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Abstract Worship attendance has been associated with longer survival in prospective cohort studies. A possible explanation is that religious involvement may promote healthier lifestyle choices. Therefore, we examined whether attendance is associated with healthy behaviors, i.e. use of preventive medicine services, non-smoking, moderate drinking, exercising regularly, and with healthy dietary habits. The population included 71,689 post-menopausal women enrolled in the Women's Health Initiative observational study free of chronic diseases at baseline. Attendance and lifestyle behaviors information was collected at baseline using self-administered questionnaires. Healthy behaviors were modeled as a function of attendance using logistic regression. After adjustment for confounders, worship attendance (less than weekly, weekly, and more than weekly vs. never) was positively associated with use of preventive services [OR for mammograms: 1.34 (CI 1.19, 1.51), 1.41 (1.26, 1.57), 1.33 (1.17, 1.52); breast self exams: 1.14 (1.02, 1.27), 1.33 (1.21, 1.48), 1.25 (1.1, 1.43); PAP smears: 1.22 (1.01, 1.47-weekly vs. none)]; non-smoking: [1.41 (1.35, 1.48), 1.76 (1.69, 1.84), 2.27 (2.15, 2.39)]; moderate drinking [1.35 (1.27, 1.45), 1.60 (1.52, 1.7), 2.19 (2.0, 2.4)]; and fiber intake [1.08 (1.03, 1.14), 1.16 (1.11, 1.22), 1.31 (1.23, 1.39), respectively], but not with regular exercise or with lower saturated fat and caloric intake. These findings suggest that worship attendance is associated with certain, but not all, healthy behaviors. Further research is needed to get a deeper understanding of the relationship between religious involvement and healthy lifestyle behaviors and of the inconsistent patterns in this association.

Keywords: middle-aged women, religion, lifestyles, health, health behaviors

Considerable effort has been devoted to the investigation of the possible relationship between religiosity and indicators of physical and mental health (Koenig, McCullough, & Larson, 2001; Powell, Shahabi, & Thoresen, 2003; Smith, McCullough, & Poll, 2003), with most recent studies reporting positive associations. In the research about religious involvement and physical health, one of the most well-established findings is the existence of an inverse relationship between different measures of religious involvement and all-cause mortality (Enstrom & Breslow, 2008; Gillum, King, Obisesan, & Koenig, 2008; House, Robbins, & Metzner, 1982; Hummer, Rogers, Nam, & Ellison, 1999; Kark et al., 1996; Koenig et al., 1999; McCullough, Hoyt, Larson, Koenig, & Thoresen, 2000; Schnall et al., 2008; Strawbridge, Cohen, Shema, & Kaplan, 1997). For example, using data from over 8,000 participants in the Third National Health and Nutrition Examination Survey (NHANES III) with an average of 8.5 years of follow-up, Gillum and colleagues (2008) reported more frequent worship attendance was associated with decreased risk of all-cause mortality. Another large study of a representative sample of over 3,600 U.S. adults age 25 and older, with an average of 7.5 years of follow up, also found more frequent worship attendance was associated with decreased all-cause mortality (Musick, House, & Williams, 2004). Some evidence for a similar association also has been reported from samples in countries other than the US (Goldbourt, Yaari, & Medalie, 1993; Kark et al., 1996). A recent meta-analysis (Chida, Steptoe, & Powell, 2009) described a positive association of religious involvement with survival in healthy populations (HR=0.82, CI 0.76, 0.87), with even stronger associations among women (HR=0.70, CI 0.55, 0.89) and older adults (HR=0.79, CI 0.69, 0.90). These associations remained significant even after adjusting for demographic, behavioral, psychological and social support variables. In this meta-analysis, in the 69 studies using community samples, attendance

at religious services was the measure of religious involvement that had the strongest positive association with survival.

In contrast to the research about religious involvement and all-cause mortality, there have been fewer studies of the relationship with the incidence of diseases that are leading causes of death such as cardiovascular disease or cancer, and the findings are less consistent. For example, two studies have reported more frequent worship attendance was inversely related to cardiovascular mortality (Hummer et al., 1999; Oman, Kurata, Strawbridge, & Cohen, 2002). A recent meta-analysis also reported higher levels of religious involvement were associated with a reduction in cardiovascular mortality of up to 28% (Chida et al., 2009). However, such findings have not been observed among participants in two large studies of cardiovascular health, the Multi-Ethnic Study of Atherosclerosis (Feinstein, Liu, Ning, Fitchett, & Lloyd-Jones, 2010) and the Women's Health Initiative (Schnall et al., 2008). The limited available evidence also suggests that more frequent worship attendance is not associated with reductions in cancer mortality (Chida et al., 2009; Hummer et al., 1999; Oman et al., 2002). However, adherents of selected faith traditions with strict dietary and behavioral guidelines appear to be protected from some cancers (Hoff, Johannessen-Henry, Ross, Hvidt, & Johansen, 2008).

There also are inconsistent findings from the few studies that have examined age and gender differences in the relationship between frequency of worship attendance and all-cause mortality. For example, some studies (Chida et al., 2009; Koenig et al., 1999) reported a stronger association among women, but other studies found no such pattern (Musick et al., 2004). Some studies found a stronger association in middle age vs. older adults (Musick et al., 2004), but the Women's Health Initiative (Schnall et al., 2008), and a meta-analysis (Chida et al., 2009) reported a stronger relationship among older women, and among adults age 60 and older,

respectively. In sum, there is strong and consistent evidence that greater levels of religious involvement, usually measured as more frequent worship attendance, are associated with better physical health when the measure of physical health employed is all-cause mortality. However, when we examine the relationship with cause-specific mortality, or age and gender differences in these associations, the evidence becomes far less consistent.

Other efforts to understand the relationship between religious involvement and physical health focused on three mediating mechanisms. The first mechanism is the ways in which religious involvement fosters psychological well-being (Strawbridge, Shema, Cohen, & Kaplan, 2001) or buffers the harmful effects of emotions such as anxiety and depression (Hughes et al., 2004; Smith et al., 2003). The second mechanism is the ways religious involvement promotes social relationship and social support (Strawbridge et al., 2001). A third possible mechanism is that religious involvement may promote healthy lifestyle choices. There is reasonably consistent evidence of the beneficial effects of religious involvement for some aspects of a healthy lifestyle such as not smoking (Gillum, 2005; Roff et al., 2005; Whooley, Boyd, Gardin, & Williams, 2002) or the limited consumption of alcohol (Hill, Burdette, Ellison, & Musick, 2006; Luczak, Shea, Carr, Li, & Wall, 2002). Evidence also has begun to suggest that higher levels of religious involvement are associated with regular medical and dental check-ups (Hill et al., 2006), and adherence to recommended cancer screening protocols (Benjamins, 2006). However, inconsistent and contradictory findings begin to emerge when other types of health behavior are considered. For example, some studies reported a positive association between religious involvement and greater physical activity (Hill et al., 2006; Strawbridge et al., 2001), but others found little or no association (Gillum, 2006a). Several studies have reported that greater levels of religious involvement were associated with more overweight and obesity (Feinstein et al., 2010;

Gillum, 2006b), but other studies found no association (Roff et al., 2005). In some studies different measures of religion yielded different patterns in this association (Cline & Ferraro, 2006). Studies examining the association between religious involvement and dietary behaviors such as energy and fat intake are limited in number, used different definitions of religious involvement, and yielded conflicting results, with two studies (Friedlander, Kark, Kaufmann, & Stein, 1985; Hart, Tinker, Bowen, Satia-Abouta, & McLerran, 2004) showing a positive association with low-fat intake, and two studies showing either no associations (Obisesan, Livingston, Trulear, & Gillum, 2006) or even a harmful association for some subgroups (Hill et al., 2006). Interpreting the inconsistencies in the evidence about religious involvement and lifestyle has been hampered by several factors including the limited measures of lifestyle in most studies and the diversity of the measures of religious involvement employed in different studies.

The present study is an effort to advance our understanding of the contribution of religious involvement to healthy lifestyles. Specifically, we examined the association of self-reported religious service attendance with multiple indicators of healthy lifestyle in a large and diverse population of women enrolled in the Women's Health Initiative study. Besides indicators such as smoking and drinking behaviors whose association with religious involvement has been well-documented, we also considered factors such exercise, dietary behaviors and use of preventive services that have received less attention in the research about religion and health. Most of the selected indicators are risk factors for either cardiovascular disease or cancer, or both. Furthermore, we restricted our study to healthy women. This permitted us to examine the contribution of religious involvement to the lifestyle behaviors of healthy persons and to avoid the confounding effect of previous illness on both health behaviors and worship attendance. We thus hypothesized that more frequent attendance at religious services might be positively

associated with healthy behaviors such as being a non-smoker, drinking in moderation, accessing preventive services, having healthier diets (low-calorie, low-saturated fat and higher fiber intake), and with increased physical exercise.

Method

Population and Design

The Women's Health Initiative consisted of a set of placebo-controlled randomized clinical trials, and an observational study (Hays et al., 2003). The clinical trials enrolled 68,132 post-menopausal women and included a Hormone Therapy trial examining the effects of combined hormones or estrogen alone on the prevention of coronary heart disease and osteoporotic fractures, and risk of breast cancer; a Dietary Modification trial evaluating the effect of a low-fat and high fruit, vegetable and grain diet on the prevention of breast and colorectal cancers and coronary heart disease; and a Calcium/Vitamin D trial evaluating the effect of calcium and vitamin D on the prevention of osteoporotic fractures and colorectal cancer. The observational study included 93,676 women ineligible or unwilling to take part in the clinical trials or recruited specifically for the observational study, and examined the relationship between lifestyle, health and risk factors and specific disease outcomes.

Of the multiple recruitment strategies used in the Women's Health Initiative, mass mailings was the primary method of contacting women potentially interested in the initial screening. Addresses for mass mailings were obtained from a variety of sources, including department of motor vehicle registration lists, voter's registration lists, HMO enrollee lists, Health Care and Financing Administration (currently known as the Centers for Medicare and Medicaid Services) lists, and commercial mailing lists. (Hays et al., 2003).

In order to be eligible women had to be 50 to 79 years old, post-menopause, provide written informed consent, and reside in the study area for at least 3 years following enrollment. Exclusion criteria included medical conditions predictive of a survival time of less than 3 years; conditions inconsistent with study participation and adherence (alcoholism, drug dependency, mental illness, and dementia) and participation in another randomized trial. Follow-up duration was between 6 and 10 years, depending on when women enrolled in the study.

Baseline assessment of study participants included physical measurements, blood specimens' collection, a medication/supplement inventory, and completion of questionnaires related to medical, family and reproductive history, lifestyle/behavioral factors, and quality of life. Clinical outcomes were identified annually by self-report on the medical history update or by reporting directly to clinic staff in the intervals between questionnaires. Centrally-trained cardiovascular physicians and neurologists adjudicated cardiovascular and mortality outcomes (Curb et al., 2003).

The present study included women from both the clinical trials and the observational study (n=161,808). In order to avoid the confounding effect of previous illness on both health behaviors and worship attendance, women with a history of chronic diseases such as cancer and cardiovascular, respiratory, hepatic, renal, neurological or metabolic diseases at study entry (n=90,119) were excluded, leaving 71,689 women for this analysis.

Measures

Religiosity (independent variable).

Information about service attendance was collected by means of a self-administered questionnaire. The question read as follows "How often have you gone to a religious service or to a church during the past month?" Possible answers were "not at all, once, two or three times,

once a week, two to six times a week, and every day". To be consistent with previous literature and with a paper examining the association between religiosity and mortality in the same population (Schnall et al., 2008), this variable was categorized as not at all in past month (reference group); less than once per week (i.e., 1-3 times in last month); once per week; and more than once per week.

Healthy lifestyle indicators (outcome variable).

Four healthy lifestyle indicators represented the study outcomes: diet, physical activity, smoking and drinking behaviors, and use of preventive services. Nine variables each collected at baseline by means of self-administered questionnaires were considered. For dietary behaviors we considered total caloric intake, saturated fat intake, and total fiber intake; the intake of these nutrients was derived from a food-frequency questionnaire designed for the Women's Health Initiative (Patterson et al., 1999). Physical activity was collected through a self-administered questionnaire inquiring about physical exercise habits (not including walking outside the home). We generated a four-category variable indicating no exercise, and mild (slow dancing, bowling, golf), moderate (biking outdoors, stationary bike or treadmill, calisthenics, easy swimming, popular or folk dancing) and hard exercise (aerobic, aerobic dancing, jogging, tennis, swimming laps) at least twice a week.

For smoking and drinking behaviors, we used baseline smoking status (never, current, ex smoker), and number of alcoholic drinks per week. Indicators of preventive services use (mammogram ever, Pap smear ever, and breast self-exam ever) were selected based on available evidence from the literature (Benjamins, 2006; Benjamins, Trinitapoli, & Ellison, 2006). Breast self-exam information was available in the observational study only. Of note, the Women's Health Initiative was conducted before the current changes to recommendations for

mammograms and breast self-exam ("Screening for Breast Cancer: U.S. Preventive Services Task Force Recommendation Statement," 2009).

Covariates.

The following covariates were selected based on previous literature: age (<50-59, 60-69 and 70-79+); race/ethnicity (American Indian or Alaskan Native, Asian or Pacific Islander, Black or African-American, Hispanic/Latino, White, other); marital status (never married, married or in marriage-like relationship, widowed, divorced/separated); education (high school, graduate, post-graduate); income (<=19,999, 20,000-49,999, 50,000-99,999, >=100,000); health insurance status (yes vs. no); enrollment status (observational study vs. clinical trials); and family history of breast cancer (yes vs. no). Physical functioning and self-rated health scales, derived from the Rand 36-Item Health Survey, were categorized (quartiles) to account for lack of linear association with the outcomes. All covariates of interest were collected at baseline by means of self-administered questionnaires.

Data analysis

Baseline characteristics across different religious attendance categories were compared using chi square for proportions and ANOVA for continuous variables (Kruskall-Wallis test was used if the assumption of constant variance across groups was not met or if the variable was not normally distributed).

The nine outcome variables of interest were treated as dichotomous variables and modeled as a function of religious attendance, first using a univariate logistic regression model (unadjusted associations), and then a multivariate model adjusted for confounding variables. For continuous variables (log-transformed), a linear regression model yielded similar results (data not shown). We chose to show the results from the logistic regression for ease of presentation.

Each multivariate model was adjusted for age, race/ethnicity, marital status, family income, education, enrollment status (clinical trials vs. observational study), general health score, physical functioning, and health insurance status. Family history of breast cancer was included in the analysis of mammogram and self-breast exam. For the analysis of dietary behaviors, we also adjusted for total caloric intake. When associations in the logistic regression model looked linear, we also tested for linear associations. Results are presented as ORs with 95% confidence intervals. All statistical analyses were performed using STATA statistical software version 10.

Results

Baseline Characteristics

Of the 71,689 women initially available, 21.4 % were excluded for missing data on confounders or some of the outcome variables, leaving 56,372 women for the final multivariate analysis. Compared with those included in the analyses (Table 1), a slightly higher proportion of women excluded due to missing data attended services more than weekly (16.8% vs.13.8%), was African American (10.9 vs. 7.3%) or Hispanic (6.7 vs. 4.1%), was less educated (post graduate education, 26.2 vs. 30.6%) or had no health insurance (6.8 vs. 5.1%), $p<0.001$. Outcome variables comparisons (fiber, saturated fats and caloric intake, use of preventive services, drinking, and smoking and exercise behaviors) between the women who were retained and those who were excluded from the analyses were statistically significant because of the large number of observations, with modest differences between groups.

The reference group (no attendance in the past month) consisted of 33.7% of participants; 30.5% reported once per week attendance, 21.4% reported attendance of less than once per month, and 14.4% reported to attend more than once per week. Mean duration of follow-up was 7.83 years (median, 7.96).

Compared to women attending less frequently, women reporting higher frequency of attendance tended to be older, less educated, and of lower socio-economic status (Table 2); they were more likely to be of African American or Hispanic descent, and to be married or widowed. Overall, 94.5% of all women had health insurance. Overall health scores were similar across attendance categories, while physical functioning scores tended to decrease among more frequent attendees.

Regarding use of preventive services (Table 3), there were small, but statistically significant, differences in the number of women who reported mammograms, breast self-exams or PAP tests based on frequency of religious service attendance. As for smoking and drinking, a higher proportion of more frequent service attendees never smoked, while the percentage of current smokers was higher in the group not attending services at all in the previous month. The average number of alcohol servings per week was lower in women who attended once or more than once a week compared with those reporting no attendance. Average fiber, saturated fat and total caloric intake was higher among more frequent attendees, but differences were modest. Finally, a higher proportion of most frequent service attendees reported that they never exercised (Table 3).

Univariate and Multivariate Models

In both the unadjusted and multivariate-adjusted analyses results indicate the odds of women having adopted a certain healthy behavior in each religious service attendance category compared to the reference group who never attended during the past month. An OR >1 indicates increased probability of having adopted a specific behavior, whereas an OR <1 indicates a decreased chance. If the confidence interval for the OR does not include 1, it can be assumed that

the results are statistically significant. Unadjusted and adjusted associations between different health behaviors and service attendance are presented in Table 4.

Use of preventive medicine services

Women attending religious services were more likely to have undergone mammograms and Pap tests and to perform breast self-exams. The direction of the association was consistent in most categories of attendance and the association was strongest for women attending weekly, whose odds of having ever had a mammogram, performed a breast self-exam, and had a Pap smear were respectively 41%, 33% and 22% higher compared to women never attending (Table 4). The positive relationship between attendance and use of preventive medicine services was somewhat blunted in the group with the highest frequency of attendance, which also demonstrated no association with the performance of Pap tests.

Drinking and smoking behaviors

Women attending services more frequently were at increased odds of having never smoked, and they were more likely to drink less than 1 drink a day compared to women who never attended. After re-estimating the logistic regression models for these variables using attendance as a continuous variable, the likelihood of being a non-smoker and of drinking less than one drink a day rose with increasing service attendance (p for linear association, <0.001). The odds of having never smoked and of drinking less than one drink daily increased 32.3% and 31.7%, respectively, with each increase in category of attendance.

Physical activity

After adjustment for confounders, there was no association between weekly service attendance and any physical activity (mild, moderate or strenuous) at least twice a week (Table

4). More than weekly attendance was associated with significantly lower levels of physical activity (OR=0.87, CI: 0.83, 0.92).

Diet

Women attending services at least weekly were less likely to have a lower caloric intake compared with those not attending (OR=0.91, CI: 0.87, 0.95 in women attending weekly, and 0.94, CI: 0.89, 0.99 in women attending more than once a week), a 9% and 6% decrease in the odds of having a caloric intake below the 50^{th} percentile, respectively. There was no association with a lower intake of saturated fat in the adjusted model. Women reporting more frequent attendance were more likely to have a higher intake of fiber (OR=1.16, CI: 1.11, 1.22 in women attending weekly, and 1.31, CI: 1.23, 1.39 in women attending more than once a week, p for linear association: <0.001, Table 4).

Discussion

As described previously, there is considerable evidence in favor of a positive association of frequent worship attendance and survival (Enstrom & Breslow, 2008; Gillum et al., 2008; House et al., 1982; Hummer et al., 1999; Kark et al., 1996; Koenig et al., 1999; McCullough et al., 2000; Schnall et al., 2008; Strawbridge et al., 1997). A possible explanation for this association is the embracing of a healthier lifestyle by the more religiously involved (Benjamins, 2006; Gillum, 2005, 2006a; Hill, Ellison, Burdette, & Musick, 2007; Strawbridge et al., 2001). This study of a large population of healthy women from the Women's Health Initiative, employing a comprehensive group of measures of health behaviors and including extensive adjustment for numerous confounders, suggests that the relationship between worship attendance and health behaviors is more complex. Women reporting more frequent worship attendance accessed preventive medicine services more extensively, were more likely non-

smokers or had quit smoking, consumed less alcohol, and ate diets richer in fiber compared to women reporting that they did not attend services during the previous month. On the other hand, attending services was not associated with behaviors such as exercising regularly or eating less saturated fat and calories. Furthermore, the relationship between frequency of attendance and health behavior was often non-linear, with women with the highest frequency of worship attendance sometimes adopting specific healthy behaviors to a lesser extent than women who reported weekly attendance.

The strongest associations in the present study were observed with smoking and drinking, which also were associated linearly with increasing frequency of attendance. These findings are consistent with well-established evidence from the literature, although with different populations and study designs (Feinstein et al., 2010; Gillum, 2005; Hill et al., 2006; Roff et al., 2005; Shmueli & Tamir, 2007), showing that among frequent worship attendees there is a higher prevalence of never smokers and moderate drinkers.

There is a limited amount of research regarding the use of preventive services and participation in religious services. The associations we found with preventive services were weaker than in the studies of Benjamins and colleagues (Benjamins, 2006; Benjamins & Brown, 2004). Possible explanations are that we adjusted for confounders such as family history of breast cancer, and we excluded women with previous disease. Our findings of a non-linear association between frequency of worship attendance and preventive service use have been reported in two other studies among women (Benjamins, 2006; Benjamins et al., 2006) and deserve further investigation.

Studies of dietary behaviors and religiosity have yielded conflicting results, and in this respect ours is the first study providing extensive information about dietary behaviors and

worship attendance. Obisesan et al. (2006) showed no association between attendance frequency and serum lipid levels or dietary intake of energy and fat. Hart and colleagues (2004) showed a positive association of extrinsic (socially motivated) religious orientation with low-fat intake, after adjusting for demographic characteristics, while no association was found with vegetable and fruit intake. A cross-sectional study (Friedlander et al., 1985) conducted in a Jewish population showed that self-defined "secular" subjects consumed more total fat and more saturated fatty acids than religious subjects. Differences may be explained by the fact that the present study accounted for confounders such as total caloric intake, previous disease, and self-reported health, which were not considered in prior studies. Our report of the lack of association between religious attendance and low-saturated fat and low-calorie diets is consistent with, and may explain, the higher prevalence of obesity and overweight observed in self-reported frequent attendees of religious services in other populations (Feinstein et al., 2010; Gillum, 2006b; Shmueli & Tamir, 2007). Other factors that have been suggested as contributing to this pattern include the lower rates of smoking among the more religiously involved, less stigma toward those who are overweight or obese (Cline & Ferraro, 2006) and differences in the moral views of faith groups and denominations toward diet and body weight (Ferraro, 1998).

Our data do not confirm previous reports of a positive association between physical activity and services attendance (Gillum, 2006a; Hill et al., 2006; Merrill & Thygerson, 2001), showing instead a lack of association or even an inverse relationship. It is worth noting that poor health may confound the relationship between attendance and physical activity, as unhealthy women will be both unable to attend services and to exercise regularly. Since we excluded women with previous disease, we eliminated the confounding effect of poor health on this association.

In the observational cohort of the Women's Health Initiative (Schnall et al., 2008) self-reported attendance at religious services was associated with a reduction in all-cause, but not cardiovascular, mortality; instead, an increased risk of this outcome was observed in some models, contrary to previous reports (Hummer et al., 1999; Oman et al., 2002). Our findings may help explain this lack of protection as women attending more frequently had a higher prevalence of risk factors for coronary heart disease: they exercised less, had a higher caloric intake, and had diets richer in saturated fat compared to their less religious counterparts.

This study has several limitations. First, due to its cross-sectional design, we do not know whether there is a causal association between attendance at worship services and healthy behaviors and our findings need to be confirmed in prospective cohort studies.

Second, most variables were self-reported, including attendance at services. Higher levels of attendance are usually described in surveys compared to assessments using head-count approaches (Hadaway, Marler, & Chaves, 1993, 1998). If women over-reported their frequency of attendance, then the strength of the association between services attendance and healthy behaviors would be underestimated.

Third, most studies inquired about frequency of attendance during the past year while the Women's Health Initiative asked about frequency of attendance in the past month. Measuring attendance over a one-year time frame may more accurately reflect the habitual patterns of attendance, while a one-month time frame may be affected by temporary disruptions of the usual attendance pattern due to health or family problems, job losses, and bereavement. This may result in a misclassification of the exposure with the reference category including women who never attend services together with women who did not attend over the past month but may definitely attend more frequently over a one-year period. Consequently, the strength of the

associations may be underestimated. This is a common problem in the religion literature and measurements of long-term patterns of religious involvement are needed (George, Hays, Flint, & Meador, 2004).

The use of frequency of worship attendance as the only measure of religious involvement may also be seen as a limitation of this study. We focused on frequency of worship attendance because it is one of the most commonly used measures of religious involvement in research about religion and physical health, and especially religion and mortality. The use of this measure thus permits comparison of these results with previous research. Two other measures of religion, religious affiliation and strength and comfort from religion, were collected in the Women's Health Initiative but we chose not to use them. The existing evidence suggests that associations between religious affiliation and health behavior are mostly found for very specific faith groups (e.g. Mormons, 7th Day Adventists). Examining these associations is best done in studies that have reasonable samples of participants from those groups which was not the case for the Women's Health Initiative. The other measure of religion in this study was strength and comfort from religion. This is generally seen as a measure of religious coping and may be influenced by the mobilization of religion to cope with stressful events. As such, it is not appropriate for an analysis that was focused on the effects of day-to-day religious involvement on the health behavior of healthy women.

The information relative to the performance of breast self-exam was available only in the observational study. The observational study cohort was composed primarily of women who were ineligible or refused to be randomized to the different clinical trials, typically because of conditions such as breast and endometrial cancer or other severe chronic diseases. Consequently, women in the observational study had a higher prevalence of breast cancer, which in turn may

affect the association between worship attendance and performance of breast self-exam. However, since women with a prior diagnosis of breast cancer (and other chronic diseases) were excluded from our analysis, we believe that the impact on our findings was modest.

For some variables differences were modest and were statistically significant because of the large sample size and power to detect differences that may be not be clinically meaningful. Since this is an observational study, whose aim was to explore the relationship between a marker of religious involvement (service attendance) and healthy behaviors, rather than evaluating the "effect" of an intervention as in a clinical trial, we believe that even such small differences may be of interest at the population level and for the generation of future hypothesis.

Another limitation was our choice to limit the analysis to healthy women which resulted in the exclusion of a large number of study participants. The results of this study can only be applied to healthy women who are post-menopause and they are not generalizable to younger or unhealthy women and to men.

Finally, we note that our study focused on establishing whether frequency of worship attendance was associated with a range of health behaviors and we did not attempt to identify any mechanisms that might further our understanding of the patterns we have observed. A number of possible mechanisms linking health behaviors with higher levels of religious involvement have been suggested (Benjamins, 2006; Benjamins et al., 2006; Ferraro, 1998) including greater access to health-related information and services through congregation-sponsored exercise or weight control programs, health fairs, parish nurses, or assistance with transportation to medical appointments. Faith group teachings about health behavior, and the way those teachings are reinforced by faith group leaders, role models, and group norms, may be another important mechanism. Benjamins and colleagues (Benjamins et al., 2006) have reported

that stronger belief in a religious duty to care for one's body was not associated with use of mammography among a sample of Presbyterian women, but this remains an important area for further investigation. It has also been suggested that higher levels of religious involvement may be associated with more conscientious and/or less risky health behavior (Benjamins, 2006; Benjamins et al., 2006).

In conclusion, our study provides further insight into the positive association between religiosity and health. However, issues such as the lack of a positive relationship between religious involvement and behaviors such as regular exercise or low-calorie, low-saturated fat diets, or why some associations seem to be more modest in the most frequent attendees deserve further investigation. Perhaps religious communities could have a role in advocating lifestyle changes that have not yet received adequate attention, such as exercising regularly or consuming healthy diets (Resnicow et al., 2002; Resnicow et al., 2005) probably because a sedentary life or a fat-rich diet do not carry the same negative moral connotations that excessive drinking or smoking do. Even after extensive adjustment for potential confounders there is still a residual, unexplained, positive association of religiosity with survival. Despite being older, less educated, from socially disadvantaged backgrounds, eating relatively unhealthy diets, exercising less, and being overweight or obese, women attending services still seem to live longer and perhaps happier lives.

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