Religion and Cognitive Dysfunction in an Elderly Cohort

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Objectives. This study examines whether attendance at religious services has an inverse association with cognitive dysfunction in an elderly cohort in whom it has already been shown that religious attendance has an inverse association with physical disability and that social engagement has an inverse association with cognitive decline.

Methods. The study population is a racially and religiously diverse sample of 2,812 community-dwelling men and women from New Haven, Connecticut; it was representative of New Haven in 1982, but not of the United States then or now. The primary study hypothesis proposes that attendance at religious services as measured in 1982 contributes to the prediction of lower levels of cognitive dysfunction in 1985 and 1988. A multivariate logistic regression analysis controlling for seven sociodemographic, four behavioral, and seven biomedical covariates is conducted.

Results. Study results show an inverse association between religious attendance in 1982 and cognitive dysfunction in 1985 (odds ratio = 0.64; 95% confidence interval = 0.49, 0.85). Religious attendance as measured in 1982 no longer contributes to the prediction of cognitive dysfunction in 1988.

Discussion. The short-term nature of the effect is partially explained by differential mortality. Persons with infrequent religious service attendance and with high levels of cognitive dysfunction in 1982 were more likely to die in the period from 1985 to 1988.

Religious beliefs and practices have been the subject of biostatistical and epidemiological research since the origins of these disciplines. In 1872, Francis Galton, an originator of regression analysis, published “Statistical Inquiries into the Efficacy of Prayer.” He claimed to find little evidence of prayer’s efficacy, for instance, in averting disease and death; his conclusions, however, are not without bias. From only anecdotal evidence, he opined that “there is reason to expect devout and superstitious men should be unreasonable” and that “praying people are not practical” (Galton, 1872). In 1897, Émile Durkheim included religious affiliation as an explanatory factor in his statistical examination of the occurrence of suicide in Western Europe. While acknowledging a protective association of Roman Catholicism and Judaism with suicide, Durkheim explained this influence by the lack of “a spirit of free inquiry” in these traditional and communal religions, and, in turn, he associated this lack with cultural “inferiority” (Durkheim, 1897, 1966).

In recent decades, there has been an increase in the number of epidemiological studies considering religion as an exposure factor (Koenig, McCullough, & Larson, 2001; Larson, Swyers, & McCullough, 1997; Levin & Schiller, 1987). Popular texts have claimed generally salutary health effects for religion (Benson, 1997; Koenig, 1999). High rates of religious belief and activity among elderly populations have attracted researchers’ attention (Idler, 1994). Few studies, however, have explicitly looked at religion in relation to the outcomes of cognitive dysfunction and dementia. These are important health problems, especially for elderly populations. U.S. prevalence studies of dementia report rates from 4.5 to 8.2% among Americans 65 and older; rates are thought to double for approximately every 5 years of aging beyond 65 (Hendrie, 1998). Given the increasing proportion of older people in the United States, concern is growing about the prevalence of Alzheimer’s disease and other forms of dementia. In fact, some commentators say that fear of Alzheimer’s disease is a health risk for some older Americans (Centofani, 1998). Thus, attention to this topic is timely. By addressing the outcome of cognitive dysfunction, this prospective cohort study will fill a gap in epidemiological research regarding religion.

Two studies using the same data set as is analyzed here have motivated the hypotheses that will be tested. From both a cross-sectional and longitudinal perspective Idler and Kasl (1997a) have shown that attendance at religious services is associated with lower levels of functional disability in this elderly population (Idler & Kasl, 1997b). The current study uses very similar measures of religiousness, as did Idler and Kasl. One purpose of the study is to determine whether the association of religion and good health in this study population extends from the domain of physical functioning to cognitive functioning, and, if so, whether religious attendance, as opposed to some other measure of religiousness, is responsible for the association. A more recent longitudinal study has shown that social disengagement is a risk factor for cognitive decline in this elderly cohort; lack of attendance at religious services is one of the six components contributing to the authors’ scale of social disengagement (Bassuk, Glass, & Berkman, 1999). Thus, a second purpose of the current study is to control for social engagement to establish whether or not the relation of religiousness to cognitive dysfunction is independent of a measure of social engagement.
The primary hypothesis of the study is that attendance at religious services in 1982 contributes to the prediction of levels of cognitive dysfunction in 1985 and 1988. On the basis of previous studies of this population that have claimed salutary associations for religious attendance—preeminently the two studies cited previously—the direction of the association is proposed to be inverse: higher levels of religious attendance will be associated with lower levels of cognitive dysfunction. Religion is assumed to be a sociobehavioral factor similar to social support and education, factors that themselves are positively associated with several health benefits, including better cognitive functioning (Stephens, Kinney, Norris, & Ritchie, 1987; Weintraub, Powell, & Whitlita, 1994). No specific mechanism for a possible protective impact of religious attendance on cognitive functioning is hypothesized; however, the proposal by Bassuk and colleagues (1999) that social engagement provides a “mental stimulation” that inhibits cognitive decline seems plausible and relevant. Attendance at religious services is potentially very stimulating in that it characteristically involves several of the domains that psychologists say comprise human intelligence (e.g., the verbal, musical, and emotional domains), and it engages them in both perceptual and productive modalities (e.g., worshippers listen to sermons and recite prayers, they hear anthems and sing hymns, and so forth; Gardner, 1983; Goleman, 1995; Sternberg, 1985).

A second hypothesis contends that most of the inverse association of religious attendance and cognitive dysfunction remains after controlling for social engagement of other types. If confirmed, this hypothesis provides evidence that religious attendance is a religious form of social engagement that is statistically independent of other forms of social engagement and thereby deserves the specific attention it has been given in recent social epidemiological literature. Finally, it is hypothesized that religious attendance is a more influential predictor of cognitive dysfunction than an alternative subjective measurement of religious identity; this hypothesis is motivated by the work of Idler and Kasl (1997a) who found this to be the case for the outcome of functional disability. Also, feelings of closeness and comfort with God are probably not accompanied by mental stimulation to the same extent as are attendance and participation in religious services. These feelings are rarely accompanied with vivid auditions and visions, and they are characteristically more perceptual than productive experiences.

**METHODS**

**Study Population**

Data are from the Yale Health and Aging Project, the New Haven, Connecticut, site of the Established Populations for Epidemiologic Studies in the Elderly program of the National Institute on Aging. Elderly persons living in the community in noninstitutional settings (N = 2,812 in 1982) were interviewed in person in 1982, 1985, and 1988. The stratified probability sample was selected from public elderly housing, private elderly housing, and the New Haven community. The 1982 response rate was 82%; follow-up response rates averaged greater than 90%. People who were community dwelling in 1982, but subsequently entered some form of elderly housing, were not dropped from the study; if they survived, they are represented in subsequent waves of data. Males and residents of public and private elderly housing were oversampled.

**Exposure**

Two separate exposure measures are used. The more objective exposure variable consists of responses to a question about the frequency of the respondent’s attendance at religious services. Six answers are offered ranging from “more than once a week” attendance to “never or almost never” attendance at religious services. Responses are dichotomized as persons attending religious services once a week or more frequently versus persons attending religious services less frequently than once a week. This point of bifurcation reflects a long-standing convention in the epidemiological literature on religion (Comstock & Partridge, 1972; Strawbridge, Cohen, Shema, & Kaplan, 1997).

The second more subjective exposure measure gauges the extent of the respondent’s religious self-identity. It is composed of responses to two questions. The first offers five options ranging from being “deeply religious” to being “against religion.” The second inquires about the extent to which the respondent experiences religion to be a source of strength and comfort, offering three options ranging from “a great deal” to “none.” Responses to these two questions are combined into a single scale and dichotomized as those persons who understand themselves to be deeply religious and greatly comforted and strengthened by religion versus those who have less strong religious identifications and experiences. The epidemiological literature contains no established convention about where to dichotomize such responses. The dichotomization used here divides the population more evenly than alternative options.

**Outcome**

The primary outcome measure consists of the number of erroneous responses to all 10 questions in Pfeiffer’s Short Portable Mental Status Questionnaire (SPMSQ). This questionnaire is designed to test whether respondents can orient themselves effectively in regard to their temporal, physical, and social environments (Pfeiffer, 1975). Questions ask, for instance, about the date and day of the week. Others ask about the current and most recent past President of the United States or about simple arithmetic. Refusals were counted as errors in accordance with Pfeiffer’s instructions. Respondents who have missing data (i.e., who gave neither a correct answer, an incorrect answer, nor an explicit refusal to answer) for two or more of the 10 questions on the questionnaire were counted as having a missing total test score. Respondents with one or two missing answers had their number of errors mathematically adjusted to be proportionally represented on a 0–10 scale of errors. One motivation for this way of handling the data was that some questions did not apply to some respondents at the time of data collection; for instance, requests to recall telephone numbers did not apply to persons lacking home telephones.

Pfeiffer grouped the SPMSQ scores into four categories, ranging from “Intact Intellectual Functioning” to “Severe Intellectual Impairment.” The questionnaire was validated...
in two elderly cohorts: one drawn from institutional living situations and the other from clinic clientele. Test-retest correlations for two groups tested were .82 and .83. There was 92% agreement between SPMSQ results and clinical diagnoses when the SPMSQ indicated high impairment and 82% agreement when mild or no impairment was indicated (Pfeiffer, 1975, p. 439).

When used in the healthier Yale Health and Aging Project cohort, researchers have changed Pfeiffer’s grouping to a trichotomy in which there is an intact category (0–1 errors), a mild dysfunction category (2–3 errors), and a severe dysfunction category (4–10 errors; Bassuk et al., 1999; Moritz, Kasl, & Berkman, 1989, 1995). Bassuk and colleagues (1999) report that, in one validation study, “sensitivity and specificity in identifying moderate or severe impairment were 85% and 96% respectively” (Field, 1993). In subsequent waves of data collection results from Folstein’s Mini-Mental State Examination were also available as a way of confirming the results of the SPMSQ; in data analysis, answers to this examination were converted into a scale of errors to conform to the scoring of the Pfeiffer questionnaire (Folstein, Folstein, & McHugh, 1975). Proxy responses were not accepted to questions comprising the Pfeiffer and Folstein examinations.

**Covariables**

Covariables are of three types: sociodemographic covariables of religious denominational preference, age, gender, race, income, education, and marital status; behavioral covariables of alcohol drinking, physical activity, smoking, and social engagement; and biomedical covariables of baseline cognitive dysfunction, depression, diabetes, functional disability, heart disease, hypertension, and stroke. Linearity test showed that age was related to the outcome variable in a linear fashion and so was entered into multivariate models as a continuous variable (mean = 74.6 and standard deviation = 6.9). Education was defined by a scale ranging from 0 (no formal schooling) to 17+ (some graduate education); it also had a linear relation to the outcome and was entered into multivariate models as continuous (mean = 9.0 and standard deviation = 3.8). Gender was defined a dichotomous categorical variable coded sequentially for males and females. Race was defined in terms of White and non-White racial categories. Income was categorized into three levels. Marital status recorded whether or not a respondent was married at the time of the interview.

A respondent was considered to be an alcohol drinker if he or she drank more than 6.8 ounces of ethyl alcohol (as contained in beer, wine, or liquor) within the last month. Physical activity was measured on a dichotomized scale reflecting whether people never (1), sometimes (2), or often (3) engaged in sports, walking, gardening, or physical exercises. The resulting scale with range from 4 to 12 was dichotomized to yield two groups of most approximately equal size (i.e., at score greater or equal to 7). Smokers were categorized as never, past, and current smokers. The social engagement variable was adapted from the social disengagement scale created by Bassuk and colleagues deleting the items that are either accounted for by the religious attendance variable or are used as covariables (i.e., marital status). The scoring in this scale represents engagement rather than disengagement and more directly reflects the original interview questions.

Respondents were defined as depressed if they had a score equal to or greater than 16 on the Center for Epidemiological Studies Depression scale. The medical covariables of diabetes, heart disease, hypertension, and stroke were defined by responses to questions as to whether the respondent had ever been definitely or possibly diagnosed with these conditions. People were defined as functionally disabled if they had a disability score of 1 or more on a seven-item activities of daily living scale; respondents were counted as disabled if they were unable to perform a given activity or if they needed assistance in doing it.

Previous studies have shown that cognitive dysfunction tends to increase with age in an elderly population and decrease with level of education even though cognitive function measures like the ones mentioned previously are not primarily intended to measure factual knowledge or general intelligence (Hendrie, 1998; Pfeiffer, 1975). Both age and education have been shown to be associated with religiousness and so are potential confounders (Ehmann, 1999). Functional disability is an especially important potential confounder: in unadjusted analyses, religious service attendees as a group may have relatively little cognitive dysfunction because good physical health enables them physically to attend services more readily than others.

**Statistical Analysis**

Statistical analysis sought to avoid categorization of continuous variables if possible. When categorization was necessary, the least arbitrary approach was chosen. The distribution of the outcome variable of cognitive dysfunction does not follow a normal distribution. More respondents have no or few errors than many errors, and there are a considerable number of zero values (see Figure 1). Following a strategy advocated by Chang and Pocock (2000) for “analyzing data with clumping at zero,” we fit a proportional odds model (i.e., an ordinal polytomous logistic regression model) using the trichotomy cited previously, except that an additional cut point between 0 and 1 was introduced to see if 0 responses differed from others. The proportional odds assumption was not met, suggesting that increments in effect were not uniform across the scale and that linear regression was not an appropriate model for this data.

Logistic regression was then chosen as the means of bivariate and multivariate analyses. The outcome variable of errors on the SPMSQ was dichotomized as 0–1 errors versus 2 or more errors, yielding one group with cognitive functioning intact and another with some level of dysfunction. This single cut point was selected because of previous use in other studies and because this dichotomization most closely approximates an equal division of the data across all three waves of data. However, because other categorizations are plausible, the main strategy of analysis was supplemented with a sensitivity analysis reporting alternative dichotomizations.

The selection process used in the fitting pruned multiple logistic regression models was manual backward elimination. Models with all relevant variables were fit first and
then variables with the highest Wald test p values were removed one by one. Religious predictor variables were forced into the model, and covariables were retained whose observed levels of significance fell below 0.25. A modified version of the social disengagement scale of Bassuk and colleagues was included in the main models to clearly show the result of controlling for this factor.

The first longitudinal model was first fit having 1982 data for religious predictor variables and relevant covariables, and 1985 data for the cognitive dysfunction outcome. Included in this model was a variable indicating the 1982 baseline cognitive dysfunction status of all respondents. The continuous version of the cognitive dysfunction variable was used for this purpose. A second longitudinal regression model was fit to see if 1982 religiousness predicts cognitive dysfunction in 1988. This model was the same as the first longitudinal model, except that 1988 cognitive function data was used.

All bivariate and multivariate analyses were weighted to account for oversampling and nonrandom patterns of refusal to participate in the study. Also, weights were included to make the sample representative of the New Haven population in 1982. Complex sample survey methods were used for variance estimation of bivariate and multivariate models to account for the stratified and clustered character of the sample. Univariate analyses were conducted with the SAS software package, version 6.12 (SAS Institute, Cary, NC; SAS/STAT User’s Guide, 1999). To account for the stratified and clustered nature of the sample design SUDAAN software, version 7.11 (Research Triangle Institute, Research Triangle Park, NC), was used in SAS-callable form for the bivariate and multivariate models (Shah, Barnwell, & Bieler, 1997). S-Plus 2000 was used to create graphs (MathSoft, Inc., Seattle, WA; S-Plus 2000 User’s Guide, 1999).

**RESULTS**

**Univariate Analyses**

Univariate analysis reveals the sample population to be a very religious cohort: fewer than 2% identify themselves as having no religious preference (Table 1). Roman Catholics make up a majority of the sample, and Jews comprise more than 10%. In these respects, the sample is atypical of the U.S. population as a whole. The 1990 National Survey of Religious Identification reports that more than 8% of Americans then identified themselves as nonreligious, approximately 26% of Americans identified themselves as Roman Catholics, and that fewer than 2% identified themselves as Jewish (Kosmin & Lachman, 1990). Approximately 40% of the sample population said they attend religious services at least once a week. This is more in line with national Gallup polls inquiring about attendance at religious services (Gallup, 1985).

The demographic data indicate that this sample from 1982 consists mostly of the “young old” being 65–74 years of age. It is also mostly White and female. The levels of income and education are quite modest. The most prevalent health problem is hypertension, but, at least in the first wave of data, few people report serious cardiovascular or cerebrovascular disease. Some 490 died between 1982 and 1985 and another 505 by 1988. Because the 1982 data for the independent variables was used in all three groups of regression models, it was the rates of cognitive dysfunction and mortality that changed over time; hence, these factors accounted for the changing pattern of association between religiousness and cognitive dysfunction in this longitudinal study.

**Bivariate Analyses**

Bivariate analyses provide an unadjusted estimate of the magnitude and direction of the relationships between independent and dependent variables (Table 2). The dichotomized versions of the two main religion predictors are only modestly correlated. Idler and Kasl (1997b, p. S309) have shown, however, that the religious attendance and religious identity variables are each well correlated with subsequent measures of the same concept. Most striking are the differences between the relationships of religious attendance and religious identity variables to the cognitive dysfunction outcomes. Religious attendance has an odds ratio (OR) less than 1 in the first two waves of data. Quite differently, the religious identity variable consistently has an OR greater than 1. The OR for religious attendance is only modestly
Religious Attendance Predictor          n (%)  
Religious Attendance              <Weekly   1,649 (59.7)  
(n = 2,762)  
≥Weekly   1,113 (40.3)  
Religious Identity               Weak     1,710 (63.8)  
(n = 2,680)  
Strong    970 (36.2)  
Sociodemographic Predictor       n (%)  
Religious Denomination           Roman Catholic 1,462 (52.9)  
(n = 2,765)  
Protestant   807 (29.2)  
Jewish     374 (13.5)  
Other      83 (3.0)  
None        39 (1.4)  
Age (years)         65–74 1,552 (55.2)  
(n = 2,782)  
75–84     976 (34.7)  
85+        284 (10.1)  
Gender          Male   1,169 (41.6)  
(n = 2,812)  
Female    1,643 (58.4)  
Race          White   2,219 (78.9)  
(n = 2,812)  
Black      529 (18.8)  
Other      64 (2.3)  
Income (dollars)       0–4,999 973 (40.0)  
(n = 2,432)  
5,000–9,999 952 (39.1)  
10,000+    507 (20.8)  
Education (years)        <12    1,857 (58.1)  
(n = 2,725)  
≥12        868 (31.9)  
Current Marital Status     No   1,740 (62.5)  
(n = 2,786)  
Yes     1,046 (37.5)  
Behavioral Predictor n (%)  
Alcohol drinking         No 2,171 (77.7)  
(n = 2,795)  
Yes    624 (22.3)  
Physical activity        Inactive 1,770 (64.1)  
(n = 2,761)  
Active   991 (35.9)  
Smoking         Never 1,411 (50.5)  
(n = 2,795)  
Past     816 (29.2)  
Current 568 (20.3)  
Social engagement                      1,176 (42.2)  
(n = 2,785)  
1       966 (34.7)  
2        499 (17.9)  
3        144 (5.2)  
Biomedical Predictor n (%)  
Cognitive dysfunction   None 1,643 (59.4)  
(n = 2,765)  
Mild or severe 1,122 (40.6)  
Depression         No   2,242 (83.1)  
(n = 2,698)  
Yes     456 (16.9)  
Diabetes         No   2,382 (84.9)  
(n = 2,807)  
Yes     425 (15.1)  
Functional disability   No 2,314 (83.0)  
(n = 2,789)  
Yes     475 (17.0)  
Heart disease         No 2,400 (85.7)  
(n = 2,801)  
Yes     401 (14.3)  
Hypertension         No   1,467 (52.3)  
(n = 2,805)  
Yes     1,336 (47.7)  
Stroke            No   2,598 (92.6)  
(n = 2,805)  
Yes     207 (7.4)  

Note: EPESE = Established Populations for Epidemiologic Studies in the Elderly.  

Table 1. 1982 Descriptive Statistics, New Haven, EPESE (N = 2,812)  

The two longitudinal models present rather different results. The 3-year model shows an inverse association (OR = .64; 95% confidence interval [CI] = 0.49–0.85) that is statistically significant. This association, however, disappears at 6 years (OR = 1.00; 95% CI = 0.71–1.41). Similar results occur when the Folstein measure (similarly dichotomized to yield to maximally equal groups) is used as the outcome variable instead of the Pfeiffer scale (respectively, OR = 0.72; 95% CI = 0.55–0.95 and OR = 1.11; 95% CI = 0.80–1.55). The data suggest that it is not a long-lasting relationship. A similar but less dramatic attenuation of relative risk is evident for the income, social engagement, and education variables. The deletion of the statistically nonsignificant variables did not much change the OR and CI of the religious attendance variable. Also, when the social engagement variable was deleted from the 1982–1985 model, the OR for the religious attendance variable was only slightly changed (OR = 0.62; 95% CI = 0.48–0.81). This indicates that controlling for social engagement eliminated only a very small portion of the inverse association of religious attendance with cognitive dysfunction.  

The logistic regression models for the religious identity variable show a different story. When the religious attendance variable was replaced by the religious identity variable in the multivariate models reported in Table 3, religious identity is shown to have a nonsignificantly elevated OR (respectively, OR = 1.06; 95% CI = 0.80–1.14 and OR = 1.13; 95% CI = 0.80–1.61). Only the 1982 cross-sectional model has an OR less than 1 (OR = 0.76; 95% CI = 0.56–1.02). Here, the addition of covariables moves the unadjusted OR for the religious identity variable from above the null value to below it. The deletion of the social engagement scale from these religious identity multivariate models introduces even less change than for the religious attendance models. Finally, when the religious identity variable is added to the 1985 religious model reported in Table 3, the OR for the religious attendance variable is slightly reduced (OR = 0.62; 95% CI = 0.47–0.82) and that of the religious identity variable is slightly elevated (OR = 1.17; 95% CI = 0.88–1.54). The p value of the Wald test for religious identity is 0.267, and so the religious identity variable was not included in the pruned models.
Several supplementary analyses were conducted. Sensitivity analysis sought to find consistent patterns of relative risk yielded by the religious attendance variable for several plausible alternate dichotomizations of the Pfeiffer scale of errors (Table 4). The covariables for all of the models are those listed in Table 3. Three such patterns are evident. First, there is a statistically significant reduction in the OR for the 1982–1985 longitudinal model for all of the four dichotomizations of the outcome variable. Second, the models that use a 0 versus 1–10 errors cut point have a consistent pattern of reduced ORs suggesting a 20%–30% reduction of risk of cognitive dysfunction for frequent attendees at religious services; the confidence interval includes the null value only for the 1982–1988 model. Finally, all of the cross-sectional models show ORs less than 1 for the religious attendance variable although only the 0 versus 1–10 errors is statistically significant. Subgroup analysis suggests that the inverse association of religious attendance and cognitive dysfunction may be concentrated among females, Whites, persons older than 75, and persons with low incomes (see Table 5). Formal interaction analyses were conducted, but none of the interaction terms were statistically significant at the .05 level of significance.

**DISCUSSION**

The primary hypothesis of the study is that higher levels of religiousness, as measured in 1982, contribute to the prediction of lower levels of cognitive dysfunction in 1985 and 1988. With regard to religious attendance, this hypothesis is partially confirmed. The relevant models show that religious attendance is inversely associated with cognitive dysfunction in the 1985 longitudinal model, but not in the 1988 model. There are two possible interpretations for this apparent inconsistency. First, if the 0 versus 1–10 errors is the more appropriate dichotomization for this cohort, then there is no major inconsistency between results for the three waves of data. Regarding other dichotomizations, one should note that, over the 6 years, the cohort is changing through differential mortality; specifically, there is higher mortality among those in 1982 with infrequent religious attendance (by 1988, 40.2% were dead, whereas only 27.9% of frequent attendees died, \( \chi^2 = 44.0, p < .0001 \)) and among those with baseline cognitive dysfunction (by 1988, 44.1% were dead, whereas...
Table 3. Multivariate Analysis: 1985 and 1988 Longitudinal Religious Attendance Models With Pfeiffer’s Cognitive Dysfunction Scale (0–1 vs. 2–10 Errors) as the Outcome

<table>
<thead>
<tr>
<th>Model</th>
<th>1982 N</th>
<th>1988 N</th>
<th>OR (95% CI)</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Religious Attendance (&lt;weekly)/≥weekly</td>
<td>.64 (.49–.85)</td>
<td>1.00 (.71–1.41)</td>
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<tr>
<td>Religious Preference</td>
<td></td>
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<tr>
<td>Protestant (no/yes)</td>
<td>.92 (.60–1.41)</td>
<td>.98 (.62–1.55)</td>
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<tr>
<td>Jewish (no/yes)</td>
<td>.78 (.46–1.32)</td>
<td>.59 (.32–1.09)</td>
<td></td>
<td></td>
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<tr>
<td>Other (no/yes)</td>
<td>.43 (.17–1.11)</td>
<td>.94 (.29–3.06)</td>
<td></td>
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</tr>
<tr>
<td>None (no/yes)</td>
<td>1.69 (.54–5.25)</td>
<td>.86 (.23–.76)</td>
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<tr>
<td>Socioeconomic</td>
<td></td>
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<tr>
<td>Age (continuous scale: 65–99)</td>
<td>1.03 (1.00–1.06)</td>
<td>1.08 (1.05–1.11)</td>
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<tr>
<td>Gender (male/female)</td>
<td>1.31 (.95–1.82)</td>
<td>1.15 (.83–1.58)</td>
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<tr>
<td>Race (White/non-White)</td>
<td>2.91 (1.79–4.73)</td>
<td>1.60 (1.88–2.91)</td>
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<tr>
<td>Income (dollars)</td>
<td></td>
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<tr>
<td>Middle income (5,000–9,999)</td>
<td>.85 (.64–1.13)</td>
<td>.86 (.58–1.28)</td>
<td></td>
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<tr>
<td>High income (10,000+)</td>
<td>.43 (.27–.69)</td>
<td>.66 (.42–1.06)</td>
<td></td>
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<tr>
<td>Missing income</td>
<td>.87 (.51–1.49)</td>
<td>.81 (.38–1.72)</td>
<td></td>
<td></td>
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<tr>
<td>Education (continuous scale: 0–17)</td>
<td>.92 (.88–.96)</td>
<td>.95 (.90–1.00)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status (unmarried/married)</td>
<td>1.13 (.75–1.70)</td>
<td>.97 (.66–1.41)</td>
<td></td>
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<tr>
<td>Behavioral Smoking</td>
<td></td>
<td></td>
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<tr>
<td>Past smoking (no/yes)</td>
<td>.76 (.58–.99)</td>
<td>.89 (.60–1.33)</td>
<td></td>
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<tr>
<td>Current smoking (no/yes)</td>
<td>1.18 (.75–1.83)</td>
<td>1.22 (.81–1.84)</td>
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<td></td>
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<tr>
<td>Social engagement (ordinal scale: 0–3)</td>
<td>.84 (.72–.97)</td>
<td>.88 (.75–1.04)</td>
<td></td>
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<tr>
<td>Biomedical Depression (no/yes)</td>
<td>1.09 (.69–1.70)</td>
<td>.95 (.57–1.57)</td>
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<tr>
<td>Functional Disability (no/yes)</td>
<td>1.18 (.78–1.80)</td>
<td>1.47 (.82–2.65)</td>
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<tr>
<td>Hypertension (no/yes)</td>
<td>.68 (.52–.88)</td>
<td>.88 (.66–1.18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke (no/yes)</td>
<td>1.85 (95–360)</td>
<td>2.19 (116–4.14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive dysfunction (continuous scale: 0–10)</td>
<td>1.51 (1.34–1.70)</td>
<td>1.54 (1.35–1.76)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: OR = odds ratio; CI = confidence interval.

Table 4. Sensitivity Analysis: Religious Attendance Main Predictor Results for Several Plausible Dichotomizations of Pfeiffer’s Cognitive Dysfunction Scale

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale Cut Points</td>
<td>OR (95% CI)</td>
<td>OR (95% CI)</td>
</tr>
<tr>
<td>0 vs. 1–10 errors</td>
<td>.70 (.54–.92)</td>
<td>.71 (.53–.94)</td>
</tr>
<tr>
<td>0–1 vs. 2–10 errors</td>
<td>.85 (.63–1.16)</td>
<td>.64 (.49–.85)</td>
</tr>
<tr>
<td>0–2 vs. 3–10 errors</td>
<td>.82 (.59–1.13)</td>
<td>.48 (.32–.73)</td>
</tr>
<tr>
<td>0–3 vs. 4–10 errors</td>
<td>.93 (.52–1.65)</td>
<td>.50 (.34–.72)</td>
</tr>
</tbody>
</table>

Notes: All models have the same main predictor variables and covariates as do the models in Table 3; only the cut point for the outcome variable changes for each reported model. OR = odds ratio; CI = confidence interval.

Table 5. Subgroup Analysis: Religious Attendance Main Predictor Results for Models Stratified by Sociodemographic Variables

<table>
<thead>
<tr>
<th>Sociodemographic Variable</th>
<th>OR (95% CI)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65–74</td>
<td>.72 (.46–1.12)</td>
<td>1,151</td>
</tr>
<tr>
<td>75+</td>
<td>.51 (.31–.85)</td>
<td>718</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>.84 (.53–1.32)</td>
<td>716</td>
</tr>
<tr>
<td>Female</td>
<td>.57 (.42–.77)</td>
<td>1,153</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>.53 (.39–.72)</td>
<td>1,478</td>
</tr>
<tr>
<td>Nonwhite</td>
<td>.78 (.30–2.01)</td>
<td>391</td>
</tr>
<tr>
<td>Income (dollars)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6,000–7,000</td>
<td>.55 (.36–.83)</td>
<td>1,001</td>
</tr>
<tr>
<td>7,000+</td>
<td>.65 (.37–1.14)</td>
<td>676</td>
</tr>
<tr>
<td>Education (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;12</td>
<td>.66 (.50–.87)</td>
<td>1,226</td>
</tr>
<tr>
<td>≥12</td>
<td>.65 (.35–1.19)</td>
<td>627</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>.66 (.47–.92)</td>
<td>1,129</td>
</tr>
<tr>
<td>Yes</td>
<td>.65 (.44–.95)</td>
<td>724</td>
</tr>
</tbody>
</table>

Notes: All models have the same main predictor variables, covariates, and outcome variable (0–1 vs. 2–10 errors) as do the models in Table 3, except the model for non-White race that includes an adjustment recommended by Pfeiffer (here 0–2 vs. 3–10 errors). OR = odds ratio; CI = confidence interval.

only 29.0% of persons without dysfunction died, χ² = 67.1, p < .0001). Thus, those infrequent religious attendees in 1982 who became cognitively impaired by 1985 were more likely to die by 1988. If they had survived then, the 1982 baseline religious attendance could have shown an association through 1988. This interpretation is particularly appropriate when the cut point is set at higher values such as 3+ or 4+ errors, because among those thus defined as cognitively impaired the proportion that dies by 1988 is greater (respectively, 49.4% and 53.5%). The pattern of increasing ORs for higher value cut points in the 1988 model supports this point.

The religious identity variable contributes little to the prediction of levels of cognitive dysfunction. This confirms the secondary hypothesis that it is a less influential predictor of cognitive dysfunction than religious attendance. These results agree well with the two studies of the same data set that motivated this analysis. For instance, Idler and Kasl (1997a, 1997b) found that religious attendance, but not religious identity, made a significant contribution to the prediction of future levels of functional disability.

Implications

Idler and Kasl (1997b) argue that higher religious attendance predicts lower levels of functional disability. Their basic argument can be extended to the relationship between religious attendance and future levels of cognitive dysfunction. The longitudinal and multivariate regression model results reported here are not supportive of the explanation that religious attendance “selects” lower levels of cognitive dysfunction in the sense that people with lower cognitive dysfunction attend religious services more frequently than others because of their higher level of functioning. In this longitudinal study, the measurement of religious attendance in 1982 occurred before the measurement of the cognitive dysfunction outcome in 1985 and so this later level of cognitive dysfunction could not be influencing the previously measured level of religious attendance; also, in the multivariate analysis, baseline cognitive dysfunction was included as a control variable. Results are, however, compatible with the
claim that frequent participation in religious services promotes lower levels of future cognitive dysfunction.

Although Idler and Kasl (1997b, p. S315) argue for an “independent role” for religious attendance in predicting level of physical disability, Bassuk and colleagues (1999) make a somewhat different claim. Speaking of the six types of social engagement contributing to their index (and of religious attendance as one of the six), they emphasize that “no particular type of social contact is essential.” Any social contact that elicits a palpable degree of “mental stimulation” may inhibit cognitive decline in old age, “possibly by maintaining a critical density of neocortical synapses” (Bassuk et al., 1999). After controlling for social engagement, the inverse association of religious attendance and cognitive dysfunction remains. Although there is no direct evidence for it from this study beyond the meaning of statistically controlling for a variable, we believe that religious attendance is a religious form of social engagement that makes a contribution that is unique in the sense that its inverse association with cognitive functioning would remain even as one increases social engagement in other, nonreligious domains of social life. We cannot reject, however, either with additional empirical results or additional statistical controls, the argument that religious attendance is merely a form of social engagement. That is an interpretation of the very meaning of what the religious attendance variable measures. Now, and in these data, it is not a testable proposition.

The implications of this study for the understanding of religiousness are several. First, this study demonstrates that religiousness is not an undifferentiated single phenomenon. The dichotomized religious attendance and religious identity variables are not highly correlated, and they yield quite divergent ORs in logistic regression models of their relationship with cognitive dysfunction. In two further respects, they are quite different. The OR of the religious attendance variable is farther below 1 in the 1982–1985 model than in the 1982 cross-sectional model; for the religious identity model, just the opposite is true. Also, when the religious attendance and religious identity variables are put in the same logistic regression model, the religious attendance OR is slightly lower than when alone, whereas the religious identity OR is higher than when in a similar regression model alone. These results support the need to develop multidimensional instruments for measuring spirituality and religiousness (Fetzer Institute/National Institute of Aging Working, 1999). A second implication of this study is that the magnitude of the associations of religiousness with health outcomes may be sensitive to demographic characteristics of sex, race, age, and income.

Limitations

Concepts can be informative only to the extent that they are measured precisely and comprehensively. The measurement of religiousness in this study addressed only two dimensions of religiousness, and whereas attendance at religious services was measured, the nature of the respondents’ participation in the services attended was not. Also, the measurement of cognitive dysfunction was made with screening instruments that are not capable of diagnostic sensitivity. Thus, the relationship between religious attendance and cognitive dysfunction was not fully specifiable. Even though the study was longitudinal and religious attendance was measured before cognitive dysfunction, one cannot on this basis alone infer a causal relationship from their inverse association. Finally, the results of the study are limited to the population studied and cannot be readily generalizable to other settings and populations.

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References


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**Editor Nominations**

**Journal of Gerontology: Psychological Sciences**

The Gerontological Society of America’s Publications Committee is seeking nominations for the position of Editor of the *Journal of Gerontology: Psychological Sciences*.

The position will become effective January 1, 2004. The Editor makes appointments to the journal’s editorial board and develops policies in accord with the scope statement prepared by the Publications Committee and approved by Council (see the journal’s masthead page). The Editor works with reviewers and has the final responsibility for the acceptance of articles for his/her journal. The editorship is a voluntary position. Candidates must be members of The Gerontological Society of America and dedicated to developing a premier scientific journal.

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