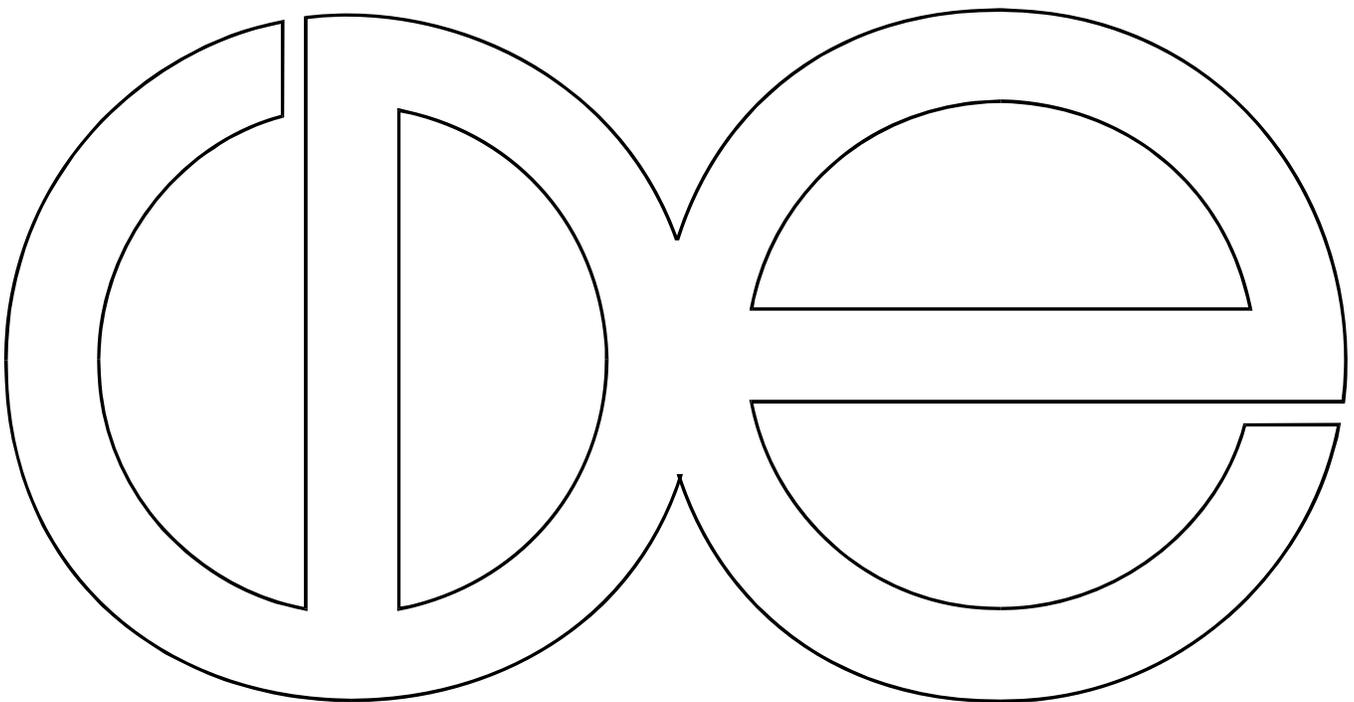


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**Assessing Longitudinal Relationships
between Social Factors and Health**

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Assessing Longitudinal Relationships between Social Factors and Health

Promoting the good health of an aging citizenry is a major research priority in the United States. This study contributes to this research agenda by examining the health benefits conferred by social support, social participation, and religiosity. Using cross-sectional and longitudinal ordinal logistic regression models, we test the effects of these variables on self-reported health in the two most recent waves of the Wisconsin Longitudinal Study. We find that benefits of social participation persisted in our full models but with a good deal of gender discrepancy. However, in sharp contrast to previous research, we find no evidence to support the universal health benefit to religious engagement.

Assessing Longitudinal Relationships between Social Factors and Health

Preserving the quality of life for aging populations is a major research priority in the United States. After initially focusing on biological contributors, a growing number of studies indicate social factors play a significant role in shaping mental and physical health. Social support, social participation, and religious participation all have been shown to have significant, positive relationships with various health outcomes. Social factors are of particular interest because unlike biological or genetic risk factors they are more open to modification and intervention. However, since research evaluating different social factors has developed in relative isolation, we need to better understand how they affect health before writing prescriptions for bowling leagues and book clubs. Using data from the Wisconsin Longitudinal Study, we assess the interrelationships between social participation, social support, religious participation, and self-reported physical health.

In this study we use cross-sectional and longitudinal analyses to address the following research questions:

1. Are social support, social participation and religious participation unique and independent predictors of health?
2. How do these relationships vary by gender?
3. Do these effects persist when prior measures of health and participation are added to the models?

Throughout this study we define social participation as self-reported engagement in or association with community-based organizations and social support as the frequency of informal gathering with family and friends. Religiosity can be operationalized in a multitude of ways (Weaver et al. 2005): in terms of religious behaviors like attendance or devotional activity, religious beliefs, self-identification or strength of commitment. While each of these has been used, in one form or another, religious service attendance is perhaps the most common, given its

ease of measurement. In this study we use religious service attendance, as well as participation in religious organizations, and in our cross-sectional analyses, religious importance. We begin with multivariate analyses to determine which, if any, of these three social factors yields an independent pathway to health. Next, we use longitudinal analyses to determine whether these relationships may be causal in nature. Finally we examine gender variation in the effects of social factors.

Literature Review

Empirical studies have repeatedly demonstrated a positive relationship between social support (Uchino, Cacioppo, and Kiecolt-Glaser 1996), social participation (e.g. Everard et al. 2000), religiosity or religious attendance (e.g. Hummer et al. 1999) and self-reported physical health. Researchers claim that these links are causal and that the effects are direct (Bennett 2002). Indeed, some authors believe the issue to be relatively settled; House (2002) compared the robustness of research findings on social participation and health to that of smoking and lung disease. Bennett neatly summarizes the literature noting, “Social aspects of aging have a role in maintaining physical health and can be considered under three broad headings: networks, support, and participation” (2002:165). We do not analyze networks independently of participation because network membership is an inherent part of both social participation and support. Instead, we attempt to tease out variation in effects of social participation, religious participation, and social support.

Effects of Social Participation on Health: Effects of social participation on health are widely documented for a variety of health outcomes including self-reported physical health (Uchino et al. 1996), depression (Greenfield and Marks 2007), psychological distress (Ellaway and Macintyre 2007), cognition (Wang et al. 2002), and mortality (Glass et al. 1999). Painted in

broad strokes, this literature suggests social participation is beneficial to everyone but a closer look reveals significant variation in who benefits from what types of participation.

Young and Glasgow (1998) used cross-sectional regression models to examine self-reported health and social participation in a sample of 629 elderly adults living in non-metropolitan areas. They identified two different categories of participation with significant connections to self-perceived health: instrumental (community or other-oriented organizations) and expressive (self-beneficial). Participation in instrumental activities predicted better health for both men and women, but only women appeared to benefit from expressive activities. In their study of participation and onset of functional disability in adults using the National Study of Families and Households (NSFH), Greenfield and Marks (2007) found an interaction between type of participation, gender and health outcomes. Specifically, they noted that men but not women benefited from continuous participation in civic organizations, and that continuous religious but not social participation was related to less depression. In contrast, Thoits and Hewitt (2001) found a relationship between social participation, specifically volunteering, and six measures of well-being and happiness: happiness, life satisfaction, self-esteem, mastery, depression, and physical health at time two. They used the American Changing Lives data (House 1995) and also found a small effect of prior well-being on later participation, indicating selection effects may be present.

Oxman, Freeman and Manheimer (1995) studied factors predicting mortality during the 6 months after cardiac surgery in a sample of 232 clinical patients. Even controlling for prior health status, the authors' logistic regression models revealed evidence that a lack of participation in community group activities and a lack of comfort or support from religion independently predicted mortality after elective open heart surgery. In particular, they found

patients who were not actively participating in community groups and those who reported drawing no comfort or support from religion were three times more likely to die during the 6-month follow-up period. Follow-up analyses led the authors to conclude that these were independent and additive contributors to risk of mortality. However, their analytical sample was very small (only 21 participants died during the follow-up period) and their data does not allow for causal inference.

Using the New Haven EPESE data, Glass et al. (1999) compared the effects of three categories of participation: social, physical and productive (e.g., household errands, cooking) on mortality. The authors found, “a clear mortality gradient across levels of reported activity for each type of activity” (1999:479). When known predictors of health (e.g., SES, race) were introduced into models only social and physical variables remained significant predictors. Unfortunately, the ‘social’ variable used by Glass et al. (1999) combines measures of church attendance, informal social activities (e.g., going to the movies) and participation in social groups. Sundquist et al. (2004) found a similar gradient between participation and coronary heart disease related morbidity and mortality in a ten year study of 6900 Swedish men and women. Their analyses indicate adults scoring low on their social participation index were at the greatest risk for coronary heart disease, followed by moderate participation and so on. This pattern remained even in models controlling for education and smoking. One strength of the study is its sample, randomly drawn from the population of Swedes aged 35-74. Unfortunately the authors measure social participation using an 18-item index combining measures of religious, informal and community/group participation.

Ellaway and Macintyre (2007) looked at cross-sectional relationships between participation and risk factors for cardiovascular disease in a Scottish sample (n = 2334). They

conducted all analyses separately for men and women and, admittedly, found little regularity in the pattern of relationships between activity type and risk factors (BMI, waist-hip ratio, blood pressure, resting heart rate, anxiety, and psychological distress). The most consistent pattern they identified appeared between participation and reduced psychological distress. All forms of social participation except church related activities were related to psychological distress in both genders, although the relationships were stronger for men. Also with evidence more favorable for men, Hyypä et al. (2006) studied the relationship between social (leisure) participation and mortality over twenty years in a sample of Finns. The authors reported that regular (vs. scarce) participation predicts survival for men but not women. They found that men benefited from both intermediate and high levels of participation even after controlling for initial health status, health related behaviors and demographic characteristics. In contrast, there was no observable health boost attributable to activity participation for women who started the study in good health.

Reviewing the research presented above we find conflicting information about whether and how different types of participation matter, as well as for whom. Gender differences in effects and associations were a common theme throughout the literature. Greenfield and Marks (2007) link religious participation and reduced depression, Ellaway and Macintyre (2007) reported that religious activity is the one type of participation that doesn't matter. Young and Glasgow (1998) found women to benefit from two types of social participation where as men benefited only from instrumental participation. However, Hyypä et al. (2006) showed social participation to predict survival for men only while Sundquist et al. (2004) indicate social participation had stronger effects on psychological distress for men. In conclusion, we find compelling evidence from the social participation literature to recommend analyzing data

separately for men and women, as well as to include independent measures of social support, social participation, and religion in our models.

Social Support and Health: Growing out of work on social integration, social support and contact research has a very long history. Berkman and Syme (1979) reported that a lack of social and community ties predicted mortality in a nine-year panel study of 6,028 California residents. Isolation predicted mortality even when controlling for initial physical health, socioeconomic status, health risk behaviors, physical activity and a host of other related factors. Subsequent research confirmed and expanded these findings. By the year 2000, Berkman and colleagues pronounced, “It is widely recognized that social relationships and affiliations have powerful effects on physical and mental health” (Berkman et al. 2000:843).

Attention gradually turned to defining social support, understanding the structure of social ties, researching effects on different diseases, and considering different mechanisms for observed effects. While studies of social support alone tend to reveal an unequivocally positive relationship with health, these effects do not prove to be robust. When we consider research using measures of social support and activity participation in combination or in tandem, effects of social support are minimized or even reduced into insignificance. Everard et al. (2000) used hierarchical linear regression to look for differences in the relationship of social support and activity participation to health. In addition to support, they examined four different types of activity: instrumental (e.g., cooking, household chores), low-demand leisure (e.g., reading, listening to music), high-demand leisure (e.g., swimming, walking, woodworking), and social activities (e.g., entertaining friends, travel, church attendance). Everard et al. found that while both social support and participation were associated with health, only social participation was associated with high levels of functioning and only participation in such low-demand activities

was associated with mental health. Conversely, low-demand activity was also associated with poorer physical health, whereas “maintenance of high-demand leisure, social, and instrumental activities, and male gender were associated with greater physical health” (Everard et al. 2000:S211). However, their data comes from a convenience sample of 232 members of an organization for older adults.

Religion and Health: Evidence supporting the religion-health link points strongly to religious attendance as the single most important factor. So much research has pointed to the association between health and religiosity that a recent meta-analysis and review of the literature argued that “1,418 effect sizes with a mean odds ratio of 1.0 would be needed to overturn the significant overall association...” (McCullough et al. 2000).¹ In addition to a strong negative association between attendance and mortality (Dupre, Franzese and Parrado 2006), studies have also identified mounting protective effects to health with increasing levels of attendance (Hummer et al. 1999). In addition to these direct effects, it has been noted that religion may indirectly affect health behaviors by influencing personal lifestyle choices (e.g., smoking, alcohol consumption, drug use) that function to cause good health and lower mortality (Jarvis and Northcott 1987; Strawbridge et al. 1997). Although many researchers treat this positive association between religion and health as extremely well established, it is not a point of unanimity. As we will explain later, this association depends heavily on how religiosity is conceptualized.

Levin’s (1994) challenge to the evidence supporting a religion-health relationship focused on the limitations of observational studies. He noted that the zero-order correlations

¹ Sloan and Bagiella (2001) criticized McCullough et al. (2000), claiming that their finding was not simply overstated but rather was completely misinterpreted. They argued that McCullough’s finding robustly demonstrated the opposite of their argument, that “the relationship between religious involvement and mortality is weak or even nonexistent.”

between religion and health neither assure the validity of this association nor do they warrant an assumption of causality. He argued that a correlation can be misleading if extenuating variables account for the relationship, and warned that causal assumptions based on correlations may be unwarranted and erroneous. Specifically on the topic of religion and health, Levin and Markides (1986) emphasized that the association lacks robustness, noting that it disappears when accounting for the effects of physical capacity. It is also possible that the apparent effect of religion on health is simply a series of indirect effects for which religiosity is a more distal cause. For instance, Maselko and Kubzansky (2006) noted that religion may influence health by promoting its more proximate causes, such as social participation. Taken together, it is likely that religion is not unique in containing these proximal influences on health but rather is simply a common and convenient package for these indirect effects.

In addition, there is little evidence for direct effects of religious attendance on health. According to Ellison (1991), the effect of attendance and devotional activity on subjective well-being is indirect, operating as the behaviors that reflect and strengthen religious belief. Robustness of these effects is also questionable as they disappear when important controls are included in models. For instance, models including religious belief have largely found that it has no additional effect on health once the effect of attendance has been partialled out (Ferraro and Albrecht-Jensen 1991; Musick, House and William 2004). Musick (1996) also found little evidence supporting a link between religious devotion and subjective health once functional health was considered.

Another source of inconstancy in the literature linking religion and health involves the conceptualization and measurement of religion. When religiosity is operationalized in terms of religious service attendance, the association between it and health has been frequently supported.

Religious service attendance has been found to be positively correlated with subjective well-being in older adults (Barkan and Greenwood 2003), decreased functional impairment (Benjamins 2004; Idler 1987), and decreased depressive symptomatology (Idler 1987). However, when alternative operationalizations of religiousness are included in models, the estimated effects are inconsistent. Including religious activity like volunteering and private devotional activity decreases the size of the effect of religion on health (Musick et al. 2004). Using a more subjective measure of religiosity, Benjamins found a positive relationship between religious salience (operationalized as self-reported importance of religiosity) and increased functional impairment (2004; see also Musick et al. 2004).

Data and Methods

The Wisconsin Longitudinal Study (WLS) contains over five decades of data from a one-third random sample of the graduating high school class of 1957 in the state of Wisconsin (n= 10, 713). We use data collected by telephone and mail survey in the 1993 and 2004 waves when respondents were approximately 53-54 and 64-65 years of age. Sample retention has been exceptional giving us a robust N = 4651 in our final model, although this sample size varies with inclusion of covariates. Compared to the general population, this sample is whiter, more educated, and healthier. Nonetheless, WLS participants are similar to 2/3 of the members in their age cohort (Sewell et al. 2004). All variables are available and comparably measured in both the 1993 and 2004 waves unless noted below.

Measures

Dependent Variable: The WLS contains two measures of self-rated health (SRH). The measure in the mail survey asks respondents to report their health using the following five-point

scale: excellent, good, fair, poor, and very poor. This scale is positively skewed with nearly eighty percent of respondents choosing excellent and good. A variation of this question used in the phone instrument expanded the positive side of the scale to adjust for negative skew, although still limiting the response categories to five: excellent, very good, good, fair, and poor. We will primarily use this second measure from the 2004 phone instrument; however, since it was not used in the earlier wave, we will use the mail survey from 1993 when necessary.

Independent Variables:

Demographic variables. Annual household income was measured using an open-ended item and then recoded into seven categories for analysis: no income; categories breaking at 25, 50, 75, 100, 150, and 300 thousand dollars; and a truncated category for annual incomes over 300 thousand dollars. In our analyses, the omitted baseline category is \$25-49,000. Educational level is included in the model, recoded into the following four categories: high school graduate, some college, college graduate, and additional education beyond college. Recall that all sample members have at least a high school diploma as eligible units in the sampling frame included only high school graduates. A high school diploma is the omitted reference category in the following analyses. Marital status was included in the models, recoded into the following three categories: currently (reference category), previously (divorced, separated or widowed) or never married. Sex is dichotomous, with females coded as 1.

Social support and social participation. Social support was operationalized as the logged sum of the frequency of contact with friends and/or family over a one-month period. The raw scores ranged from 0 to a maximum of 28. For social participation, respondents indicated their level of involvement in various types of community, volunteer and other social groups. Following Piliavin (2004), these individual measures were summed and log-transformed. The

raw scores ranged from 0 to a maximum of 68. Participation in religious organizations were withheld from this summary measure and included in analyses separately.

Religious involvement and religiosity. The first of our measures captured respondents' level of involvement in groups connected with their religious organization as a part of the social participation module described above. Church attendance was measured openly, allowing respondents to report the number of times s/he attended per day, week, month or year. The variable was recoded to a five-point scale: not at all (reference category), 1-9 times per year, 1-3 times per month, once a week, and more than once a week. Only in the 2004 wave were respondents asked about their own perceived religiosity. The item included asked how important religion is in the respondent's life and was measured using a five-point scale from not at all to extremely.

Physical limitation. Respondents were asked to report the number of days in the previous year that s/he stayed in bed due to illness or injury. The responses were recoded into three categories: 0 days (reference category), a week or less (1-7 days), or more than a week (8 days or more).

Methods

Presented below are the results of the cross-sectional and longitudinal ordinal logistic regression analyses we conducted. Our ordered models meet the parallel regressions/proportionality of odds assumption, which assumes the equivalence of the slopes regardless of the dichotomization of the dependent variable (Agresti 2002; Long 1997). Based on evidence of gender differences in the literature, we ran separate models for men and women, in addition to the full models, and report on their divergence from the full model and from each other.

Results

Cross-sectional models: In the first ordered logit model, we predicted SRH using the usual suite of demographic covariates (see Table 1). In comparison to the reference category (\$25-49,000) lower levels of household income are associated with poorer subjective health, and higher levels are associated with better health. Education follows suit, as higher levels of education are associated with better health in comparison to the reference category (high school diploma.) Never married respondents report lower levels of SRH in comparison to currently-married respondents. Finally, women report higher levels of SRH than do men.

In the second model, we added an indicator of physical limitation. As would be expected, an inability to leave bed is highly predictive of poorer physical health. Adding this covariate changed relationships observed in the previous model very little.

In the third model, we added the suite of religion variables: involvement in church-related activity, religious service attendance, and religious identity importance.² The addition of religion variables leaves all of the associations from Model 2 unchanged.³ Involvement in church-related activity is positively associated with SRH, however only the highest level of activity (“a great deal”) significantly differs from no involvement. Attendance at religious services does not differ from non-attendance in its relationship with SRH. Surprisingly, we find that higher levels of religious importance are associated with poorer SRH. In comparison with the reference category “not at all,” almost every category is highly significant and negative.

² The omitted comparison group for each variable is “none”: no involvement, never attending, and not at all important.

³ We ran this model, as well as those that follow, with all possible combinations of the religion variables. When attendance or involvement is excluded, the other becomes only slightly more predictive of health at higher values (results not shown). Importance shows little change regardless of the inclusion of other variables.

In Model 4, we added the social support and social participation variables. For both variables, higher levels of activity are related to higher levels of SRH. Adding social support and social participation weakens the relationship between religious involvement and SRH. When compared to no involvement, the coefficient for “a great deal” of involvement shifts just outside traditional levels of statistical significance.

Cross-Sectional Models by Gender: We chose to run our first sex-separated models (Models 4a and 4b) on our full cross-sectional model. Our results point to some interesting interactions between sex and the other covariates. Beginning with the demographic variables, the relationship between income and SRH differs by sex. Women’s, but not men’s, health is negatively associated with low levels of income in comparison with the reference category. Women who attended some college, unlike men at the same level of education, report higher levels of SRH in comparison to those with only a high school degree.

For both men and women, neither religious involvement nor attendance is related to health. The negative association of religious importance and SRH in the full model appears to be driven by men, as the effect for women is reduced to insignificance. Among the social support and social participation variables, the effect of social support on SRH in the full model appears to be driven by women as this relationship for men is reduced to insignificance.

In sum, the cross sectional models suggest that the relationship between religious practice and subjective health is better understood as a function of social participation and support. Moreover, the relationship between the importance ascribed to one’s religiosity and SRH is negative in these models, controlling for demographic variables, physical limitations, and religious practice, whether or not social participation and support are included in the model.

Investigating the causal relationship: We employed two distinct statistical approaches to address our question of whether the relationship between SRH, social participation, social support, and religious participation are causal. First, we wanted to confirm that the observed relationship between our dependent variable (SRH in 2004) and the social support, social participation and religion variables from 2004 could not be explained simply by past health. In other words, we wanted to establish that 1993 SRH did not explain the observed relationships in our cross-sectional analyses. We did so by regressing 2004 health on 1993 SRH and our 2004 predictors. Next, we utilized the panel component of the WLS to more directly assess causality in these relationships. By using data collected at two different points in time, we were able to make causal inferences about the effect of social support, social and religious participation on self-reported health. In this final set of analyses, we predicted 2004 health with 1993 covariates, including 1993 self-reported health using ordered logistic regression. Unfortunately, as there is no measure available in the 1993 wave of the WLS, these final analyses proceed without a measure of religious importance.

Our first analyses confirm that 1993 SRH does not explain the relationships between social factors and health returned by our cross-sectional analyses (see Table 2). As would be expected, SRH in 1993 is highly predictive of 2004 SRH. Yet even with the inclusion of 1993 SRH, the relationship between 2004 physical limitations and 2004 health remains highly negative and significant. Although the outcomes of our full, cross-sectional model (see Model 5) are somewhat modified, we feel confident that we have accounted for the most likely cause of spuriousness. Below we report the findings from gender specific cross-sectional analyses controlling for 1993 SRH.

Increasing or decreasing income (relative to the reference category) appears to have no

relationship with health for men (see Model 5a.) However, lower income is still associated with poorer health for women (see Model 5b), and some levels of higher income are still associated with better health for women, net of 1993 SRH and the other 2004 covariates. Education functions similarly to the previous models, although the positive association between health and some college (compared to high school only) is reduced for women as well as for men. The overall positive association between higher education and better health continues.

The relationship of the religiosity variables changed little when we controlled for previous health. Involvement in church activities is significantly different from the base category (none) only at the highest level (a great deal) in the full model and for women, and is at that level positively related with 2004 SRH. For neither sex does church attendance of any frequency predict greater health in 2004 compared to the base category (nonattendance). Moreover, religious importance continues its negative relationship with health, and again reaches traditional levels of statistical significance. In sum, there is still little evidence to suggest a connection between religiosity and higher levels of self-reported health.

Finally, social participation and support continue to have positive relationships with SRH for women, but for both covariates, the relationship with health for men is virtually zero and insignificant.

Longitudinal Analysis: Drawing upon the WLS' strength as true panel data, we next turned to longitudinal models using logistic regression to predict 2004 health using 1993 predictors and controlling for 1993 SRH. We report below on both the full model (Model 6) and the gender differences we observe (Models 6a and 6b.)

On the whole, the 1993 demographic covariates operate as expected when predicting 2004 SRH in our full model. As in our cross-sectional models, some interesting gender

differences emerge in the sex-separated models. Men in households with an annual income of \$150,000 or more report better health. Women in middle income households in 1993 (between \$50,000 and \$149,000) report better health than those in the omitted category (\$25,000-\$49,000). Education operates similarly in this model to previous models. This result is hardly surprising considering changes in educational achievement are very rare between 1993 and 2004 given the ages of the respondents. As before, educational achievement at the level of a college degree and beyond appears to benefit health in 2004. Marital status, as in the previous model, appears to have no significant influence on SRH.

Again, as would be expected, 1993 SRH is a strong predictor of 2004 SRH. However, unlike previous models, 1993 physical limitation to bed does not predict 2004 SRH consistently. From our sex-specific models it becomes clear that the significant (or marginally significant, for shorter durations of limitation) effects are driven by women. For men, physical limitation in 1993 is predictive of SRH in 2004, but the higher level of limitation is predictive for women net of the other covariates.

Our longitudinal models included only two religion variables: religious service attendance and involvement with religious activities. Involvement maintains sporadic positive effects on health, although these effects appear to be driven by women. In the male-only model, 2004 health is unaffected by any level of religious involvement in 1993. However, in the female-only model, involvement in 1993 positively influences 2004 health at the middle two categories (“some” and “quite a bit”) in comparison to the reference category.

At no level of 1993 attendance does SRH differ significantly from the baseline category of nonattendance, in both the full and gender-separated models. Moreover, the coefficients are negative. Omitting (by necessity) the religious importance variable shifts the negative

association between importance and health to the attendance variable, although it does not rise to traditional levels of significance. In sum, we consistently find no evidence for a positive causal effect of church attendance on self-reported health, net of the other covariates.⁴

Finally, the effect of 1993 social participation and social support varies between the sexes quite dramatically. In the full model, including both sexes, the effect of 1993 social participation on 2004 health is small and insignificant. In contrast, the effect of 1993 social support on health is moderate and statistically significant. The full model conceals a striking difference between the sexes. For women, both 1993 social participation and support, even net of all other covariates, are large and statistically significant. However, for men, the effect of 1993 participation is negative and just outside of traditional levels of significance, while the effect of 1993 support is small and insignificant. Interestingly, for men, the relationship between SRH in 2004 and social participation in 1993 does not change when we add 1993 work status to the longitudinal model (results not shown.) In sum, men do not enjoy the same health benefits as women for their religiosity, social participation or social support.

Discussion

While older adults who are engaged with their friends and communities are not likely motivated by a desire to improve health, our results indicate many do benefit. Social participation robustly predicts good health for women net of the effects of the suite of demographic variables, physical incapacity, and even religious attendance and religiosity. We hope these encouraging findings will prompt further investigation of social pathways for

⁴ Testing of this final model indicates that, without attendance in the model, involvement becomes a somewhat stronger predictor of health (results not shown). However, without involvement in the model, attendance remains a very poor predictor of health. Given this result, we are reassured of the validity of our findings regarding the lack of a robust association between religion and health.

improving women's health. Disappointingly, men do not appear to reap significant health benefits from social participation.⁵ Please note, however, that in this study we compare only formal and informal social participation. Other authors (e.g., Piliavin and Siegl 2007) attribute health benefits to specific forms of social participation, specifically volunteer and service activities.

The idea that religion or religious behaviors (prayer, church service attendance and the like) have special, positive influence over health has a long history. In contrast to the wealth of supporting evidence, we consistently found little or no effect on self-rated health regardless of how we operationalized religion. Specifically, we found no significant positive association between religious importance and health. Quite the opposite in fact, respondents who rated religion as important in their lives reported poorer subjective health. Second, religious service attendance failed to show a robust effect on health, in either cross-sectional or longitudinal models. Third, church-related social participation is significant only intermittently for women and at relatively high levels of activity. We argue that the effect of religious involvement is likely attributable to the components of religious activity: physical activity, social participation, and connections to others. In sum, our results fail to replicate the widely acknowledged link between religion and good health.

Our results challenge current practices and emphasize the importance of how social factors are defined, measured and combined. For example, church attendance does not adequately represent the full spectrum of religious participation's relationship to health, so researchers should consider additional indicators. Moreover, our study identifies distinct contributions of social participation and social support to self-reported health, suggesting that

⁵ This finding may be attributable to differential selection of men into social participation activities. Further research is needed to examine this finding.

researchers should differentiate measures of social engagement from social support. Clearly, additional research is needed to confirm our findings. We see a logical next step as looking for the common elements between these factors: what is it about social participation and support that promotes good health? Future experimental work offering additional opportunities for social participation or sense of support are needed to reaffirm our findings. In the meantime, we hope to pursue our understanding of why and how social factors affect health through future waves of the WLS.

Limitations:

The Wisconsin Longitudinal Study participants are nearly all white, the same age, and above the national average in terms of educational attainment and income. Though not nationally representative, the WLS sample is a lot like nearly 2/3 of their age cohort (Sewell et al. 2004). The limited variability in race and education, which are highly related to health, allows us to be more confident that the relationships we find are not driven by unobserved factors.

Selection effects are always a concern when the goal is to infer causal relationships. We fully acknowledge that much of the relationship between social activity and health may be attributed to the confounding factor of physical ability. That is, only those able to leave bed and home may participate in social organizations like those of interest here. Without a minimum level of vitality, participation is likely not possible, and as such, we encounter a selection effect (Idler 1987). In an effort to account for this bias, we included a strong measure of physical limitation and in so doing created a more robust test of the effect of social participation (religious and otherwise).

Conclusion

We began this paper by arguing that we need to better understand the interrelationships between social participation, social support, religious participation, and self-reported physical health. In order to address this need, we used cross-sectional and longitudinal analyses to investigate whether social support, social participation and religious participation are independent and causal predictors of health for both men and women.

We found divergent paths to health for men and women. Social participation proved to be a positive influence on health for women, although not for men. The same can be said of social support. However, no operationalization of religion showed consistent positive effects on health for either men or women. This result is at odds with a great deal of existing research. The sporadic positive effects of involvement in church-related activities are likely due less to their specific religious content and more to elements they share with other social and community activities. If a special health benefit of religion does exist than it is simply not captured in the measures available to us here.

Although this study supports the general consensus that social factors matter for health, our findings point to the need for a significant change in their operationalization. Failure to distinguish between social participation and support, and the overemphasis on church attendance may lead to model misspecification and unwarranted inferences. Although we use true panel data, our study ends when participants are in early old age, approximately 64 years old. Other research cautions against extrapolating from these findings into coming years (Lennartsson and Silverstein 2001). We look forward to replicating these findings in future waves of the WLS.

The WLS provides us an excellent opportunity to understand the factors that facilitate continuing good health in late life. While every generation ages somewhat differently, the

experience of the WLS cohort provides a sneak preview into the aging of the baby boomers. Considering how the boomers have taxed social institutions and community services at every stage of life, our ability to prepare for their later years is especially important. Given the overall good health of the WLS cohort, the lessons to be learned about healthy aging are plenty. And the lesson learned here is clear: social activity – volunteering, participating, and being engaged -- is a toast to good health.

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Table 1.
Cross-sectional analysis (2003-5): Regressing social participation, support, and religiosity on SRH

	Model 1. Demographics		Model 2. M1 + bed		Model 3. M2 + religion		Model 4. M3 + social		Model 4a. Men only		Model 4b. Women only	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Household income												
no income	-0.017	0.139	-0.056	0.140	-0.061	0.140	-0.079	0.140	0.210	0.248	-0.230	0.17
\$1-24k	-0.218 **	0.103	-0.261 **	0.104	-0.284 **	0.104	-0.307 **	0.105	-0.099	0.189	-0.398 **	0.12
\$25-49k							1.000		1.000		1.000	
\$50-74k	0.084	0.096	0.064	0.096	0.065	0.097	0.055	0.097	0.047	0.141	0.073	0.13
\$75-99k	0.183	0.115	0.208 +	0.116	0.227 +	0.116	0.202 +	0.116	0.252	0.166	0.165	0.16
\$100-149k	0.183 **	0.129	0.410 **	0.129	0.415 ***	0.130	0.386 **	0.130	0.391 *	0.177	0.402 *	0.19
\$150-299k	0.546 ***	0.153	0.588 ***	0.153	0.603 ***	0.154	0.569 ***	0.154	0.461 *	0.209	0.797 ***	0.23
\$300k or more	0.808 ***	0.205	0.810 ***	0.206	0.834 ***	0.207	0.737 ***	0.209	0.723 **	0.263	0.806 *	0.36
Education												
High school												
Some college	0.182 +	0.094	0.216 **	0.095	0.206 *	0.095	0.176 +	0.096	0.010	0.145	0.311 *	0.12
College grad	0.729 ***	0.098	0.733 ***	0.098	0.703 ***	0.099	0.674 ***	0.099	0.604 ***	0.150	0.729 ***	0.13
More than college	0.827 ***	0.098	0.846 ***	0.098	0.796 ***	0.101	0.743 ***	0.102	0.717 ***	0.137	0.764 ***	0.15
Marital status												
Married												
Previously	0.017	0.089	0.087	0.090	0.102	0.091	0.068	0.091	0.220	0.164	-0.010	0.11
Never married	-0.421 *	0.183	-0.319 +	0.184	-0.333 +	0.184	-0.365 *	0.185	-0.369	0.304	-0.402 +	0.23
Female	0.296 ***	0.068	0.357 ***	0.069	0.316 ***	0.070	0.295 ***	0.071				
Limited to bed												
No limitation												
A week or less			-0.595 ***	0.077	-0.589 ***	0.078	-0.596 ***	0.078	-0.671 ***	0.120	-0.542 ***	0.10
More than a week			-2.144 ***	0.169	-2.132 ***	0.169	-2.163 ***	0.170	-2.129 ***	0.281	-2.199 ***	0.21
Involvement in church												
No involvement												
Very little					0.019	0.093	-0.021	0.094	0.108	0.135	-0.119	0.13
Some					-0.033	0.102	-0.111	0.104	-0.123	0.161	-0.120	0.13
Quite a bit					0.120	0.123	0.017	0.125	0.212	0.208	-0.075	0.15
A great deal					0.445 **	0.167	0.321 +	0.170	0.295	0.319	0.331	0.20
Church attendance												
Not at all												
1-9 times/year					0.107	0.129	0.085	0.129	0.067	0.170	0.113	0.19
1-3 times/month					0.109	0.139	0.071	0.140	0.003	0.190	0.128	0.20
Once a week					0.187	0.140	0.174	0.140	0.175	0.195	0.170	0.20
More than 1x/wk					0.141	0.180	0.125	0.180	0.070	0.277	0.143	0.24
Religious importance												
Not at all												
Not very					-0.243	0.180	-0.255	0.180	-0.353	0.235	-0.020	0.28
Somewhat					-0.381 **	0.178	-0.374 *	0.177	-0.462 *	0.234	-0.153	0.27
Very					-0.398 **	0.187	-0.394 *	0.187	-0.456 +	0.252	-0.215	0.28
Extremely					-0.253	0.199	-0.242	0.199	-0.340	0.278	-0.036	0.29
Social participation							0.166 ***	0.045	0.144 *	0.064	0.188 **	0.06
Social support							0.147 ***	0.046	0.083	0.067	0.204 ***	0.06
	N = 3247		N = 3247		N = 3247		N = 3247		N = 1492		N = 1755	
	X2(13) = 216.52		X2(15) = 415.20		X2(27) = 437.11		X2(29) = 464.04		X2(28) = 194.46		X2(28) = 286.69	

Table 2.

Longitudinal analysis: Regressing 1993 health, social participation, support, and religiosity on 2004 SRH

	Model 5. full model		Model 5a. male only		Model 5b. female only		Model 6. full model		Model 6a. male only		Model 6i female or	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	
Subjective health 1993	1.326 ***	0.065	1.147 ***	0.096	1.505 ***	0.091	1.469 ***	0.051	1.389 ***	0.074	1.553 ***	0
Household income												
no income	-0.066	0.154	0.260	0.276	-0.215	0.189	0.033	0.128	0.005	0.212	0.066	0
\$1-24k	-0.363 ***	0.114	-0.160	0.207	-0.444 ***	0.140	-0.155	0.109	-0.021	0.198	-0.156	0
\$25-49k												
\$50-74k	-0.044	0.104	-0.033	0.152	-0.047	0.147	0.198 **	0.077	0.170	0.114	0.233 *	0
\$75-99k	0.023	0.125	0.031	0.182	0.039	0.176	0.105	0.094	0.026	0.131	0.229 +	0
\$100-149k	0.212	0.141	0.254	0.193	0.175	0.215	0.326 **	0.104	0.175	0.145	0.537 ***	0
\$150-299k	0.421 *	0.167	0.314	0.227	0.646 *	0.255	0.435 ***	0.135	0.545 **	0.184	0.245	0
\$300k or more	0.424 +	0.220	0.382	0.280	0.597	0.370	0.830 ***	0.221	1.096 ***	0.300	0.488	0
Education												
High school												
Some college	0.111	0.103	-0.028	0.156	0.237 +	0.140	0.122	0.078	0.127	0.115	0.124	0
College grad	0.457 ***	0.106	0.388 *	0.164	0.509 ***	0.142	0.429 ***	0.084	0.430 ***	0.122	0.403 ***	0
More than college	0.440 ***	0.109	0.408 **	0.148	0.480 **	0.167	0.533 ***	0.087	0.491 ***	0.116	0.591 ***	0
Marital status												
Married												
Previously	0.077	0.100	0.046	0.184	0.101	0.122	-0.155 +	0.094	-0.168	0.155	-0.141	0
Never married	-0.258	0.195	-0.413	0.316	-0.183	0.255	-0.088	0.145	-0.279	0.213	0.090	0
Female	0.207 **	0.077					0.136 *	0.059				
Limited to bed												
No limitation												
A week or less	-0.486 ***	0.084	-0.549 ***	0.130	-0.428 ***	0.112	-0.112 +	0.061	-0.144	0.092	-0.085	0
More than a week	-1.988 ***	0.185	-2.131 ***	0.306	-1.876 ***	0.238	-0.439 **	0.147	-0.081	0.267	-0.587 ***	0
Involvement in church												
No involvement												
very little	-0.011	0.102	0.054	0.145	-0.048	0.144	0.117	0.084	0.174	0.116	0.117	0
some	-0.159	0.111	-0.210	0.172	-0.121	0.148	0.168 *	0.082	0.135	0.122	0.238 *	0
quite a bit	0.096	0.135	0.251	0.225	0.063	0.173	0.177 +	0.103	0.111	0.158	0.269 +	0
a great deal	0.360 *	0.181	0.123	0.358	0.459 *	0.219	0.167	0.118	0.182	0.190	0.163	0
Church attendance												
Not at all												
1-9 times/year	0.084	0.141	0.045	0.186	0.176	0.216	-0.112	0.102	-0.081	0.136	-0.123	0
1-3 times/month	0.066	0.152	-0.048	0.205	0.223	0.230	-0.140	0.103	-0.053	0.141	-0.201	0
Once a week	0.166	0.154	0.116	0.214	0.258	0.228	0.013	0.099	0.106	0.138	-0.055	0
More than 1x/wk	0.091	0.197	-0.083	0.299	0.239	0.276	-0.168	0.163	-0.350	0.251	-0.053	0
Religious importance												
Not at all												
Not very	-0.335 +	0.192	-0.360	0.252	-0.211	0.299						
Somewhat	-0.471 *	0.190	-0.470 +	0.251	-0.368	0.292						
Very	-0.430 *	0.201	-0.387	0.273	-0.377	0.303						
Extremely	-0.373 +	0.213	-0.367	0.300	-0.302	0.315						
Social participation	0.113 *	0.048	0.067	0.069	0.164 *	0.069	0.006	0.038	-0.107 +	0.056	0.114 *	0
Social support	0.149 **	0.049	0.091	0.073	0.195 **	0.068	0.083 *	0.040	0.030	0.057	0.125 *	0
		N = 2884		N = 1310		N = 1574		N = 4651		N = 2229		N = 242:
		$\chi^2 = 895.45$		$\chi^2 = 342.68$		$\chi^2 = 577.69$		$\chi^2 = 1281.62$		$\chi^2 = 549.62$		$\chi^2 = 767.:$

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