Frequent Attendance at Religious Services and Mortality over 28 Years

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ABSTRACT

Objectives. This study analyzed the long-term association between religious attendance and mortality to determine whether the association is explained by improvements in health practices and social connections for frequent attenders.

Methods. The association between frequent attendance and mortality over 28 years for 5286 Alameda County Study respondents was examined. Logistic regression models analyzed associations between attendance and subsequent improvements in health practices and social connections.

Results. Frequent attenders had lower mortality rates than infrequent attenders (relative hazard [RH] = 0.64; 95% confidence interval [CI] = 0.53, 0.77). Results were stronger for females. Health adjustments had little impact, but adjustments for social connections and health practices reduced the relationship (RH = 0.77; 95% CI = 0.64, 0.93). During follow-up, frequent attenders were more likely to stop smoking, increase exercising, increase social contacts, and stay married.

Conclusions. Lower mortality rates for frequent religious attenders are partly explained by improved health practices, increased social contacts, and more stable marriages occurring in conjunction with attendance. The mechanisms by which these changes occur have broad intervention implications. (*Am J Public Health.* 1997;87:957–961)

Introduction

Associations between religious affiliation and mortality have been analyzed since Durkheim's 1897 comparison of suicide rates among Catholics, Protestants, and Jews.[1] Most commonly, mortality rates of selected religious groups are compared with those of the general population, and lower mortality rates have been found for members of behaviorally strict denominations, such as Mormons and Seventh Day Adventists.[2] These groups prescribe such health practices as not smoking cigarettes or drinking alcohol.[3,4] More generally, the emphasis placed by many religions on respect for one's body and moderation in behavior implies that adherents will be more likely to adopt good health practices.[5] Social and psychological factors may also be important: a recent study attributed the considerably lower mortality in religious kibbutzim compared with secular kibbutzim in Israel to a social environment that caused less stress, enhanced host resistance, and improved well-being.[6]

Over the past 2 decades, increased interest has been shown in measuring religiosity by the frequency of attending services (usually dichotomized as once a week or more vs less) rather than by affiliation.[7] Frequent attendance was associated with lower mortality for females (but not males) in the Tecumseh Community Health Study, lower 2-year mortality rates in a sample of elderly poor, and lower cause-specific mortality rates for arteriosclerotic heart disease, suicide, cirrhosis of the liver, and emphysema among a variety of groups.[8–10] More frequent religious attendance has been associated with less depressive symptomatology, lower blood pressure, better perceived health, and higher life satisfaction.[11–16]

For Mormon women, higher church activity was associated with lower rates of lung cancer.[17] More broadly, higher activity has been associated with lower mortality rates among the elderly.[18]

As suggestive as these studies are, they often suffer from methodological difficulties, such as employing cross-sectional designs and omitting adjustments for likely confounders.[19] Disabled persons may be less likely to attend religious services, yet health status is rarely assessed. The observed lower mortality rate for frequent attenders in one study disappeared after 6 years of follow-up, suggesting that better health status at baseline might have been a confounder.[20] Other potential confounders include social connections and such health practices as exercising and not smoking. If persons with good health practices and stronger social connections also attend religious services, observed differences in mortality between attenders and nonattenders might be explained by the healthier practices and stronger connections of the attenders.

However, it is also possible that health practices and social connections are intervening variables that lie on the causal pathway between attendance and mortality.[21] Frequent attendance may facilitate the adoption of better health practices and stronger social connections over time. Examining the timing of

adopting better health practices and strengthening social connections in relation to attendance would help clarify the causal pathways involved.

The analyses reported here address previous methodologic difficulties by examining the association between frequent religious attendance and mortality over 28 years and by including likely confounders. Changes in health, health practices, and social connections are assessed to determine whether these factors explain any observed association.

Methods

Study Population

A longitudinal study of health and mortality, the Alameda County [California] Study has followed 6928 persons aged 16 to 94 at baseline since 1965.[22,23] Survivors were resurveyed in 1974, 1983, and 1994. Response rates for the four surveys starting in 1965 were 86%, 85%, 87%, and 93%, respectively.

Mortality analyses (n = 5286) are based on respondents aged 21 through 65 at baseline in 1965 who had no missing values on any of the variables used in the statistical models. Mean age was 39.8; 52.8% were female, and 12.7% were Black. Analyses for improvements in health practices, body mass index, and social contacts are based on 2540 survivors who responded to the 1994 questionnaire; their mean age was 65.3 (range 50 through 94).

Measures

Measures were selected from those that were included in all four surveys and that had demonstrated associations with mortality.

Attendance. Frequent attenders were defined as those who went to religious services once a week or more and constituted 25.1% of the sample in 1965. For infrequent attenders in 1965, 31% said they never attended, 38% went only once or twice a year, and 31% went once or twice a month. The dichotomous split between frequent and infrequent attenders was relatively stable over time: among survivors, 58% of 1965 frequent attenders were still frequent attenders in 1994, and 86% of 1965 infrequent attenders were still infrequent attenders in 1994.

Adjustment variables. Because frequency of attendance was higher for some religious groups than others, religious affiliation was included as a control and coded as Protestant, Catholic, Fundamen-

talist, Seventh Day Adventist/Mormon, and others/none. Small numbers for some groups precluded more detailed coding. Sociodemographic variables included age, gender, ethnicity, and education. Health variables included mobility impairment (trouble climbing stairs or going outdoors), perceived health (good or excellent vs fair or poor), depression (score of 5 or more on the scale developed by Roberts and O'Keefe),[24] and a count of the presence in the past 12 months of diabetes, cancer, stroke, heart disease, bronchitis, or high blood pressure.

Health practices and conditions. The ones assessed included cigarette smoking (current, former, or never), physical exercise (often, sometimes, or never walk, swim, do physical exercise, or do sports for exercise), and alcohol consumption (abstain, 1 to 45 drinks per month, over 45 drinks per month). The body mass index (weight in kilograms divided by height in meters squared) was used to divide subjects into weight quintiles by gender: those in the upper quintile were considered overweight; those in the lower quintile were considered underweight. All of these practices and conditions have been shown to predict both mortality and morbidity.[22,25–28]

Social connections. These included three from the Social Network Index: marital status (married vs not married), close social contacts (seeing three or more close friends or relatives at least once a month vs fewer than three), and group memberships (belonging to three or more nonreligiously associated groups vs fewer than three). This index and its components have been shown to predict mortality and physical functioning.[29–33]

Improved health practices, increased social contacts, and stable marriages from 1965 to 1994. Improved health practices included quitting smoking by 1994 for those smoking in 1965; increased exercise by 1994 for those exercising never or only sometimes in 1965; being no longer in the top body mass index quintile in 1994 for those in the top body mass index quintile in 1965; and reduced alcohol consumption for those having more than 45 drinks per month in 1965. Increased social contacts included increased numbers of close friends and relatives seen each month for those seeing fewer than three in 1965 and increased nonreligious group memberships for those belonging to fewer than three in 1965. Marital stability was measured in terms of whether 1994 respondents were married

to the same person they had been married to in 1965.

Statistical Analyses

Baseline associations between frequent attendance and adjustment variables were analyzed with percentages and unadjusted odds ratios.

Cox proportional hazards models with time-dependent covariates were used to analyze the relationship between attendance and mortality.[34,35] This method takes into account changes in attendance and adjustment variables reported at each new survey during follow-up. Survival times were censored at loss to follow-up or at end of study. Deaths were included through 1993 and numbered 770. Four sequential models were used to assess the relative impacts of the adjustment variables on the relationship between attendance and mortality. The first model included age, gender, ethnicity, education, and affiliation as adjustments. The second model added health conditions; the third added social connections; and the fourth added health practices. Gender differences in outcomes and gender-specific associations between attendance and mortality were assessed by adding gender-by-attendance interaction terms to the models.

Multiple logistic regression was used to assess associations between attendance and 1965-through-1994 changes in health practices, body mass index, and social connections. Adjustments included age, gender, ethnicity, religious affiliation, education, and health conditions.

Results

Baseline Associations and Mortality

Table 1 presents associations between baseline characteristics and frequent attendance. Females and Blacks were more likely to attend frequently, as were those who were mobility impaired and not depressed. Marriage was not associated with frequent attendance, but both number of close social contacts and group memberships were. While there was no association for exercise, smokers and heavy drinkers were much less likely to be frequent attenders. Overweight persons were more likely to be frequent attenders.

Table 2 presents the results of the Cox proportional hazards analyses using time-dependent covariates. Frequent attenders had lower mortality rates than nonattenders when only age, gender, ethnicity, education, and affiliation were

included as adjustments (relative hazard [RH] = 0.64; 95% confidence interval [CI] = 0.53, 0.77). There were modest reductions in this relationship when health conditions (Model II) and social connections (Model III) were added. When adjustments for health practices and body mass index were included (Model IV), the relationship between frequent attendance and mortality became weaker (RH = 0.77; 95% CI = 0.64, 0.93) though still statistically significant.

The data from Table 2 also indicate that the relationship between frequent attendance and mortality was stronger for females than for males. For males, the inclusion of all covariates made the relationship between frequent attendance and mortality no longer statistically significant (RH = 0.90; 95% CI = 0.70, 1.15). The relationship between frequent attendance and mortality remained statistically significant for females even when all covariates were included (RH = 0.66; 95% CI = 0.51, 0.86).

Changes in Health Practices and Social Contacts for Survivors

Table 3 presents the results comparing frequent and infrequent attenders on improvements in health practices, body mass index, and social connections between 1965 and 1994. Frequent attenders who smoked in 1965 were nearly twice as likely as infrequent attenders to stop (odds ratio [OR] = 1.90; 95% CI = 1.27, 2.85). Frequent attenders who exercised never or only sometimes in 1965 were over a third more likely to increase their frequency of exercise (OR = 1.38; 95% CI = 1.08, 1.77). The odds ratios for reducing drinking by 1994 and for no longer being overweight favored frequent attenders, but small numbers made the resulting confidence intervals wide.

Frequent attenders showed greater stability or improvement on the three social measures than infrequent attenders. They were more likely to stay married to the same person (OR = 1.79; 95% CI = 1.36, 2.35); those with few group memberships were more likely to increase memberships (OR = 1.58; 95% CI = 1.21, 2.06); and those with few close contacts in 1965 were 50% more likely to increase their contacts (OR = 1.50; 95% CI = 1.02, 2.21).

Discussion

Using time-dependent covariate survival models, this study demonstrated lower mortality rates over nearly 3 de-

cades for frequent religious attenders compared with infrequent attenders, even with adjustments for mental and physical health during follow-up. Adjusting for social connections had only a modest impact; the association between attendance and mortality was reduced when health practices were added as adjustments, but remained statistically significant.

Several potentially important variables to further assess the pathways by which religiosity might have an impact on health were not available to us. Religiosity may affect health through psychological means, such as an improved sense of coherence, a belief in the therapeutic value of faith, or by a stronger host resistance to the impact of stressors on

mental and physical health.[36] Quality, rather than quantity, of social relationships may also be important. Such concepts stress the intrinsic aspects of religiosity as opposed to the extrinsic or organizational aspects measured in our analysis.[37] Using such measures with our methodology might prove fruitful.

Gender Differences

The observed associations between frequent attendance and mortality were stronger for females than for males, a finding consistent with results in the Tecumseh Community Health Study.[8] Past studies of American religiosity have reported that women attend services more frequently than men and evidence a

TABLE 1—Percentage of Study Participants Reporting Frequent Attendance at Religious Services at Baseline in 1965, by Selected Characteristics, Alameda County, California

1965 Variable	Value	No.	% Frequent Attendance	OR	95% CI
Demographics					
Gender	Female	2789	29.4	1.62	1.42, 1.84
	Male	2497	20.4		
Years of education	≥12	3682	24.9	0.96	0.84, 1.10
	<12	1604	25.6		
Ethnicity	Black	672	33.9	1.64	1.38, 1.95
	All others	4614	23.9		
Physical and mental health					
Mobility impaired	Yes	187	35.3	1.66	1.22, 2.25
	No	5099	24.8		
Chronic conditions	≥1	767	26.2	1.07	0.90, 1.27
	0	4519	25.0		
Perceived health	Fair or poor	860	25.8	1.04	0.88, 1.23
	Excellent or good	4426	25.0		
Depressed	Yes	724	22.5	0.85	0.70, 1.02
	No	4562	25.6		
Social connections					
Married	Yes	4162	25.5	1.09	0.94, 1.27
	No	1124	23.8		
Close social contacts	3+	3506	27.3	1.42	1.24, 1.63
	<3	1780	20.9		
Group memberships	3+	2574	27.0	1.21	1.07, 1.37
	<3	2712	23.4		
Health practices					
Smoke cigarettes	Yes	2569	16.6	0.40	0.35, 0.46
	No	2717	33.2		
Exercise often	Yes	1930	25.0	0.99	0.87, 1.12
	No	3356	25.2		
Alcohol consumption	>45 drinks/month	843	14.5	0.45	0.37, 0.56
	≤45	4443	27.2		
Weight (measured as body mass index)	Highest quintile	1036	30.9	1.44	1.24, 1.67
	Lower 4 quintiles	4250	23.7		

Note. Odds ratios (ORs) and confidence intervals (CIs) indicate the likelihood of frequent attendance for those in indicated row category compared with those in the row immediately below.

TABLE 2—Multivariate Sequential Models Using Time-Dependent Covariates to Compare Mortality Rates for Frequent vs Infrequent Attenders of Religious Services during 28 Years of Follow-Up

Model and Covariates	Total Sample (n = 5286)		Females[a] (n = 2789)		Males[a] (n = 2497)	
	RH	95% CI	RH	95% CI	RH	95% CI
I: Age, gender, ethnicity, education, religious group	0.64	0.53, 0.77	0.54	0.42, 0.70	0.76	0.60, 0.97
II: Model I plus health conditions	0.67	0.56, 0.80	0.56	0.43, 0.73	0.80	0.62, 1.02
III: Model II plus social connections	0.69	0.57, 0.83	0.57	0.44, 0.74	0.82	0.64, 1.05
IV: Model III plus health practices, body mass index	0.77	0.64, 0.93	0.66	0.51, 0.86	0.90	0.70, 1.15

Note. RH = relative hazard; CI = confidence interval.
[a]RH and CI for males and females estimated from a single model containing gender by attendance interaction term; *P* values for this interaction term were .05 (Models I and II), .04 (Model III), and .08 (Model IV).

TABLE 3—Improved Health Practices, Social Connections, and Stable Marriages over 29 Years for Frequent Attenders of Religious Services in 1965 Compared with Infrequent Attenders

1994 Outcome	Frequent Attenders		
	No.	OR	95% CI
Improved health practices/conditions			
Stopped smoking (for those smoking in 1965)	1061	1.90	1.27, 2.85
Reduced drinking ≤45 drinks/mo (for those >45 drinks/mo in 1965)	350	1.66	0.77, 3.58
Increased exercise (for those exercising never or only sometimes in 1965)	1486	1.38	1.08, 1.77
No longer in top body mass index quintile (for those in top quintile in 1965)	355	1.37	0.80, 2.35
Stable marriages, increased social connections			
Stayed married to same person (for those married in 1965)	2007	1.79	1.36, 2.35
Increased nonchurch community group memberships to 3+ or more (for those belonging to <3 in 1965)	1701	1.58	1.21, 2.06
Increased number of close friends/relatives seen each month to 3+ (for those seeing <3 in 1965)	779	1.50	1.02, 2.21

Note. Odds ratios (ORs) and confidence intervals (CIs) are based on logistic regression models comparing those who attended religious services once a week or more in 1965 with those who attended less often or not at all. Models adjust for 1965 age, gender, ethnicity, education, religious affiliation, chronic conditions, mobility impairment, perceived health, and depression.

stronger religious commitment.[38,39] More salient to the analyses here is that more women report using religion as a coping mechanism for dealing with life stress.[40] There is also evidence that religious involvement has stronger protective associations for disability and depression among older women than among older men.[41] Given the much higher proportion of widowhood among older women, religious organizations may act to fill an otherwise unmet social-support need. Koenig suggests that religiosity is more important for women because of their lower social status; Idler suggests that such differences stem from the more general tendency of women to seek and use social interaction to cope with illness.[41,42] Further analyses of this gender difference could provide etiologic insights to better explain the relationship between religiosity and mortality.

Are Health Practices and Social Connections Confounding or Intervening Variables?

Health practices and social connections could either confound the relationship between attendance and mortality (persons with good health practices and stronger social connections are frequent attenders of religious services) or act as intervening variables on a causal pathway between attendance and mortality. We found support for both possibilities but somewhat stronger evidence for the intervening model. At baseline, frequent attenders were much less likely than infrequent attenders to smoke cigarettes or drink heavily, and among those frequent attenders who smoked or drank heavily at baseline, more were likely to stop these activities during follow-up. Both baseline differences and differential improvements during follow-up were also found for the two social-connections measures. For exercise and marital status, there were no baseline differences, yet frequent attenders who exercised little at baseline were more likely to increase, and those married were more likely to stay married to the same person. Frequent attenders may have lower mortality rates because they adopt better health practices, increase their social connections, and have more stable marriages in conjunction with their religious attendance. Attendance at religious services could also have influenced health practices and increased social contacts before the study began.

The adjustment for health practices reduced the relationship between frequent attendance and mortality more than did the adjustment for number of social connections, although it is possible that the latter relationship would have been stronger if information had been available on the quality of social connections. The stronger impact of health practices in our analyses is consistent with cross-sectional results from the Yale Health and Aging Project,[43] which used health rather than mortality as an outcome. On the other hand, Kark et al. reported that health practices were not responsible for the sharply lower mortality rate in religious vs secular Israeli kibbutzim.[6] Differences in relative importance between health practices and social ties could reflect differen-

tial measurement, the comparison groups used, or a real difference in impact. This issue should be researched further.

Public Health Implications

If, as our analyses indicate, frequent religious attendance does facilitate the adoption of better health practices, the mechanisms involved have broad public health implications. Religious organizations are frequently involved in public health campaigns and supportive programs to assist marginal members of their communities. The American Public Health Association has set up an initiative to form new partnerships with faith communities to better coordinate such activities.[44] The initiative stresses the roles of religious organizations in communities as well as impacts on their members. Understanding how these organizations affect behavior and attitudes of their own members could help us understand why some individuals adopt good health practices while others do not. Possible mechanisms by which such organizations influence good health practices include peer influence, increased self-esteem, increased sense of perceived control, prescribed practices, and a general philosophical outlook that values social ties and treating one's body with respect. Further research is needed to identify the specific mechanisms involved and determine whether they are limited primarily to active mem bers of these organizations or extend more broadly into the communities around them. □

Acknowledgment

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