also expands these discussions to include more detailed and thoughtful consideration of the connection between PNI and the religion-health relationship. Several scientists who could not attend the conference nevertheless agreed to work with us to produce chapters on their areas of expertise for this book. The end result is a series of 15 chapters, written by the eminent leaders in the PNI field, that discuss the areas of most active research and consider how research exploring the religion-immunity relationship might be conducted and interpreted.

Chapter 1 reviews research that examines the relationships between religion, mental health, and social support. If there is an association between religious involvement, better mental health, and greater social support, and if mental health and social support contribute to better immune functioning, then perhaps religious practices could also have an impact on immune function. This could help explain recent findings on the relationship between religion and physical health, particularly the rather consistent finding that religious activity is related to greater longevity. While still quite preliminary, a few studies have actually documented the association between religion and immune function, and these are reviewed.

The author of chapter 2 is George Solomon from UCLA, who, together with Robert Ader, helped give birth to the field of psychoneuroimmunology. In his chapter, Solomon reviews the history of the field, highlighting the events that have made this area of study into a highly respected scientific and medical discipline.

In chapter 3, immunologist Bruce Rabin from the University of Pittsburgh describes how psychological stress affects the brain, neuro-

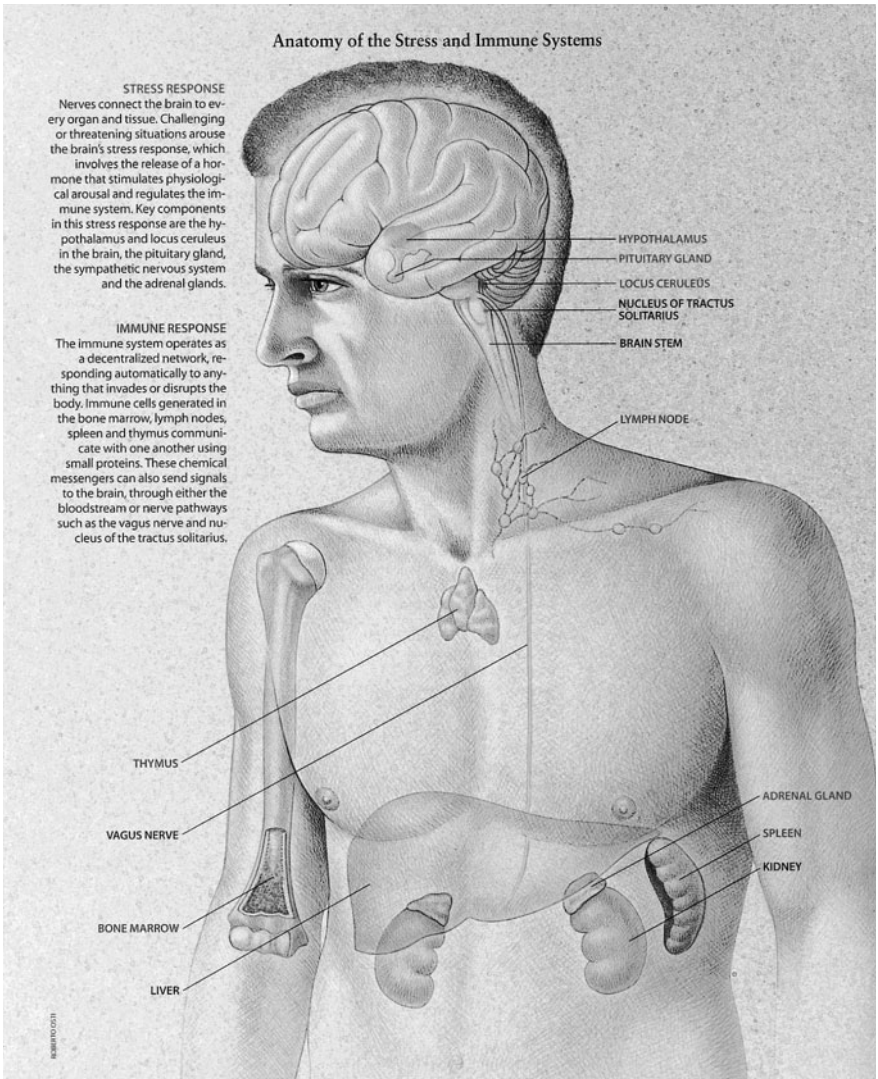


Figure I.1 “Anatomy of the stress and immune systems,” by Roberto Osti. From *Scientific American*, special issue vol. 7, no. 1 (1997). Reprinted courtesy of Roberto Osti.

endocrine system, and, ultimately, the cardiovascular and immune systems. A theoretical model is presented that details the effects of stress on the locus ceruleus and sympathetic nervous system, which connect the brain to primary and secondary lymph organs. He outlines how stress affects the hypothalamus, the pituitary, the adrenals, and the hormones

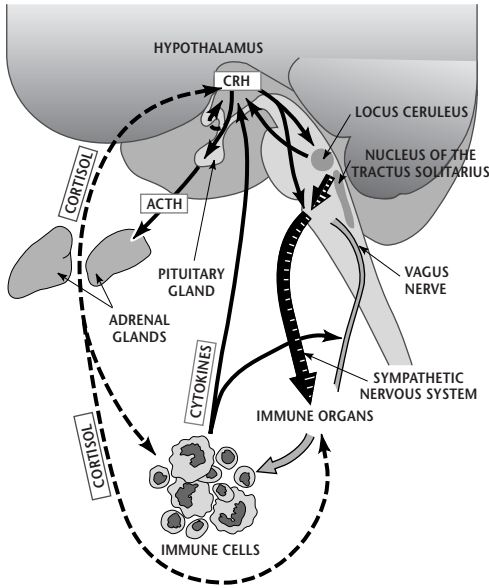


Figure I.2 Adapted from “Interaction of brain and immune system,” by Roberto Osti, from *Scientific American*, special issue vol. 7, no. 1 (1997), courtesy of Roberto Osti. The brain and immune system can either stimulate (solid arrows) or inhibit (dotted arrows) each other. Immune cells produce cytokines (chemical signals) that stimulate the hypothalamus through the bloodstream or via nerves elsewhere in the body. The hormone CRH, produced in the hypothalamus, activates the HPA axis. The release of cortisol tunes down the immune system. CRH, acting on the brain stem, stimulates the sympathetic nervous system, which innervates immune organs and regulates inflammatory responses throughout the body. Disruption of these communications in any way leads to greater susceptibility to disease and immune complications.

produced by these glands that ultimately affect cellular immunity, antibody production, and cytokine activity. Rabin discusses how religious beliefs and activity might influence this system by improving coping and increasing support or, alternatively, may simply be a marker for some other factor (genetic or acquired) that is associated with lower stress and greater sociability.

In chapter 4, Ron Herberman describes and discusses natural killer (NK) cells, a type of lymphocyte that may play a critical role in cancer surveillance and containment. As one of the discoverers of the NK cell, Herberman is better qualified than anyone else to review the research that

connects psychological and social stress to NK cell activity, which may be a key link to help explain how psychosocial factors influence susceptibility to cancer and affect its course.

In chapter 5, psychiatrists David Spiegel and Fawzy Fawzy describe the effects that social interventions can have on cancer prognosis. These two world-renowned medical scientists at Stanford University and UCLA, respectively, have each led major studies that examined the impact of psychosocial and behavioral interventions on survival in patients with breast cancer and malignant melanoma, respectively. They discuss here in detail these interventions and the immune mechanisms that may be involved in the remarkable effects observed.

In chapter 6, Sheldon Cohen from the University of Pittsburgh discusses his research on psychosocial stress, social support, and susceptibility to infection that has helped to mainstream psychoneuroimmunology into the field of medicine. His review of how social factors may affect immune functioning and disease susceptibility is perhaps the best in the published literature at this time. He goes on to hypothesize that religious factors may influence both psychological and social functioning to a degree that health is significantly affected.

In chapter 7, we further examine the effects of social factors on neuroendocrine and immune function, reviewing the work of Janice Kiecolt-Glaser and her husband, Ronald Glaser, at Ohio State University. These investigators have documented the effects of caregiver stress, marital discord, and even stress during student exams on endocrine and immune functioning. Moreover, in a series of elegant experiments in animals and humans, they have shown how stress—acting through immunological mechanisms—can significantly impair the speed of wound healing (with all the implications that has for recovery from trauma, accidents, and surgery).

In chapter 8, Gail Ironson and Neil Schneiderman at the University of Miami explore the pathogenesis of HIV infection, its treatment, and the various psychosocial factors known to play a role in the progression of HIV to AIDS. They also examine the impact of religious and spiritual beliefs and practices on these psychosocial factors and the implications that this may have for the treatment of HIV/AIDS.

In chapter 9, Redford Williams examines the relationships between hostility and anger, neuroendocrine change, and health outcome. His work has helped to establish how anger and hostile aggression can have devastating cardiovascular effects that shorten survival. Because religious and

spiritual traditions emphasize the mastery and control of negative emotions, Williams notes that this may offer opportunities not only for studying the phenomenon of hostility itself but also for understanding the ways that the health-damaging effects of hostility might be thwarted.

In chapter 10, we discuss diseases that result not from a hypoactive immune system but rather from an immune system functioning in an exaggerated or uncontrolled fashion. This is seen in autoimmune diseases such as psoriasis, rheumatoid arthritis, Graves's disease, multiple sclerosis, insulin-dependent diabetes mellitus, lupus erythematosus, inflammatory bowel disease, chronic fatigue syndrome, and a host of other disorders that result when an overactive immune system attacks normal healthy tissue. The work of Esther Sternberg at the NIH and Bruce Rabin at the University of Pittsburgh has helped clarify how stress can affect these diseases and how interventions that reduce stress may help to ameliorate them. In particular, we see how religious beliefs and practices (from Buddhist to Judeo-Christian traditions) may help reduce stress by improving coping and thereby favorably affect the course of these diseases.

In chapter 11, measures of immune function, neuroendocrine function, religion, and spirituality are reviewed and discussed, pointing out the various strengths and weaknesses of different instruments. This chapter is key for researchers and scientists who wish to study the relationship between religion and psychoneuroimmunology. To our knowledge, this is the only source that provides detailed information on both religious and PNI measures, as well as suggestions on which of these measures might best be used to identify relationships.

In chapter 12, eminent theologian Paul Griffiths from the University of Chicago briefly overviews the religious traditions of Buddhism, Hinduism, Taoism, Confucianism, and Shinto, religions adhered to by more than a billion people. He explores the implications that PNI research may have for members of Eastern religious traditions. He also discusses concerns about how information on religion and health may be used and interpreted.

In chapter 13, Warren Brown from Fuller Theological Seminary in Pasadena, California, discusses the implications of PNI research for members of Western religious traditions such as Christianity, Judaism, and Islam, in which God is understood in monotheistic and personal terms. Of particular interest is his discussion of the importance of personal relationship and emotional disclosure as they are expressed in Western religious traditions.

In chapter 14, sociologist Howard Kaye from Franklin and Marshall College discusses the implications for medicine, society, and culture of learning about the biochemical pathways by which spirituality and religious practice exert their influence on health. He discusses important and sometimes difficult questions, including how physicians and health care systems should utilize such information in their care of patients. Kaye draws comparisons with social Darwinism and the eugenics movement of the nineteenth century to make his points. As does Griffiths, he also expresses concern about the utilitarian use of religion to improve health or immune functioning.

In chapter 15, we explore avenues for future research in the area of religion, spirituality, and psychoneuroimmunology. These recommendations come directly from our July conference at Duke and, in particular, from discussions involving the PNI experts and theologians who have written this book. Here we present and prioritize specific research studies that need to be done to advance the field, information that should be useful not only to scientists but also to funding agencies that wish to support this effort.

In these 15 chapters, we have covered an enormous amount of theory and research that will help provide the foundation for future efforts to better understand how the mind, the body, and the spirit are intimately connected. We believe that such research will help validate the importance of treating the whole person in our health care system. It is becoming clearer and clearer that efforts in medicine to treat the biological disease alone will not result in complete healing unless the other aspects of what it means to be human are also considered.

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The Connection between Psychoneuroimmunology and Religion

HAROLD G. KOENIG

Psychoneuroimmunology is the study of how social and psychological factors affect neuroendocrine and immune functioning. Religion involves beliefs about *the transcendent*, as well as private or communal practices and rituals that reflect devotion or commitment to those beliefs. Why should religion and psychoneuroimmunology be related, and how? This chapter provides a background to help us understand why a connection between these two seemingly disparate topics might exist—and, in fact, makes good sense.

Historical Perspective

Religious beliefs and practices throughout recorded history have been associated with health and healing practices. All early human civilizations (Mesopotamian, Egyptian, Indian, Chinese, Greek, and Roman) dealt with physical illness in religious or spiritual terms (Koenig, McCullough, et al., 2001). Supernatural methods of treatment often involved healing rituals, prayers, incantations, or religious pilgrimages. Until recently, however, it had not been considered that religion might have an impact on physical health through natural mechanisms—that is, via social, psychological, and behavioral pathways. Relatively little attention was paid to the effects of religious beliefs and practices on mental health or social support until the latter half of the twentieth century. Research in this area, however, has been rapidly accumulating. In a recent review of this literature, we discovered that more than 850 studies have examined the relationship

between religious belief or practice and mental health or social functioning (Koenig, McCullough, et al., 2001).

Religion and Coping with Stress

Stress is common in modern society and comes in many forms. These include the stress of interpersonal conflict, unfulfilled expectations, disappointments, job and financial pressure, loss of loved ones or broken relationships, loss of dreams and hopes, and loss of health and independence—to name just a few. In this book, we will learn that psychosocial stress influences a number of biological processes in the body responsible for homeostasis—the delicate physiological equilibrium necessary for survival. Religion may be an important way that people cope with stress. As throughout human history, this continues to be true even today in the United States, one of the most educated and technologically advanced countries in the world.

In national surveys asking people to agree or disagree that religion provides personal comfort and support, 78% of Americans of all ages indicate that the statement is mostly or completely true, and nearly 90% of older adults do so (Princeton Religion Research Center, 1982, p. 120). A study of 100 healthy community-dwelling older adults found that religious methods were the most common form of coping, particularly among women (nearly two-thirds of whom used religion as their primary coping strategy during stressful periods) (Koenig, George, & Siegler, 1988). This is not as true, however, in other parts of the world. According to Rudestam (1972), approximately 80% of persons in Sweden indicated “none” when asked about their degree of religiosity (compared to only about 10% of persons in the United States who give this response). Likewise, Ringdal et al. (1995) found that nearly half (43–45%) of their cancer patients in Norway did not believe in God or receive comfort from religious beliefs.

In the United States and many other areas of the world, however, most people report that religious beliefs and activities provide comfort during stress, especially in the face of acute or chronic medical illness. For example, Kaldjian et al. (1998) reported that 98% of 90 HIV-positive patients at Yale–New Haven Hospital believed in a loving divine being called “God,” 84% expressed a personal relationship with God, and 82% indicated that their belief in God helped when they were thinking about death. Such a finding is not unusual. In fact, more than 40% of medical patients in some

areas of the United States indicate that religion is the *most important factor* that enables them to cope with illness, and an *additional* 50% report that it helps to a moderate or large degree (Koenig, 1998). Only about 10% of patients with medical illness indicate little or no comfort from religion. Other researchers have reported similar findings, particularly among older adults, women, and African Americans (Conway 1985; Manfredi & Pickett, 1987; Swanson & Harter, 1971). To what extent, however, do religious beliefs and practices result in improved coping, better mental health, or greater quality of life?

Religion, Well-Being, and Mental Health

In fact, studies do suggest that religious beliefs and practices contribute to positive emotions such as well-being, life satisfaction, and happiness. In a recent systematic review of the scientific literature that uncovered 100 studies of this relationship, 79% reported a significant positive association between religious involvement and greater well-being (Koenig, McCullough, et al., 2001). Among 10 prospective cohort studies, 9 found that greater religious beliefs or activity predicted greater well-being over time. Thus, the evidence overwhelmingly supports a connection between religious involvement and positive emotions.

Religion, Optimism, and Hope. Optimism is the ability to psychologically distance oneself from negative outcomes. Hope, by contrast, is the ability to set goals, find paths to those goals, and motivate oneself to use those paths. Religious beliefs often provide a worldview that is both optimistic and hopeful, infusing difficult or traumatic life events with purpose and meaning. We identified 14 studies that examined the relationship between religiousness and optimism or hope. Of those studies, 12 found a significant positive correlation and 2 found no association. The research team of Martin Seligman (1998 president of the American Psychological Association, best known for his work on learned helplessness) discovered that persons from fundamentalist Christian groups were more optimistic than persons from liberal religious traditions (Sethi & Seligman, 1993; 1994). These investigators traced greater optimism to the content of hymns and liturgies of fundamentalists, whose themes tended to focus on joy, victory over adversity, and salvation. Studying a random sample of nearly 3,000 older adults, Idler & Kasl (1997) similarly documented an association

between religious involvement and optimism that was particularly strong among subjects who were experiencing the stress of physical disability.

Religion, Depression, and Anxiety. If religious involvement fosters hope and an optimistic, meaningful worldview, then one might also expect an inverse relationship with symptoms of depression or anxiety. This could reflect either the prevention or quicker resolution of emotional problems. Many studies appear to bear this out. Examining 850 medically ill older men, Koenig, Cohen, Blazer, et al. (1992) found significantly lower rates of depression among those relying on religious beliefs and practices to cope with the stress of their illnesses. In a follow-up study of 201 of these patients, degree of religious coping at baseline predicted significantly fewer depressive symptoms 6 months later. Conducting a similar study among consecutive patients admitted to Duke University Medical Center (including both men and women this time), Koenig, George, and Peterson (1998) identified 87 depressed patients and followed these patients for nearly 1 year after discharge, carefully tracking the course of the depressive disorder. Rather than studying factors that were protective against depression (as in the 1992 study), investigators examined characteristics of depressed persons that might predict who would recover more quickly from depression. Greater intrinsic religiosity at baseline, measured with a standard 10-item scale, predicted a 70% increase in the speed of remission of depression.

Other investigators have reported similar findings in a variety of populations: Rabins et al. (1990) in caregivers of patients with Alzheimer's disease or end-stage cancer, Miller et al. (1997) in women with recurrent depression and their children, and Braam et al. (1997) in community-dwelling older adults in the Netherlands. In our systematic review referred to earlier, we identified 93 studies that had examined the relationship between religious involvement and depression; we found that 60 of these reported at least one significant correlation between greater religious involvement and less depression (Koenig, McCullough, et al., 2001). Of the remaining 33 studies, 13 reported no association, 4 found greater depression among the more religious, and 16 reported both positive and negative associations with different religious variables. Of particular importance was that 15 of 22 prospective cohort studies found greater religiousness at baseline predicted either less depression or quicker recovery from depression when subjects were reevaluated over time. In addition, of 8 clinical trials conducted using religious interventions, 5 showed that depressed

patients who received religious treatments recovered faster than patients receiving only a secular intervention or no treatment. Furthermore, of 68 studies examining the relationship between religion and suicide, 57 (84%) found significantly less suicide or more negative attitudes toward suicide among the more religious.

Similar relationships were found for anxiety symptoms, anxiety disorders, and fears concerning death. We identified 7 clinical trials and 69 observational studies that examined relationships with religious variables. More than half of the observational studies (35 of 69) found significantly less anxiety or fear among the more religious, and 6 of the 7 clinical trials found that religious interventions were more effective for reducing anxiety than secular therapy alone or no treatment.

Religion and Social Support

Religiously involved people consistently report greater social support than do the religiously uninvolved. This applies to both persons attending religious services and those involved in private religious practices like prayer. In our review, 19 of 20 studies found a significant positive association between religious involvement and greater social support (Koenig, McCullough, et al., 2001). Many of the studies involved large random samples of the American population, ranging from 2,956 to 4,522 participants (Bradley, 1995; Ellison & George, 1994; Koenig, Hays, George, et al. 1997; Ortega et al., 1983). More important, support provided by religious sources appears to be more satisfying and more resilient than support from secular resources. This is particularly true for those experiencing declines in physical health and functioning with age, when sources of support often begin to diminish. Continued provision of support from religious sources is bolstered by religious belief systems that emphasize the responsibility to care for and support one another during times of need.

Social Support and Aging. Cutler (1976) conducted a national random survey of 833 elderly persons in the United States to assess voluntary associations. Membership in church-affiliated groups *alone* was a significant predictor of life satisfaction and happiness after covariates and membership in other associations were controlled. About three-quarters of older adults in the sample belonged to one or more voluntary associations: 49% belonged to church-affiliated groups (more than all other associations combined), with the next most common being fraternal groups (18%) and veterans

groups (9%). In a random sample of 4,000 community-dwelling older adults, Koenig, Hays, George, et al. (1997) found that frequency of private religious activities (prayer and Bible study) was associated with significantly greater social support after controlling for multiple demographic and health factors, including church attendance.

Social Support and African Americans. Ortega et al. (1983) surveyed a random sample of 4,522 persons in urban, rural, and isolated rural communities in northern Alabama; the sampling method was designed to oversample physically disabled people, elderly people, women, and African-Americans. Using regression models that included multiple controls, investigators found that informal interpersonal contact was the strongest predictor of life satisfaction. Interpersonal contact produced this effect, however, only if friendships had the church as their locus. Investigators concluded that the greater life satisfaction of African-American elderly people in this study was due almost entirely to greater contact with church-related friends; in fact, church-related friendships were more strongly related to life satisfaction than race itself was.

Social Support and Women. Hatch (1991) examined the relationship between religious involvement and social support among 1,439 women participating in the National Survey of Families and Households. Among African-Americans, frequent attendance at religious social events was associated with a lower likelihood of selecting children for help and a greater likelihood of selecting nonrelatives for help. Help received from nonrelatives for both African-Americans and whites was significantly associated with participation in religious social events. Hatch concluded that, especially among older African-American women, greater involvement in religious social activities was associated with greater help given to and provided by nonrelatives and less help involving adult children. As the number of elderly persons grows in countries around the world, and as adult children increasingly face the stress of caring for aging parents, the church may become an increasingly vital resource for relieving this burden (on women, especially).

Quality of Social Support. Ellison and George (1994) surveyed a random sample of 2,956 community-dwelling adults as part of Wave II of the NIMH Epidemiologic Catchment Area (ECA) project, North Carolina site. Using regression analysis to control for other covariates, investigators

found that greater church attendance significantly predicted number of non-kin ties, in-person contacts, and telephone calls, as well as amount of instrumental support received. There was also a significant relationship between church attendance and *quality of social support*, even after controlling for other measures of social support. It is clear, then, from multiple studies that religious involvement is a key source of meaningful high-quality support for many Americans, especially older adults, women, and African Americans.

In conclusion, if relationships exist between religion, mental health, and social support, then this provides an important pathway by which religion could influence physical health. This could be largely due to mind-body effects that are now being identified and will be described later in this volume.

Religion, Physical Health, and Mortality

Of particular interest is the relationship between religious involvement and physical health. This relationship is perhaps most evident in studies that examine the effects of religious activities on mortality and survival. Since 1993, 13 published studies have examined the relationship between religious activity and longevity. Twelve of these studies report a significant relationship between greater religious involvement and longer survival.

Jews. Goldbourt et al. (1993), following 10,000 Israeli male civil service workers for 23 years, found that religiously involved Jews were 20% less likely than nonbelievers to die of coronary artery disease (after controlling for multiple risk factors). Kark et al. (1996) conducted a 16-year historical cohort study, comparing survival between members of 11 religious kibbutzim and 11 matched secular kibbutzim in Israel. In this study of 3,900 participants, the likelihood of dying was 93% greater among members of secular than of religious kibbutzim. Even after eliminating social support and other risk factors as confounding variables, members of religious kibbutzim still lived significantly longer than members of secular kibbutzim.

Christians. Oxman et al. (1995), following 232 older adults for 6 months after they had open-heart surgery, found that the likelihood of dying during the follow-up period was three times greater in those receiving no comfort or support from religious faith (a finding independent of other risk factors and social support). In the only one of 13 studies that did not

find an effect of religion on survival, Koenig, Larson, et al. (1998) conducted a 9-year follow-up study of 1,010 patients ages 20 to 39 and 65 to 102 years who had been admitted to the general medicine and neurology services of the Durham Veterans Administration Medical Center. Religious coping (degree to which the patient relied on religious faith for comfort and strength) was again examined as a predictor of survival; Cox proportional hazards models were used to control for other predictors of survival. Religious coping was unrelated to survival in both bivariate and multivariate analyses (hazard ratio 1.00, 95% CI 0.99–1.01). Investigators explained this lack of association as being due to persons turning to religion to facilitate coping as illness severity worsened and death approached (thus disguising any impact of religious coping on survival). A more recent study by this research group, however, reported an inverse relationship between private religious activity (prayer and Bible study) and mortality, but only among healthy older adults without physical disability (Helm et al., 2000). They concluded that whereas private religious activity also may prolong the survival of persons with physical illness and disability, this effect can be more easily demonstrated in healthy persons in whom the force of mortality exerted by physical illness is not as great.

Krause (1998) also failed to find an overall association between religious coping and survival, although interactions were again substantial. He examined predictors of mortality over 6 years in a national probability sample of 819 older adults. Self-rated health and functional disability were controlled, along with age, sex, and marital status. Results indicated that religious attendance (organizational religiosity) was inversely related to mortality (odds ratio 0.88, 95% CI 0.79–0.98). Religious coping, however, was not. In fact, there was an overall slight positive relationship with mortality (odds ratio 1.15, 95% CI 1.02–1.29, $p < .05$). However, when the interaction between religious coping and salient roles stress was examined, Krause found that that among those subjects who were experiencing severe stress in areas of life that were important to them, religious coping was associated with lower mortality (odds ratio 0.94, 95% CI 0.88–0.996, $p < .05$). In fact, among less-educated older adults (those with fewer than 10 years of education), stressors in highly valued social roles were associated with a greater than 70% increase in the likelihood of dying for those not relying heavily on their religious faith.

A number of other studies suggest that religious attendance, in particular, is a powerful predictor of survival. Goldman et al. (1995) examined mortality over 6 years in a random national sample of nearly 7,500 persons

age 70 or over (National Health Survey). After controlling for demographics, disability, self-rated health, and medical conditions, not attending church within the past 2 weeks was associated with an increased probability of dying for both men and women. Expanding that sample to include 15,938 subjects age 55 or older, Rogers (1996) found that 53.7% of persons alive in 1991 had attended church or temple in 1984, compared with 41.1% of those who died during follow-up. This highly significant difference persisted after controlling for multiple social factors, physical health, and other predictors of survival.

In one of the best designed studies to date, Strawbridge and colleagues (1997) followed 5,286 participants in the Alameda County Study for nearly three decades to examine the effects of religious attendance on survival. At the beginning of the study in 1965, frequent church attenders typically were women, black, more likely to have close social contacts and more group memberships, and less likely to smoke cigarettes, consume excessive alcohol, or be depressed, although they also were *more likely* to have impaired mobility. After adjusting for the usual predictors of survival at baseline and time-varying covariates during follow-up, frequent religious attendance (once a week or more) was associated with a 23% lower likelihood of dying during the 28-year period. Investigators also found that frequent attenders were more likely to stop smoking, increase exercising, increase social connections, and stay married; none of these factors, however, could explain the lower mortality of churchgoers.

Likewise, Oman and Reed (1998) reported that religious attendance was associated with prolonged survival in 1,931 older residents of Marin County (just north of San Francisco). Frequent attenders, particularly those who also volunteered time to help others, were significantly less likely to die during the 5-year follow-up, an effect that persisted after other predictors of survival were controlled. Interestingly, secular types of social involvement were not associated as strongly with lower mortality.

Three other studies that examined large random American samples reported similar findings soon after the Strawbridge and Oman studies from California were published. Koenig, Hays, Larson, et al. (1999), following 4,000 randomly selected older adults for 6 years, examined the effects of frequent religious attendance (once per week or more) on survival after controlling for multiple predictors of survival. Attempting to replicate the Strawbridge et al. (1997) West Coast study on the East Coast, these investigators used similar control variables and analyzed their data following Strawbridge's analysis plan. The findings were remarkably similar. After