

# Does Private Religious Activity Prolong Survival? A Six-Year Follow-up Study of 3,851 Older Adults

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**Background.** Previous studies have linked higher religious attendance and longer survival. In this study, we examine the relationship between survival and private religious activity.

**Methods.** A probability sample of elderly community-dwelling adults in North Carolina was assembled in 1986 and followed for 6 years. Level of participation in private religious activities such as prayer, meditation, or Bible study was assessed by self-report at baseline, along with a wide variety of sociodemographic and health variables. The main outcome was time (days) to death or censoring.

**Results.** During a median 6.3-year follow-up period, 1,137 subjects (29.5%) died. Those reporting rarely to never participating in private religious activity had an increased relative hazard of dying over more frequent participants, but this hazard did not remain significant for the sample as a whole after adjustment for demographic and health variables. When the sample was divided into activity of daily living (ADL) impaired and unimpaired, the effect did not remain significant for the ADL impaired group after controlling for demographic variables (hazard ratio [RH] 1.11, 95% confidence interval [CI] 0.91–1.35). However, the increased hazard remained significant for the ADL unimpaired group even after controlling for demographic and health variables (RH 1.63, 95% CI 1.20–2.21), and this effect persisted despite controlling for numerous explanatory variables including health practices, social support, and other religious practices (RH 1.47, 95% CI 1.07–2.03).

**Conclusions.** Older adults who participate in private religious activity before the onset of ADL impairment appear to have a survival advantage over those who do not.

THE impact of religion on health is a topic of increasing interest to epidemiologists, sociologists, and clinicians. Many recent studies have found health differences between religious and nonreligious groups, yet many questions remain unanswered. New studies are needed to illuminate which specific areas of religious participation are beneficial to which health outcomes (1).

Investigations to date have predominantly explored the effect of organizational religious behaviors, such as church attendance, on health. Although some research has been criticized for poor design, a growing body of soundly conducted investigation is showing a positive health effect for religious participants (2,3). Six recent studies have demonstrated a reduction in mortality for frequent church attenders, even after controlling for demographic, health, social, and psychological factors known to impact mortality (4–9).

Studies of private religious activities have shown a psychological benefit for participants. In a randomized, controlled, double-blind study, O’Laiore found persons who pray to have improvement over nonpraying counterparts in 10 of 11 measures of self-esteem, anxiety, and depression (10). Other studies have shown a correlation between sense of well-being and private religiousness (11–13).

Few prospective studies have been published to date that analyze the relationship between physical health and private religiousness. Various cross-sectional studies have shown that those who are sicker or more disabled pray more (14,15). This finding agrees with Krause and Van Tran’s suppressor model of religiousness, which theorizes that religion

is used as a coping device in times of crisis (16), but it fails to demonstrate possible health benefits. Gupta identified prayer as protective against coronary heart disease in a rural population in Rajasthan, India (17), but did not find prayer to be significantly protective in an urban population (18). Do private religious activities such as prayer or study of scripture have a beneficial health effect in a Western population?

We hypothesized that elderly persons who participated in private religious activity would survive longer than those who did not and that this benefit would be stronger in those who reported private religious activity in the absence of any impairment in activities of daily living (ADLs). Impairment in ADLs has been shown to correlate with both increased private religious activity and increased mortality (15,19). Analysis of the ADL impaired and the ADL unimpaired separately may show greater benefit for the ADL unimpaired, because their religious activity may reflect habit and not simply prayer under duress.

## METHODS

### *Design and Sample*

This study used a prospective cohort design. Data came from the Duke University Established Populations for Epidemiologic Studies of the Elderly (Duke/EPESSE), a population survey that was part of a multicenter, collaborative investigation of persons aged 65 and older. The North Carolina sample was enrolled in 1986–1987 and is a popu-

lation-based, stratified random sample, with African American and rural older adult subjects oversampled. At baseline, 5,223 residents of five contiguous counties (Durham, Granville, Vance, Warren, and Franklin) in the Piedmont area of North Carolina were selected. Details of the sampling method are presented elsewhere (20). Of those initially selected, 4,162 completed the baseline survey, yielding an 80% response rate. Of these, 26 were neither Caucasian nor African American and were deleted from the analysis. An additional 160 proxy interviews were deleted, because no self-reported data were available for these interviews. Of the remaining 3,976, data on private religious activities were available for 3,851 sample members.

Analysis of the 125 nonresponders to the private religious activity question versus the 3,851 responders revealed no significant differences in age, gender, rural or urban location, or years of school between the groups. However, a higher percentage of African Americans than white sample members answered the religion items.

The religious composition of the sample is overwhelmingly Protestant (97.3%, with 59.3% Baptist). Only 1.0% identified themselves as Catholic, Jewish, or Eastern Orthodox; 1.4% reported that they were either atheist or had no religious association; 0.2% of sample members had missing data for this question.

### Assessment

Private religious activities were assessed by the question "How often do you spend time in private religious activities, such as prayer, meditation, or Bible study?" Responses available were (1) rarely or never, (2) a few times a month, (3) once a week, (4) two or more times a week, or (5) daily (or more often). Responses were dichotomized into rarely or never (1) versus all other groups (2–5). There were 678 sample members (17.6%) in the rarely to never group and 3,173 sample members (82.4%) in the other groups combined.

Vital status was assessed through annual follow-up interviews either by telephone or in person, with dates of death confirmed by abstracting death certificates ( $n = 1,137$ ). Surveillance continued until 1992, with length of time in days from the initial interview until death recorded as the time until death. Those alive at the final interview in 1992 were censored at 183 days (6 months) beyond the last interview date. Those lost to follow-up, 7.3%, were censored at 183 days beyond the last contact.

Covariates were chosen because of demonstrated associations with mortality (4,20–28). All were measured at baseline (1986–1987) and comprised five categories: religion, demographics, physical and mental health, social connections, and health practices (see Table 1).

In addition to private religious activity, both church attendance and religious media use were analyzed. Church attendance and religious media use were divided into once a week or more versus less than once a week.

Demographic variables included age, defined as 65–74 versus 75 or older, gender, ethnicity, and education. Education was divided between 0 to 10 years of school and 11 or more years of school, because high school in North Carolina formerly ended after the eleventh grade.

Physical health variables included chronic conditions and impaired daily activities (inability to perform one or more ADLs [29] vs no inability in ADLs) as well as self-rated health. Lifetime history of chronic conditions were dichotomized as none versus one or more of the following (by self-report): cancer, stroke, heart attack, diabetes, hip fractures, fracture of other bones; or current angina pectoris, bronchitis, cardiac glycoside use, antihypertensive use, or cognitive impairment on the Short Portable Mental Status Questionnaire (30). Additionally, two blood pressure (BP) measurements were taken; if systolic BP averaged >140 mm Hg or diastolic BP averaged >90 mm Hg, a diagnosis of hypertension was included in the chronic diseases variable. Self-rated health was measured as the answer to the question "Overall, how would you rate your health—as excellent, good, fair, or poor?" with responses dichotomized between good or excellent versus fair or poor. Mental health measures included depression, as measured by a CES-D depression score of 9 or more (31), and self-reported negative life events in the year prior to baseline. Negative life events included illnesses or deaths of family or friends, divorce, residential moves, legal or financial problems, and retirement.

Social connections variables included marital status and six measures of social support: immediate social network, personal contacts in the last month, satisfaction with a supportive confidant, satisfaction with social interaction, and support given and received from family and friends.

Health practices included smoking, defined as yes or no as a current smoker at the baseline interview; drinking alcohol, dichotomized into 20 or more drinks in the previous month versus less than 20; and body mass index. Body mass

Table 1. Multivariate Sequential Models Using Baseline Covariates to Compare Mortality Rates for Very Infrequent Versus All Other Groups in Private Religious Participation During 6 Years of Follow-up

Model and Covariates	ADL Impaired $n = 2,058$ RH (95% CI)	ADL Unimpaired $n = 1,793$ RH (95% CI)
Model I: Report rarely or never participating in private religious activity vs all-cause mortality	1.41 (1.17–1.71)	1.73 (1.27–2.35)
Model I plus demographic variables	1.11 (0.91–1.35)	1.66 (1.23–2.22)
Model II plus health variables	1.05 (0.86–1.29)	1.63 (1.20–2.21)
Model III plus health practices	1.07 (0.88–1.31)	1.54 (1.13–2.10)
Model IV plus social support variables	1.03 (0.85–1.26)	1.55 (1.13–2.11)
Model V plus religion variables	0.98 (0.80–1.20)	1.47 (1.07–2.03)

index was divided into bottom quintile, middle three quintiles, and top quintile, with the middle group used as the reference group.

Covariates with missing data at baseline were imputed to their mean if fewer than 2% were missing. If between 2% and 5% were missing, stochastic regression imputation techniques were used. No variable was missing more than 5%.

### Analysis

All analyses were conducted using SAS (32) or SUDAAN (33) statistical analysis software. Baseline associations between private religious activity and all covariates were analyzed using the chi-square statistic. The relationship between private religious activity and each of the covariates was assessed. The unadjusted association between higher levels of private religious activity and survival was examined first, followed by the sequential addition of five groups of covariates, using a Cox proportional hazards regression model with 95% confidence intervals (34). First demographic variables were added, followed by the addition of physical and mental health variables. Social connections were added third, followed by health practices, and fifth and finally by the addition of the two religion variables. This model was first applied to the group as a whole and then to the ADL impaired and ADL unimpaired groups separately.

We tested for both a dose-response and a threshold effect for devotional activity as follows. Four dummy variables were constructed to represent increasingly frequent devotional activity. Two Cox proportional hazard models were analyzed, the first including the full complement of control variables but without the four dummy variables, and the second also fully adjusted but with the addition of the four dummy variables. The difference between the omnibus (Satterthwaite adjusted) chi-square statistics was 4.04 (4 *df*) (cut-off for  $\chi_{.05}^2 = 9.48$ ), which indicates no evidence of a significant trend across increasing levels of devotional activity.

Subsequently, a third Cox proportional hazard model was analyzed, including all control variables in addition to the dichotomized variable for rarely/never versus any devotional activity. The difference between the omnibus chi-square statistic for the model with the single dichotomous variable and the same statistic for the model with four dummy variables was 0.18 (3 *df*) (cut-off for  $\chi_{.05}^2 = 2.35$ ). This indicates no evidence of significant additional effect above the threshold level of several times a month. Finally, the increase of 3.86 (4.04–0.18) in the chi-square statistic created by adding the single dichotomous variable to the model that included only control variables provides evidence of a significant effect for any devotional activity (cut-off for  $\chi_{.05}^2 [1 \text{ df}] = 3.84$ ). Therefore, we present in Table 1 the hazard ratios for the independent variable, dichotomized as any versus no devotional activity.

### RESULTS

First, the relationship between private religious activity and covariates at baseline was analyzed. Odds of low private religiousness were associated with a likelihood of both low church attendance and low religious media use. There was also a strong association between gender and private religious activity, with males nearly three times more likely

than females to be low private religious participants. Additional demographic features of those likely to be infrequent participants were younger age, urban location, and white race; education level was not significantly different between the two groups. In physical and mental health measures, only those reporting negative life events occurring in the year prior to survey were less likely to be rare to never participants in prayer, meditation, or Bible studies. Odds of impaired function, history of chronic health conditions, and depression were not significantly different between higher and lower frequency participants. Interestingly, those who were married were much more likely to be in the rarely to never category. Other than marital status, those with a higher score on social contact measures were more often in the higher frequency category. As expected, alcohol and smoking were much higher in the rarely to never group. Although no significant correlation was found with the lowest quintile in body mass index, the highest quintile showed a higher frequency of participation. Overall, correlations were in the expected direction and consistent with previous research.

Those who reported rare participation in private religious activities were more likely to die during the follow-up period than those who did not, but this association disappeared for the group as a whole once known risks for mortality were included (RH 1.08, 95% CI 0.90–1.30). In the stratified models, similar results were obtained for the ADL impaired group ( $n = 2,058$ ; Table 1). However, a significant survival advantage was seen for those reporting private religious activity among the ADL unimpaired group ( $n = 1,793$ ; Table 1). The increased hazard remained statistically significant for this group after controlling for demographic and health variables (RH 1.63, 95% CI 1.20–2.21), and this effect persisted after further controlling for explanatory variables, including health practices, social support, and other religious practices (RH 1.47, 95% CI 1.07–2.03).

### DISCUSSION

In this study we found that private religious activities provided a protective effect against mortality for an elderly population free of functional impairment, even after controlling for numerous covariates; no such effect persisted in the ADL impaired group. To our knowledge, this is the first study to document a possible protective effect for private religious activity on mortality in a large community-dwelling population. Whereas studies of organizational religious activity (ORA) and mortality have shown a positive correlation (4–9), this study demonstrates protection via nonorganizational religious activity (NORA), at least for those who practice NORA before the onset of impairment in ADLs.

Impairment in ADLs has long been recognized as a strong predictor of mortality in elderly adults (19,35–41). Functional health status, as measured by ADL impairment, is often viewed as a “method of conceptualizing [overall] health status” (19). Because declining health has been associated with increased private religiousness (14,15), our analysis was stratified by ADL impairment. The purpose was to distinguish between those praying in a foxhole (i.e., offering prayer in times of need at the end of life) and those who may have had a long-term habit of private devotionals more likely to positively affect physical health.

A study by Koenig and coworkers demonstrated that an ill, elderly population may not be able to overcome the force of impending mortality even when employing various behaviors that have been shown in healthy populations to correlate with extended survival (42). It is possible that the relatively subtle effects of private religious activity are not sufficient to overcome the overwhelming force exerted on mortality by health decline to the point of ADL impairment. Thus, the milder effects of private religious activities on mortality are more detectable among those persons who are relatively healthy. Future studies may want to ask how long a person has been engaged in private religious activity, to determine if habits begun after the onset of ADL impairment are begun too late to show a survival benefit.

A number of hypotheses have been offered to explain the physical health benefit from religious activity. Social support and health behavior differences have often been suggested as the primary mechanisms of health benefit, but this study found, as did other recent religion and mortality studies (4–9), that adjustments for differences in these areas did not fully account for the survival benefit religious participants received.

Another prominent theory suggests that the repetitive ritual of prayer or meditation provides health benefits through mechanisms such as blood pressure reduction and improved psychoneuroendocrine function. This model asserts that physiologic benefits occur as a response to positive emotions experienced during prayer or meditation (43). Although a growing body of literature supports these assertions, particularly in those who practice meditation techniques frequently (44–46), the repetitive ritual model does not seem adequate to explain the results found in this investigation. First, frequent meditation is not a part of typical Protestant religious practice. Second, this study found that the protective benefits extended nearly equally from those that participated daily or more all the way down to those that reported only participating in private religious activity a few times a month. In other words, the risk appears only in the lowest frequency group, and the benefit extends to all other groups, regardless of frequency.

Although the repetitive ritual model does not seem to provide a useful model to explain the findings here, other prominent hypotheses do. Many of these, such as improved psychological state (43), enhanced immunity (47), better coping methods (48), and stress reduction (49), do not require daily participation to provide physical benefit. Those who pray or meditate even occasionally may have an improved psychological state or better coping skills, and thus reduced stress and/or enhanced immunity, because of the comforting knowledge of having a higher being to turn to in time of need. Levin has proposed that simply having religious faith may cause “the fostering of learned optimism” (43). Participating in prayer or Bible study even occasionally may be an identifying feature of those who benefit from this learned optimism engendered by faith. Having a sense of the availability of a Higher Power may reduce stress and thus provide the various psychological and physical benefits described.

Data from this study indicate that the absence of private religious activity and the subsequent lack of psychological

benefit may manifest at a level below clinical depression and still have a physical health impact, because depression was one of the covariates for which these results were controlled.

This study has a number of strengths. These include a large sample size, longitudinal design, good response rate, and adjustment for numerous confounders. The endpoint chosen, all-cause mortality, is subject to minimal reporting bias, and the elderly population surveyed had a mortality rate high enough to provide more than adequate follow-up events for hypothesis testing.

One significant limitation of this study was the lack of specificity for the private religious activity variable, which asks about “prayer, meditation, or Bible study.” Although meditation is not typical of Southern Protestant religious observance, sample members were likely reporting both on prayer and Bible study, and may have been including in the category of prayer even brief ritualistic prayer before meals. Future studies should both separate prayer from other types of private devotionals and distinguish between different types or dimensions of prayer. Other limitations included the lack of data on both the nutrition and exercise levels of sample members. Additionally, the predominantly Protestant nature of this population precludes generalizability to non-Protestant populations.

Future studies may want to determine what aspect of private religiousness is most beneficial to health. In a comprehensive review of the benefit of social support on mental health, George described the accumulating evidence that specific dimensions of social support may be differentially important in protecting against late-life depression. Specifically, perception of social support is more protective against depression than objective measures such as social network size or structure (50). In particular, the availability of a confidant and the perceived adequacy of social interaction have shown strong protective health effects in community and clinical samples (51,52). In the case of devotional activity, it may be that the perceived availability of a Higher Power or the perceived adequacy of the responsiveness of that Higher Power, rather than the actual number of times an elder called upon that resource, represents the key benefit to survival. Future studies may want to estimate the differential effect of frequency of devotional behaviors versus the subjective sense of the availability of a higher being.

This study indicates that physicians’ appropriate support of the faith of their patients may have positive health effects. The study also strengthens the assertion that private religion users receive not only psychological but physical benefits.

In conclusion, this analysis demonstrated a significant protective effect against mortality for private religious activity in a relatively healthy elderly population. This protective effect remained significant even after controlling for multiple confounding variables. Although no protective effect persisted in the ADL impaired portion of our population, this finding is consistent with the suppressor model of religious participation (16), which posits that increased prayer occurs in response to stress. The ADL impaired group may have begun private religious activity only in response to declining health, too late to show a protective effect against mortality.

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