The Longevity Effects of Religious and Nonreligious Participation: A Meta-Analysis and Meta-Regression

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Scholars have long argued that the reduced mortality risk associated with frequent participation in religious services derives from two sources: social participation and religious belief efficacy. In contrast, the reduced mortality risk associated with participation in nonreligious groups is thought to derive solely from the social participation component. This study tests the religious efficacy hypothesis by comparing the effects of religious participation with nonreligious participation using meta-analyses of 312 mortality risk estimates from 74 publications (providing data on more than 300,000 persons). We found no significant difference between the mean hazard ratio (HR) for low religious participation (HR, 1.32; 95% CI, 1.24–1.41) and the mean HR for low nonreligious participation (HR, 1.25; 95% CI, 1.17–1.33). These findings suggest that the positive health effects of religious participation may largely be attributed to the social participation component, rather than to the religious component of the act.

Keywords: religious participation, volunteering, mortality, meta-analysis, meta-regression, church attendance.

INTRODUCTION

A growing body of research has shown that attending religious services is associated with better physical health (Idler 1987; Koenig et al. 1997; Musick, House and Williams 2004), with better mental health (Idler and Kasl 1992; Koenig et al. 1997), and with feelings of well-being, life satisfaction, and happiness (Ellison 1991; Koenig et al. 1997; Levine, Chatters, and Taylor 1995). Religious participation was also found to be positively associated with longevity (Gillum et al. 2008; Musick, House, and Williams 2004; Oman et al. 2002; Strawbridge, Cohen, and Shema 2000; Strawbridge et al. 1997).

Common beliefs regarding group participation suggest that religious participation may be more beneficial than other forms of social participation. This study uses meta-analysis and meta-regression to examine the association between multiple types of social participation and all-cause mortality. Former meta-analyses have examined the relationship between religiosity/spirituality and mental health, looking at measures such as psychological adjustment to stress (Ano and Vasconcelles 2005) and depressive symptoms (Smith, McCullough, and Poll 2003). Two previous systematic reviews have also looked directly at the relationship between religiosity and mortality (Chida, Steptoe, and Powell 2009; McCullough et al. 2000). Both were restricted to the examination of religious involvement and mortality. McCullough et al. (2000) examined 42 independent samples and found that those with lower levels of religious involvement had a 29 percent higher risk of death compared to those with higher levels of religious involvement. Chida, Steptoe, and Powell (2009) examined both religiosity and spirituality, finding that these were associated with an 18 percent reduction in mortality risk for healthy population studies, and more specifically that religious attendance was associated with a 23 percent reduction in the risk.

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This study substantially extends the ones conducted by McCullough et al. (2000) and by Chida, Steptoe, and Powell (2009). First, and most importantly, we examine a wider set of group participation practices, comparing participation in voluntary groups, religious groups, and other types of group participation (e.g., participation in recreational clubs and in support groups). This comparison allows us to assess whether religious participation is indeed a uniquely beneficial form of social participation. Second, we perform additional meta-regression analyses on the data. These allow us to examine potentially important moderators of the association between group participation and all-cause mortality, such as age, gender, and other study characteristics.

The main question we seek to answer in this study is whether religious participation is clearly distinguished from other forms of social participation in terms of its beneficial effects on mortality rates. Our findings suggest that there exists no significant difference between the increase in the risk of mortality for those with low religious group participation and the increase in the risk for those with low participation in other social groups.

EXPLANATIONS FOR THE ASSOCIATION BETWEEN SOCIAL PARTICIPATION AND MORTALITY

While considerable attention has been given to religious participation, many studies have also noted the potential health benefits of other types of social participation, such as participation in voluntary associations or in social clubs. Research shows that there is a positive relationship between volunteering and both physical and mental health (Greenfield and Marks 2004; Lum and Lightfoot 2005; Morrow-Howell et al. 2003), as well as an association between volunteering and reduced mortality (Ayalon 2008; Harris and Thoresen 2005; Musick, Herzog, and House 1999). Participation in recreational group activities, in clubs, and in self-help groups was also found to be associated with improved health (Gregson et al. 2004; Hamzat and Seyi-Adeyemo 2008; Phillips 1967) and with lower rates of mortality (Friend et al. 1986; Masudomi et al. 2004; Murata et al. 2005; Oxman, Freeman, and Manheimer 1995).

The literature suggests a variety of mechanisms linking social participation with health and mortality. First, people who participate in various group activities and clubs enjoy the opportunity to develop social relationships with others. Social engagement theory suggests that maintaining social ties with others contributes to people's mental and physical well-being, especially at older ages, by decreasing feelings of loneliness and social isolation (Ayalon 2008; House, Landis, and Umberson 1988; Young and Glawgow 1998). The connection to other people, achieved through participation, can increase one's sense of acceptance and inclusion (Berkman 1995; Thoits 2011). It can further help in creating a sense of companionship with others, which has been shown to enhance both physical and psychological health (Rook 1990; Uchino 2004).

Second, the social relationships attained through participation in social activities may also provide one with beneficial comparison groups or social control. Comparison groups have been shown to provide individuals with normative and behavioral guidance, through the observance and contrasting of self with others (Marsden and Friedkin 1994; Thoits 2011). The social control aspect of social relationships can also be beneficial, especially as it relates to the monitoring or even attempts to intervene in unhealthy behaviors such as drug use or risky driving (Thoits 2011; Umberson, Crosnoe, and Reczek 2010; Umberson and Montez 2010).

Third, role theory and social activity theory both suggest that participation in social activities enhances people's sense of purpose by providing them with the opportunity to take a productive role in society, which increases feelings of self-esteem, self-worth, and well-being. The increased sense of well-being and worth, in turn, decreases the risk of morbidity and mortality (Chambré 1987; Herzog and House 1991; Moen, Dempster-McClain, and Williams 1992; Morrow-Howell et al. 2003).

Finally, the ability to participate in social activities also provides one with perceptions of control and mastery over life. This in turn sustains confidence in one's ability to cope in the face

of challenges or stressors, decreasing anxiety and depression (Mirowsky and Ross 2003; Thoits 2011; Turner and Lloyd 1999; Turner and Marino 1994). These effects may be especially salient for participants in voluntary activities and for older adults (Ayalon 2008).

RELIGIOUS PARTICIPATION AND HEALTH: A UNIQUE CASE OF SOCIAL PARTICIPATION?

Attendance at religious services, one may argue, might constitute an especially beneficial form of social participation because religious participation is believed to provide individuals with additional health-related advantages. First, while normative and behavioral guidance, social control, and pressures to avoid risky activities characterize a variety of groups, religious groups may be especially influential in these domains. This may be the result of the content of religious sermons that condemn practices such as smoking, drinking, drug use, and gluttony (Michalak, Trocki, and Bond 2007; Strawbridge et al. 2001), the comparison of oneself to other participants in religious activities (who are likely to also avoid risky behaviors), and the psychological resources (e.g., conscientiousness and self-control) one acquires through sustained religious commitment and involvement (McCullough et al. 2009).

Indeed, it was found that religious people tend to lead healthier lifestyles (Chliaoutakis et al. 2002; Mechanic 1990), are more likely to quit smoking (Idler and Kasl 1992; Kim and Sobal 2004; Koenig et al. 1998; Strawbridge et al. 1997), less likely to use drugs or alcohol (Brown et al. 2001; Gartner, Larson, and Allen 1991), and less likely to be sensation-seeking (Zuckerman and Neeb 1980). Furthermore, religious people are more likely to adopt even those health behaviors that are not prescribed by their religion, such as visiting their physicians (McCullough et al. 2009), keeping better diets (Fønnebø 1988; McIntosh and Shifflett 1984), taking vitamins (McCullough et al. 2009; Shmueli and Tamir 2007), and engaging in more physical activity (Strawbridge et al. 2001). Such health behaviors were found to be a key reason in prolonging life among Mormons (Enstrom and Breslow 2008) and Seventh-Day Adventists (Heuch, Jacobsen, and Fraser 2005).

A second unique advantage often associated with religious participation is the sense of spiritual comfort during hard times and the existential sense of meaning often associated with participation in religious services (Musick, House, and Williams 2004; Sullivan 2010). Religion, according to this position, helps to alleviate the negative effects of stressful life events and make sense of adverse situations. While similar benefits may be associated with participation in other groups, norms of service and compassion may be argued to pervade religious groups to a greater extent than they do other forms of voluntary participation. For example, Musick and Wilson (2003) argue that religious volunteering may be more rewarding and meaningful than other types of volunteering. This is because the former is driven by religious values and moral duties, while the latter is often more instrumental in nature (the parent volunteering for the PTA or the factory worker volunteering for the union). Indeed, Musick and Wilson (2003) report that among older populations volunteering for religious causes was associated with better mental health than volunteering only for secular causes. Similarly, Curtis, Baer, and Grabb (2001) found that membership in religious organizations was associated with enhanced psychological well-being while membership in other voluntary associations was not. In addition, some scholars have suggested that the social support resulting from religious participation may be of higher quality than the social support obtained through other sources, as the former improves commitment to family and friends and to community institutions that promote longevity (Ellison and George 1994; McCullough et al. 2009; Sullivan 2010).

Third, Durkheim ([1915] 1951) and others (e.g., Musick, House, and Williams 2004) have suggested that the rituals themselves—the participation in the worship service—may have an important role in maintaining a sense of well-being among religious adherents. According to this view, simply being involved in a religious ritual that follows a familiar set of rules and actions and carries a symbolic value may be comforting, as it provides one with a sense of familiarity and

security. On average, these kinds of highly structured rituals seem to be more common in religious activities than in nonreligious activities (such as voluntary groups, PTAs, or labor unions). That said, one should recognize that not all religious practices are highly ritualized and, conversely, that many nonreligious groups (e.g., Alcoholic Anonymous) do offer a highly structured and ritualized experience to participants.

Finally, one may add the common conviction among religious adherents (also often discussed and examined by the academic community) regarding the efficacy of prayers. Simply stated, according to this line of thought, one is able to get closer to God and increase the chances of prayers being fulfilled by attending religious services. In other words, religious participation has the potential to please a higher power, which in turn may reward believers with better health and longer life. While a few studies reported that prayers have a protective health effect (Byrd 1988; Harris et al. 1999), most health scholars and empirical evidence reject the proposition that prayers assist in increasing the health and longevity of the person at which the prayers are directed (Aviles et al. 2001; Benson et al. 2006; Galton 1872; Krucoff et al. 2005; Leibovici 2001). Nevertheless, the belief that a higher power is on your side still has the potential of relieving stress and worries about the future, which in turn may have a positive effect on health and longevity.

Taken together, these additional potential advantages suggest that religious participation may constitute a unique case of social participation, one that is particularly beneficial for the individual. If this indeed is the case, we would expect the effects of religious attendance on health and longevity to be substantially more pronounced than those for other types of social participation. While many studies of religious participation have sought to statistically control for respondents' levels of nonreligious participation (e.g., Gillum et al. 2008; Musick, House, and Williams 2004; Strawbridge, Cohen, and Shema 2000; Strawbridge et al. 1997), jointly controlling for both types of participation does not by itself give an indication of the relative magnitude. Testing the coefficients for both religious and nonreligious participation against their respective null hypotheses establishes (if both are significant) that both forms of participation exert an effect on mortality. Testing the religious efficacy hypothesis, however, requires the direct comparison of the religious participation and nonreligious participation coefficients. Such a comparison, to our knowledge, has not been reported in any former study of religious or social participation. Furthermore, while such a comparison could be done at the individual-study level (by comparing standardized coefficients), a more comprehensive comparison can be made using meta-analytic methods.

OTHER MODERATING FACTORS IN THE PARTICIPATION-MORTALITY ASSOCIATION

In addition to differences between religious and nonreligious participation, we examine the heterogeneity in the participation-mortality association stemming from differences in the gender and age of the support recipient. We also control for study-related characteristics, including study recentness and study quality. Below we outline the theoretical relevance of these factors and the rationale for their inclusion in our analyses.

Gender

The benefits of social participation mentioned above can be expected to affect both men and women. To be sure, many former studies found that participation is a significant predictor of improved health and survival for both men and women (Cerhan and Wallace 1997; Jylha and Aro 1989; Nakanishi and Tatara 2000). Still, some scholars suggested that social involvement should have a stronger effect on the health and mortality of men than women because social ties are especially influential in deterring risky behaviors among men (Umberson, Crosnoe, and Reczek 2010; Waite and Gallagher 2000). While the results of some studies are consistent with

this proposition (e.g., Hyyppa et al. 2006; Schoenbach et al. 1986), others have reported the reverse, finding participation to be especially beneficial (or perhaps even only beneficial) for women (Agahi and Parker 2008; Koenig et al. 1999; la Cour, Avlund, and Schultz-Larsen 2006; Strawbridge et al. 1997). Ellison et al. (2000) suggest that at least for religious participation this may be the result of women's greater involvement in religion, while some have argued that social activities in general are more important to women, as they generate tighter social relationships (Idler 1987; Strawbridge et al. 1997).

Age

Many of the previous studies on participation and mortality have focused on older age persons (Fuhrer et al. 1999; Litwin 2007; Murata et al. 2005; Sun and Liu 2008; Walter-Ginzburg et al. 2005; Yasuda and Ohara 1989). The (often implicit) assumption behind this choice is that the benefits of social participation are especially pronounced in older populations (Ellison 1991; Koenig et al. 1999; Krause 1998; Strawbridge et al. 1997). Older people may be more likely to suffer from loneliness and lack of intimacy, and participation is likely to alleviate these feelings. This assumption seems to be confirmed by studies that looked at both older and younger age groups (Fuhrer et al. 1999; Schoenbach et al. 1986), but some have also found the reverse effect, where participation appears to become less important with the passage of time (Ellison et al. 2000; Sato et al. 2007).
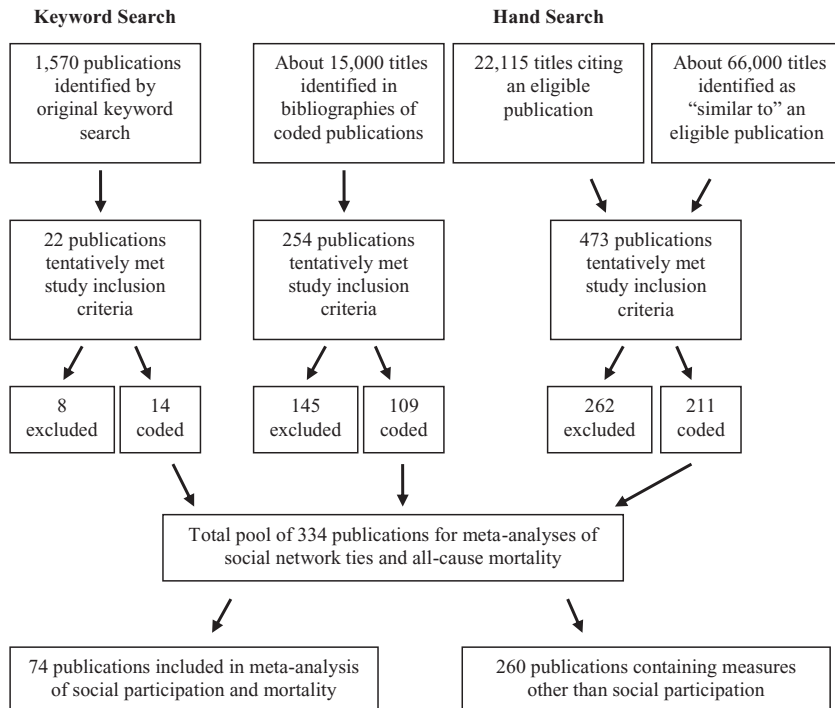
Study-Related Characteristics

Finally, it is important to examine the effects of study-design variables on the size of the effect. One possible explanation for the association between mortality and social participation, whether religious or nonreligious in nature, is that this relationship can be attributed to confounding factors—that is, a *selection effect*. According to this line of reasoning, the relationship may be at least partly spurious because other factors predict both participation and mortality. Two such factors, which we will control for in our study, are health status and socioeconomic status (SES). First, unhealthy people are both less able to participate in various groups and activities (especially at older ages) and have a higher risk of death (Ainlay, Singleton, and Swigert 1992; Harris and Thoresen 2005; Musick, House, and Williams 2004; Sloan, Bagiella, and Powell 1999). Second, some have suggested that higher SES may predict both participation in public activities and lower rates of mortality (Beit-Hallahmi and Argyle 1997; Musick, House, and Williams 2004).

We will also control for the recentness of the study. On the one hand, more recent studies often control more carefully for additional covariants, and therefore may be expected to produce a more moderate effect. On the other hand, one might speculate that, especially in Western societies, the increase in individualistic norms and practices makes support from members of voluntary groups increasingly important as a substitute for more traditional sources of support (Green, Deschamps, and Paez 2005; Putnam 2000). Finally, the quality of a given study may also be important in predicting the strength of the relationship. Studies that do not maintain appropriate research norms, and in particular those that do not control for key alternative explanations and covariates, run the danger of inflating the size of the effect.

METHODS AND INCLUSION CRITERIA

Despite their common utilization in other disciplines (e.g., psychology, epidemiology, and medicine), sociologists have only recently begun to use meta-analysis and meta-regression techniques. A meta-analysis is a quantitative synthesis of the literature. It takes a large number of hazard ratios (or equivalent measures) from different studies and calculates an overall average

Figure 1
Search strategy and yield

Keyword Search

| 1,570 publications identified by original keyword search |

| 22 publications tentatively met study inclusion criteria |

| 8 excluded | 14 coded |

Hand Search

| About 15,000 titles identified in bibliographies of coded publications | 22,115 titles citing an eligible publication | About 66,000 titles identified as "similar to" an eligible publication |

| 254 publications tentatively met study inclusion criteria | 473 publications tentatively met study inclusion criteria |

| 145 excluded | 109 coded | 262 excluded | 211 coded |

Total pool of 334 publications for meta-analyses of social network ties and all-cause mortality

| 74 publications included in meta-analysis of social participation and mortality | 260 publications containing measures other than social participation |

hazard ratio, weighted by study sample size. A meta-regression analysis may be used to complement the meta-analysis, and is similar in essence to a weighted linear regression. In a meta-regression the dependent variable is the size of the coefficients (e.g., hazard ratios) from individual studies, and the predictors are the characteristics of these studies (e.g., sample size, age of participants, or location) that might influence the magnitude of the effect. Thus, a meta-regression may help us determine not only whether people who participate in social activities tend to live longer, but also whether, for example, this effect is stronger for men or for women.

In June 2005, we conducted a search for publications concerning psychosocial stress or social isolation (including social participation) and all-cause mortality. We used 100 search clauses for Medline, 97 for EMBASE, 81 for CINAHL, and 20 for Web of Science. Using these search results as a base, we conducted iterative searches in three online databases: Web of Knowledge, PubMed, and Google Scholar. We searched for (1) relevant items from the bibliographies of eligible publications; (2) the lists of sources citing an eligible publication; and (3) the sources identified as "similar to" an eligible publication. We exhausted the literature in January 2009 after five iterations. The two authors independently determined publication eligibility using predefined criteria. In the rare instances (<1 percent) where there was an initial disagreement regarding study eligibility, the final inclusion/exclusion decisions were made following consultation between the two authors. Unpublished work was considered for inclusion. The most frequent reasons for study exclusion included the lack of an eligible social relationship measure, failure to report a ratio measure of mortality risk, and an outcome variable that was not strictly all-cause mortality. The full "social relationships" database contains 334 publications. We randomly selected and recoded 25 publications (153 point estimates) and found no coding errors.

The present analysis uses the subset of articles ($n = 74$) that reported the effect of social participation (defined as the number of groups and the frequency with which the respondent participates in the activities of these groups) on all-cause mortality. Relevant publications included

at least one measure of religious participation, one measure of nonreligious participation, or both. However, in our coding we carefully separated between participation in religious activities and participation in nonreligious activities. The former excluded private (nongroup related) religiosity and self-rated religiosity, and focused on attendance in religious services. Participation in nonreligious activities included activities such as playing cards, bingo, or games, volunteering in clubs and organizations, participation in political activities, voluntary community work, and participation in family activities (such as birthdays and other celebrations). We did not include measures that looked primarily at out-of-home activities that may be done without group contact, such as visits to movies or restaurants or working in the garden. Finally, some measures were coded as involving both religious and nonreligious participation. Examples for the latter include being in the lowest quartile on a social activity scale that included either church attendance, day or overnight trips, or participation in other social groups (Glass et al. 1999) and measures such as "meetings or activities in the past 12 months or religious services in past 12 months" (Wilkins 2003). Of the 74 publications, 72 appeared in peer-reviewed journals and 2 in edited books (see Table 1 for the full list of publications and the measures extracted from each).

A study was included in the present analysis if the outcome variable was all-cause mortality and a clear comparison was made between a group of people who had a lower rate of participation (or no participation at all) and another group of people who had a higher rate of participation. In total, the 74 publications provided 312 point estimates for analysis. Statistical methods varied between studies, and all nonhazard-ratio point estimates were converted to HRs (see Section 1 of Appendix S1). When not reported, standard errors were calculated using (1) confidence intervals, (2) t statistics, (3) χ^2 statistics, or (4) p values. We sought to maximize the number of HRs analyzed, capturing variability both between and within publications. In cases where this caused a set of person-years to be represented more than once, we used a variance adjustment procedure (see Section 2 of Appendix S1).

Two measures of study quality were adopted. First, we assigned a three-level subjective rating to each publication (individual study ratings are available upon request). Publications were rated low quality if they contained obvious reporting or methodological errors (e.g., mathematically impossible confidence intervals or referring to the results of a Poisson regression as an odds ratio). Publications were rated high quality if models were well specified and results were reported in detail. Second, we used principal components factor analysis to construct a scale quality measure using (a) the five-year impact factor of the journal (the few journals for which an impact factor could not be found were assigned a conservative impact factor of 1; this was done to avoid overemphasizing their importance, as these were largely second and third tier journals); and (b) the number of citations received per year since publication.

Heterogeneity presence and magnitude was assessed with Q-tests and I^2 tests (Huedo-Medina, Sanchez-Meca, and Marin-Martinez 2006). All analyses were calculated by maximum likelihood using a random effects model and matrix macros provided by Lipsey and Wilson (2001). The possibility of selection and publication bias was examined using Rosenthal's (1979) method and examinations of the funnel plot, with plot asymmetry evaluated using Peters's test (Moreno et al. 2009; Peters et al. 2006; additional details on the issue of publication bias and our treatment of it are provided under the "limitations" section).

The covariates used in the analyses were: (1) proportion of respondents who were male; (2) mean age of sample at baseline, divided by 10; (3) age range of sample at baseline, divided by 10; (4) age of the publication (years elapsed since publication), divided by 10; (5) age of the study (years elapsed since the collection of baseline data), divided by 10; (6) duration of the baseline period, in years; (7) an interaction term between gender and mean age; (8) geographic region; (9) sample size, log transformed; (10) a series of variables indicating the level of statistical adjustment; (11) subjective quality rating (range = 1–3); and (12) the composite scale of study quality. For descriptive statistics for select variables, see Table 2 (see Section 3 of the Appendix S1 for the full list of variables extracted in the original data-coding procedure).

Table 1: Studies included in analyses

Publication	Data Source	Country	Religious Participation	Other Participation	Years	Sample Size	Mean HR	# HRs
Agahi and Parker 2008[73]	SWEOLD and LNU	Sweden	No	Yes	1991–2003	1,246	1.72	10
Anstey, Luszcz, and Andrews 2002[74]	ALSA Study	Australia	Yes	Yes	1992–2001	2,087	1.41	3
Avlund, Damsgaard, and Holstein 1998[75]	1914 Cohort, Glostrup	Denmark	Yes	Yes	1984–1995	734	.91	6
Ayalon 2008[15]	Original Data	Israel	No	Yes	1997–2004	5,055	1.72	6
Ayalon and Covinsky 2007[76]	Original Data	Israel	Yes	No	1997–2004	4,179	1.79	1
Bagiella, Hong, and Sloan 2005[77]	EPESE Study	U.S.	Yes	No	1981–2002	14,456	1.26	5
Bagiella, Hong, and Sloan 2005[77]	EPESE Study	U.S.	No	Yes	1981–2002	14,456	1.09	5
Baumann et al. 1998[78]	MONICA Study	Germany	No	Yes	1989-1995	1,987	2.17	2
Berkman and Syme 1979[79]	Alameda County Study	U.S.	Yes	No	1965–1974	6,928	1.50	6
Berkman and Syme 1979[79]	Alameda County Study	U.S.	No	Yes	1965–1974	6,928	1.33	6
Cerhan and Wallace 1997[80]	EPESE Study	U.S.	No	Yes	1982–1993	2,575	1.48	6
Cerhan and Wallace 1997[80]	EPESE Study	U.S.	Yes	Yes	1982–1993	2,575	1.70	6
Dalgard and Haheim 1998[81]	Original Data	Norway	No	Yes	1974–1993	1,010	1.33	5
Ellison et al. 2000[82]	NHIS-CRFS	U.S.	Yes	No	1987–1995	3,002	2.56	9
Eng et al. 2002[83]	HPFUS Study	U.S.	No	Yes	1986–1998	28,369	1.56	1
Eng et al. 2002[83]	HPFUS Study	U.S.	Yes	No	1986–1998	28,369	1.15	1
Falk et al. 1992[84]	Original Data	Sweden	Yes	Yes	1982–1989	500	1.20	1
Friend et al. 1986[24]	Original Data	U.S.	No	Yes	1971–1982	126	.47	2
Fuhrer et al. 1999[85]	PAQUID Study	France	No	Yes	1988–1994	3,777	1.13	2
Gillum 2008[10]	NHANES III	U.S.	Yes	No	1988–2000	8,450	1.19	1
Glass et al. 1999[86]	EPESE Study	U.S.	Yes	Yes	1982–1995	2,761	1.11	2
Gognalons-Nicolet et al. 1999[87]	OGR Study	Switzer.	No	Yes	1984–1996	820	3.23	2
Grand et al. 1990[88]	Unknown	France	No	Yes	1982–1987	645	1.61	1
Grundy, Bowling, and Farquhar 1996[89]	FHSAD Study	U.K.	No	Yes	1986–1993	618	1.51	2
Gustafsson, Isacson, and Thorslund 1998[90]	Original Data	Sweden	No	Yes	1986–1995	421	1.45	3

(*Continued*)

Table 1 (*Continued*)

Publication	Data Source	Country	Religious Participation	Other Participation	Years	Sample Size	Mean HR	# HRs
Hanson et al. 1989[91]	1914 Cohort, Glostrup	Sweden	Yes	Yes	1982–1987	500	1.45	4
Harris and Thoresen 2005 [17]	LSOA Study	U.S.	Yes	No	1984–1991	7,496	1.32	1
Harris and Thoresen 2005[17]	LSOA Study	U.S.	No	Yes	1984–1991	7,496	1.62	2
Hessler et al. 1995[92]	MRES Study	U.S.	No	Yes	1966–1987	1,700	1.36	1
Hummer et al. 1999 [93]	NHIS-MCD Study	U.S.	Yes	No	1987–1995	21,204	1.67	2
Hyyppa et al. 2006[94]	MFHS Study	Finland	Yes	Yes	1978–2005	5,087	2.03	6
Iwasaki, Otani, Ohta et al. 2002[95]	Komo Ise Study	Japan	Yes	No	1993–2000	11,565	.90	4
Iwasaki, Otani, Ohta et al. 2002 [95]	Komo Ise Study	Japan	No	Yes	1993–2000	11,565	1.63	4
Iwasaki, Otani, Sunaga et al. 2002[96]	Komo-Ise Study	Japan	Yes	No	1993–2000	11,565	.96	4
Iwasaki et al. 2002[96]	Komo-Ise Study	Japan	Yes	Yes	1993–2000	11,565	1.49	4
Jylha and Aro 1989[97]	Original Data	Finland	Yes	Yes	1979–1985	1,060	1.25	6
Kaplan et al. 1994 [98]	KIHDRFS Study	Finland	Yes	No	1986–1992	2,503	1.74	2
Kaplan et al. 1994[98]	KIHDRFS Study	Finland	No	Yes	1986–1992	2,503	1.96	2
Koenig et al. 1999[99]	EPESE Study	U.S.	Yes	No	1986–1992	3,968	1.57	6
Kroenke et al. 2006 [100]	Nurses' Health Study	U.S.	Yes	No	1992–2004	2,835	1.19	1
Kroenke et al. 2006[100]	Nurses' Health Study	U.S.	No	Yes	1992–2004	2,835	.67	1
la Cour, Avlund, and Schultz-Larsen 2006[101]	1914 Cohort, Glostrup	Denmark	Yes	No	1984–2004	734	1.28	6
Lennartsson and Silverstein 2001[102]	SWEOLD Study	Sweden	Yes	No	1992–1996	463	1.22	1
Lennartsson and Silverstein 2001[102]	SWEOLD Study	Sweden	No	Yes	1992–1996	463	1.22	1
Litwin 2007 [103]	Census, 1997	Israel	Yes	No	1997–2004	1,811	1.60	2
Litwin 2007[103]	Census, 1997	Israel	No	Yes	1997–2004	1,811	.86	4
Lutgendorf et al. 2004[104]	EPESE Study	U.S.	Yes	No	1982–1994	557	.37	1
Masudomi et al. 2004 [23]	Original Data	Japan	No	Yes	1994–1999	375	19.53	2
Murata et al. 2005[22]	Original Data	Japan	No	Yes	1992–1999	1,994	1.35	4
Musick, Herzog, and House 1999[16]	ACL Study	U.S.	No	Yes	1986–1994	1,211	1.65	3
Musick, House, and Williams 2004 [1]	ACL Study	U.S.	Yes	No	1986–1994	3,617	1.53	2

(*Continued*)

Table 1 (*Continued*)

Publication	Data Source	Country	Religious Participation	Other Participation	Years	Sample Size	Mean HR	# HRs
Nakanishi and Tatara 2000[105]	Original Data	Japan	Yes	Yes	1992–1997	493	1.58	2
Nakanishi et al. 1998a[106]	Original Data	Japan	Yes	Yes	1992–1996	1,352	1.52	1
Nakanishi et al. 1998b[107]	Original Data	Japan	Yes	Yes	1992–1997	1,405	2.28	2
Nakanishi et al. 2003[108]	Original Data	Japan	Yes	Yes	1992–2001	741	3.15	6
Oman and Reed 1998[109]	Original Data	U.S.	No	Yes	1990–1995	1,931	1.22	1
Oman and Reed 1998[109]	Original Data	U.S.	Yes	No	1990–1995	1,931	1.39	1
Oman et al. 2002[7]	Alameda County Study	U.S.	Yes	No	1965–1996	6,545	1.34	3
Orth-Gomer, Unden, and Edwards 1988[110]	Unknown Study	Sweden	Yes	Yes	1975–1985	150	7.61	2
Oxman, Freeman, and Manheimer 1995[21]	Original Data	U.S.	Yes	No	1989–1992	232	2.52	1
Oxman, Freeman, and Manheimer 1995[21]	Original Data	U.S.	No	Yes	1989–1992	232	3.58	2
Rodriguez-Laso, Zunzunegui, and Otero 2007[111]	LSAL Study	Spain	Yes	Yes	1993–1999	1,174	1.18	6
Rosengren, Orth-Gomer, and Wilhelmsen 1998[112]	Original Data	Sweden	Yes	Yes	1983–1995	717	1.91	1
Rozzini et al. 1991[113]	Original Data	Italy	Yes	No	1985–1988	1,201	2.51	1
Rozzini et al. 1991[113]	Original Data	Italy	No	Yes	1985–1988	1,201	2.01	1
Sato et al. 2007[114]	Census, 1992	Japan	No	Yes	1992–2004	637	1.43	8
Schoenbach et al. 1986[115]	ECCES Study	U.S.	Yes	No	1967–1980	2,059	1.12	20
Seeman et al. 1987[116]	Alameda County Study	U.S.	Yes	No	1965–1982	4,174	1.21	5
Seeman et al. 1987[116]	Alameda County Study	U.S.	No	Yes	1965–1982	4,174	1.00	5
Seeman et al. 1993[117]	EPESE Study	U.S.	Yes	No	1981–1987	3,809	1.79	6
Seeman et al. 1993[117]	EPESE Study	U.S.	No	Yes	1981–1987	3,809	1.46	5
Simons et al. 1996[118]	Original Data	Australia	Yes	No	1988–1993	2,805	1.57	1
Stessman et al. 2005[119]	JLS Study	Israel	No	Yes	1990–2002	463	2.21	2
Strawbridge et al. 1997[9]	Alameda County Study	U.S.	Yes	No	1965–1994	5,286	1.42	6

(*Continued*)

Table 1 (*Continued*)

Publication	Data Source	Country	Religious Participation	Other Participation	Years	Sample Size	Mean HR	# HRs
Strawbridge et al. 2000[8]	Alameda County Study	U.S.	Yes	No	1965–1994	5,894	1.37	3
Sugisawa, Liang, and Liu 1994[120]	Original Data	Japan	Yes	Yes	1987–1990	2,200	1.49	1
Sun and Liu 2006[121]	CLHLS Study	China	Yes	No	1998–2000	7,938	1.17	1
Sun and Liu 2008[122]	CLHLS Study	China	Yes	Yes	1998–2000	7,938	1.36	1
Teinonen et al. 2005[123]	Original Data	Finland	Yes	No	1990–2002	1,080	1.35	4
Tucker et al. 1996[124]	TLCS Study	U.S.	No	Yes	1950–1991	1,077	1.13	2
Tucker et al. 1997[125]	TLCS Study	U.S.	Yes	Yes	1950–1991	1,101	1.15	1
Tucker et al. 1999[126]	TLCS Study	U.S.	No	Yes	1940–1991	1,241	.83	6
Walter-Ginzburg et al. 2002[127]	CALAS Study	Israel	Yes	Yes	1989–1997	1,340	1.15	4
Walter-Ginzburg et al. 2005[128]	CALAS Study	Israel	Yes	No	1989–1999	960	1.12	2
Walter-Ginzburg et al. 2005[128]	CALAS Study	Israel	Yes	Yes	1989–1999	960	.79	2
Welin et al. 1985[129]	TSMB 1913, 1923	Sweden	No	Yes	1973–1982	989	.98	6
Welin et al. 2000[130]	Original Data	Sweden	Yes	Yes	1985–1997	275	1.89	1
Wilkins 2003[131]	NPHS Study	Canada	Yes	Yes	1994–2001	2,422	1.08	4
Wingard 1982[132]	Alameda County Study	U.S.	Yes	No	1965–1974	4,725	1.40	2
Wingard 1982[132]	Alameda County Study	U.S.	No	Yes	1965–1974	4,725	1.40	1
Yasuda and Ohara 1989[133]	Original Data	Japan	No	Yes	1982–1987	1,889	1.99	7
Yasuda et al. 1997[134]	Original Data	U.S.	No	Yes	1984–1994	806	1.52	6

Table 2: Distribution of mortality risk estimates ($n = 312$) in the analysis
by selected variables (%)

Variable	Distribution
Publication date	
1979	3.9
1980–1989	18.7
1990–1999	31.7
2000–2007	45.2
Level of statistical adjustment	
Unadjusted	31.7
Adjusted for age only	9.9
Adjusted for age and additional covariates	58.3
Gender	
Women only	30.1
Men only	33.7
Both genders	36.2
Mean age of study sample at baseline	
30–39.9	1.3
40–49.9	14.4
50–59.9	19.2
60–69.9	8.0
70–79.9	39.8
≥80	17.3
Baseline start year	
1940–1949	1.9
1950–1959	1.0
1960–1969	18.6
1970–1979	8.6
1980–1989	40.7
1990–1998	29.2
Region	
Scandinavia	21.5
United States	46.8
United Kingdom, Canada, and Australia	3.2
West Continental Europe	12.2
China and Japan	16.3
Maximum follow-up duration (years)	
1st quartile	6.3
Median	8.6
3rd quartile	12.4

RESULTS

Table 3 presents the results of a number of meta-analyses (see Table 4 for sample size and heterogeneity information). We stratified all analyses by the level of statistical adjustment of the risk estimate. Persons with lower participation levels had a significantly higher risk of death than those with higher participation levels. The mean unadjusted HR was 1.60 (95% confidence interval [CI], 1.49–1.72; $n = 99$ HRs); the mean age-adjusted HR was 1.39 (95% CI, 1.26–1.53; $n = 31$); and the mean HR among point estimates adjusted for age and additional covariates was

Table 3: Meta-analyses of the hazard for those with lower levels of participation

	Unadjusted	Adjusted for Age Only	Adjusted for Age and Additional Covariates[a]
All available data	1.60 (1.49, 1.72)	1.39 (1.26, 1.53)	1.26 (1.21, 1.31)
By type of participation			
Religious	1.47 (1.32, 1.63)	1.36 (1.15, 1.62)	1.32 (1.24, 1.41)
Other social groups or activities	1.57 (1.42, 1.74)	1.46 (1.25, 1.70)	1.25 (1.17, 1.33)
Unknown/both religious and other	2.02 (1.74, 2.35)	1.45 (1.24, 1.69)	1.22 (1.13, 1.33)
By gender			
Women	1.61 (1.44, 1.81)	1.33 (1.16, 1.54)	1.28 (1.19, 1.38)
Men	1.54 (1.39, 1.71)	1.40 (1.22, 1.61)	1.23 (1.14, 1.31)
By baseline start year (study age)			
1940–1949	–	–	.83 (.72, .96) ($p = .0115$)
1950–1959	–	–	1.28 (.92, 1.77) ($p = .1453$)
1960–1969	1.21 (1.02, 1.44) ($p = .0297$)	1.31 (1.10, 1.57) ($p = .0033$)	1.23 (1.13, 1.34)
1970–1979	2.26 (1.84, 2.77)	1.29 (1.03, 1.62) ($p = .0278$)	1.21 (1.05, 1.40) ($p = 0.0076$)
1980–1989	1.60 (1.47, 1.74)	1.66 (1.35, 2.04)	1.28 (1.20, 1.36)
1990–1999	1.60 (1.40, 1.84)	1.35 (1.21, 1.52)	1.32 (1.25, 1.41)
By age			
40–49.9	1.64 (.99, 2.71) ($p = .0578$)	–	1.26 (.82, 1.94)
50–59.9	1.77 (1.44, 2.17)	–	1.33 (1.06, 1.67)
60–69.9	1.56 (1.26, 1.93)	1.46 (1.19, 1.78)	1.28 (1.15, 1.42)
70–79.9	1.63 (1.33, 1.99)	–	1.23 (1.07, 1.41)
≥80	1.58 (1.44, 1.72)	1.36 (1.23, 152)	1.25 (1.19, 1.31)

Notes: All meta-analyses calculated by maximum likelihood using a random effects model ($n = 312$). Number reported is the mean HR (95% confidence interval) (*p* value). Unless otherwise indicated, all *p* values ≤.001. Ellipses indicate situations where $n \leq 1$ and meaningful mean HR could not be calculated. See Table 4 for full information on sample sizes for each analysis.
[a]The number and type of covariates varies between studies.

Table 4: Number of hazard ratios analyzed in the meta-analyses reported in Table 3

	Unadjusted		Adjusted for Age Only		Adjusted for Age and Additional Covariates	
	N	P Value from Q-test	N	P Value from Q-test	N	P Value from Q-test
All available data	99	.013	31	.623	182	.149
By type of participation						
Religious	36	.876	11	.619	68	.998
Other social groups or activities	43	.004	10	.946	75	.015
Unknown/both religious and other	20	.013	10	.010	39	.776
By gender						
Women	31	.837	9	.942	54	.070
Men	41	.128	11	.488	53	.423
By baseline start year						
1940–1949	0	–	0	–	6	–
1950–1959	0	–	1	–	2	.440
1960–1969	24	.996	7	.707	27	.913
1970–1979	12	.020	3	.901	12	.000
1980–1989	48	.905	7	.912	72	.486
1990–1999	15	.000	13	.028	53	.102
By age						
40–49.9	4	.675	0	–	2	.494
50–59.9	15	.100	0	–	7	.503
60–69.9	13	.101	9	.576	29	.120
70–79.9	14	.901	0	–	19	.954
≥ 80	53	.003	22	.476	125	.039

1.26 (95% CI, 1.21–1.31; $n = 182$). These results show that, in studies controlling for covariates, lower levels of participation are associated with a 26 percent higher risk of mortality.

Subgroup Meta-Analyses and Meta-Regression Analyses

In the interest of presenting conservative results, from this point forward the discussion of Table 3 will focus only on HRs adjusted for age and additional covariates. Table 3 shows that lower participation was associated with an increased risk of mortality for both women and men. The magnitude of the mean HR was slightly greater for women (HR, 1.28; 95% CI, 1.19–1.38; $n = 54$ HRs) than for men (HR, 1.23; 95% CI, 1.14–1.31; $n = 53$). Table 5 presents the results of two meta-regression analyses, the first model includes all the variables in the analysis and the second is a parsimonious model. Model 1 shows that the proportion of a sample that is male had no significant impact on the magnitude of the HR ($p = .607$), indicating there is no statistical difference between the mean HR for men and women.

Similarly, the type of participation in which a person was involved had no significant effect on the magnitude of the mean HR (Table 3). People with lower participation in religious services had a slightly higher mean HR (HR, 1.32; 95% CI, 1.24–1.41; $n = 68$ HRs) than people with lower participation levels in other group activities (HR, 1.25; 95% CI, 1.17–1.33; $n = 75$ HRs).

Table 5: Multivariate meta-regression analyses predicting the magnitude of the effect of social participation on mortality

	Model 1: All Variables	Model 2: Parsimonious
Constant	4.77 (2.97, 7.64)	4.10 (2.81, 6.00)
Proportion of sample that is male	1.02 (.95, 1.09) ($p = .6071$)	
Mean age at baseline (decades)	.95 (.93, .98)	.95 (.92, .97)
Age range (decades)	1.02 (.99, 1.05) ($p = .12$)	
Publication age (decades)	1.03 (.94, 1.13) ($p = .483$)	
Study age (decades)	.92 (.87, .96)	.94 (.90, .98) ($p = .0012$)
Baseline length (years)	.99 (.98, 1.00) ($p = .0015$)	.99 (.98, 1.00)
HR controlled for:		
Gender	1.13 (1.03, 1.23) ($p = .0086$)	1.09 (1.00, 1.19) ($p = .0503$)
Age	.85 (.78, .93)	.87 (.81, .95)
Other demographics	.9 (.83, .98) ($p = .0118$)	.90 (.84, .98) ($p = .0139$)
Socioeconomic status	1.03 (.95, 1.12) ($p = .4399$)	
General health	.99 (.89, 1.10) ($p = .8628$)	
Health behaviors	1 (.88, 1.13) ($p = .966$)	
Chronic health condition	1.02 (.93, 1.10) ($p = .7222$)	
Psychological health	.91 (.82, 1.01) ($p = .0796$)	.91 (.84, .99) ($p = .0304$)
Social relationships	.91 (.83, .99) ($p = .0278$)	.90 (.83, .97) ($p = .0076$)
Stress	1.14 (.94, 1.38) ($p = .1884$)	1.19 (.98, 1.44) ($p = .0837$)
Sample size (logged)	.98 (.95, 1.01) ($p = .18$)	
Subjective quality rating	.86 (.79, .94)	.89 (.82, .96) ($p = .0023$)
Scale measure of study quality	.97 (.94, 1) ($p = .0565$)	.97 (.95, 1.00) ($p = .0309$)
Type of participation		
Religious	Reference	Reference
Other social groups or activities	.97 (.89, 1.05) ($p = .4194$)	.98 (.90, 1.06) ($p = .5661$)
Religious and nonreligious combined	.87 (.8, .94)	.87 (.81, .94)
R^2	.3609	.3391

Notes: All meta-regressions calculated by maximum likelihood using a random effects model ($n = 312$). Number reported is the exponentiated regression coefficient (95% confidence interval) (p value). Unless otherwise indicated, all p values $\leq .001$. Ellipses indicate when a variable was not included in the model.
[a]Obtained using backwards elimination, $p > .10$ to exit.

However, the meta-regression results in Table 5 indicate that this difference is not significant ($p = .419$ and $p = .566$ for Models 1 and 2, respectively).

Table 3 also shows that the effects of participation on mortality have gradually increased over time. Lower levels of participation are associated with a decreased risk of mortality in studies conducted between 1940 and 1949 (mean HR, .83; 95% CI, .72–.96; $n = 6$). In the two studies with baselines between 1950 and 1959, the mean HR is not significantly different from 1.00 ($p = .145$). However, for studies using data gathered after 1960, the mean HRs are significant and generally increasing in magnitude. The mean HR was 1.23 (95% CI, 1.13–1.34; $n = 27$) for studies with baselines between 1960 and 1969, 1.21 (95% CI, 1.05–1.40; $n = 12$) for 1970–1979, 1.28 (95% CI, 1.20–1.36; $n = 72$) for 1980–1989, and 1.32 (95% CI, 1.25–1.41; $n = 53$) for 1990–1999.

Table 5 shows that other significant predictors of differences among reported HRs include mean age at baseline (a 5 percent decrease for each additional 10 years of age, $p = .002$), baseline length (a 1 percent decrease for each additional year of baseline, $p < .001$), and whether the study controlled for gender, age, other demographic characteristics, psychological health, social relationships, and general stress. The various measures of study quality were also found to be significant predictors. Higher study quality was associated with lower HRs according to both the subjective quality rating (an 11 percent decrease in the HR for each unit; $p = .002$) and the scale measure of study quality (a 3 percent decrease in the HR for additional unit; $p = .031$). This suggests that, as suggested earlier, studies with lower quality tend to overestimate the effects of participation on mortality.

Finally, a number of predictors did not affect the magnitude of the effect (see Table 5). These include gender, age range, the interaction of gender and mean age, the publication date, whether studies controlled for SES and various health measures, and the size of the sample.

Analysis of Data Heterogeneity

The between-groups Cochrane's Q for the meta-analysis of all 312 HRs was statistically significant ($p < .01$; I^2, 20.96; 95% CI, 8.43–31.78), indicating that important moderating variables exist and supporting the decision to use random effects models and conduct subgroup meta-analyses. Since the discussion of the meta-analysis focused on HRs adjusted for age and additional covariates, the corresponding heterogeneity test results were carefully examined. As shown in Table 5, the Q-tests for these subgroup meta-analyses were statistically significant for only two cases, the voluntary organizations participants subgroup ($p = .015$) and the 1970–1979 baseline subgroup ($p < .001$). I^2 tests for these subgroups indicate heterogeneity was moderate for the voluntary organizations group (I^2, 47.66; 95% CI, 31.40–60.06) and high for the 1970–1979 baseline subgroup (I^2, 73.85; 95% CI, 53.64–85.25). The results from these two subgroup meta-analyses should therefore be treated conservatively. In all of the remaining subgroup analyses however, Q-tests and I^2 tests were nonsignificant, indicating that heterogeneity was adequately accounted for by the use of a random effects model.

Meta-regressions were also used to examine possible sources of heterogeneity in the data. The model fit statistics for Model 1 of Table 5 (R^2, .3609; $p < .001$ for the Cochrane's Q of the model) indicate that this model captured a substantial portion of the heterogeneity in the data. Nevertheless, the unexplained heterogeneity variance component for both Models 1 and 2 of Table 5 remained significant ($p < .001$ in both cases), confirming the need to use a random effects model for all analyses.

<div align="center">DISCUSSION</div>

The results of the present meta-analyses and meta-regression analyses show that social participation is by and large associated with lower mortality rates. Among HRs adjusted for age and additional covariates, the risk of death for people with lower social participation levels was 26 percent higher than the risk among those with higher levels of social participation. However, the magnitude of the effect was not uniform across all subgroups.

The most revealing finding of our study is that participation is helpful regardless of the type of social activity in which a person takes part. More specifically, the risk among those who had lower levels of religious participation was 32 percent higher than those with higher levels of religious participation, slightly higher than the 25 percent increase in risk for people with lower participation in other group activities. However, the meta-regression results (Table 5) show that this difference was not statistically significant.

This finding is especially important for sociologists of religion, who study the outcomes of religious faith and religious participation. As noted above, religious participation may be thought of as a special case of social participation, one that may provide the individual with benefits that exceed those of other forms of group participation. Former studies have suggested that, beyond the advantages associated with any social activity (social ties, social support, and a sense of control, purpose, and self-worth), religious participation also provides individuals with increased awareness of health-related behaviors, an existential sense of comfort and meaning, and an opportunity to participate in rituals, which may all be predictors of improved health and well-being, as well as of lower mortality rates (Musick, House, and Williams 2004). The results of the current study, however, do not provide support for this proposition.

One might argue that the lack of difference between religious and nonreligious participation is due to countervailing selection effects. In other words, perhaps the additional benefits of religious participation are being countered because those social strata that attend religious services have a generally higher level of mortality risk to begin with. For example, if we follow Marxist ideas about religion as the opiate of the (dispossessed) masses, we may speculate that the members of lower classes would be more likely to attend religious services than to participate in other voluntary organizations. If that is true, the deleterious health effects (Adler et al. 1994; Illsley and Baker 1991) and decreased longevity (Antonovsky 1967; Lynch et al. 1996) associated with being a member of a lower social class would potentially negate the benefits of religious participation. However, a host of studies have reported that SES is actually positively associated with religious attendance (Beit-Hallahmi and Argyle 1997; Fukuyama 1961; Gaede 1977; Hertel 1973; Mueller and Johnson 1975; Musick, House, and Williams 2004). Furthermore, while our own study cannot determine whether participation is especially beneficial for those coming from lower classes, we did find that the magnitude of the hazard ratios in studies that did not control for SES was not significantly different from the magnitude of the hazard ratios in studies that did control for SES. This suggests that socioeconomic factors may not be a primary factor in the relationship between participation and longevity.

One might also argue that the lack of difference between religious and nonreligious participation is due to health status confounding. Those who participate in religious activities and groups may suffer from more health problems to begin with, a feature that would in turn lead many of them to participate in order to seek divine assistance. However, this explanation is also not supported by the findings of previous studies, which show that people with better health are actually *more* likely to attend religious services (Ainlay, Singleton, and Swigert 1992; Harris and Thoresen 2005; Sloan, Bagiella, and Powell 1999). The meta-regression analyses presented in Table 5 further refute this explanation. The magnitude of the hazard ratio in studies that controlled for key health measures (general health, health behaviors, and chronic health conditions) did not differ significantly from the magnitude of the hazard ratio in studies that did not control for these health measures. The sole health measure that was a significant predictor of the HR was psychological health, but this variable was uncorrelated with both religious and nonreligious participation.

The findings coming from the meta-regression analyses are insightful beyond what they tell us about the difference (or lack of) between religious participation and other types of social participation. These findings also provide no support for socioeconomic and health selection explanations, often discussed in the literature as possible confounding factors of the relationship between social participation and mortality (Musick, House, and Williams 2004). The fact that no significant difference was found between the magnitude of the effect in studies that controlled for SES and/or for the key health status measures and the magnitude in those that did not, suggests that socioeconomic and health factors do not provide an alternative explanation for the relationship between social participation and mortality. In other words, this relationship is not likely a spurious one and therefore the various protection effects associated with social participation seem especially important in accounting for it.

Since socioeconomic and health status selection effects are not likely responsible for the lack of difference between religious participation and other forms of social participation, an alternative explanation emerges. The similarity between the effects of these different forms of social participation suggests that, more than anything else, religious and nonreligious participation alike may be beneficial because they provide individuals with social support and a sense of vitality and self-worth. Consistent with the assumptions of social engagement theory (Ayalon 2008; House, Landis, and Umberson 1988; Young and Glawgow 1998), role theory (Chambré 1987; Moen, Dempster-McClain, and Williams 1992; Morrow-Howell et al. 2003), and activity theory (Gubrium 1973; Herzog and House 1991; Lemon, Bengston, and Peterson 1972), being part of a social group helps individuals gain and maintain helpful social relationships, provides them with an opportunity to engage in activities that they see as productive, and gives them a sense of purpose and self-worth. The other aspects and benefits often specifically associated with religious participation (e.g., experiencing a sense of existential meaning, participating in a ritual, or believing that God protects you) may have little or no effect.

While these theoretical explanations seem plausible, we cannot rule out some alternative explanations. First, the similarity between the protective effects of religious participation and those of other types of participation may result, at least partly, from the lack of differentiation between various denominations and different types of religious participation. The large majority of the studies evaluated in the present analysis did not separate between different denominations, preventing us from analyzing possible differentiating effects. Recent research, however, suggests that different forms of denominational affiliation may be associated with distinctive social outcomes, including health and mortality outcomes (Blanchard et al. 2008). This calls for a careful attention in future studies to religious participation by members of various denominations and the potentially differing effects these may have in terms of health and longevity.

Furthermore, one cannot rule out an explanation suggesting that some factors that may be associated specifically with certain types of religious involvement (e.g., the privileging of the afterlife, a tendency to trust religious healers over conventional practitioners, or the valorization of suffering) could lead to a lax orientation toward health and self-care. In other words, religious beliefs, fostered by religious participation and preaching, may lead to maladaptive health behaviors that counteract the additional gains that would otherwise be observed for religious involvement.

Aside from the lack of difference between the effects of religious and nonreligious participation, it is interesting to note that studies conducted in more recent decades generally reported greater excess risks of death. This suggests that the importance of group participation for individuals' health has been increasing over the years (although very gradually). These results offer some evidence for claims that support from members of voluntary groups is becoming increasingly important in modern societies (particularly the Western societies) as they become more individualized and traditional sources of support diminish (Allik and Realo 2004; Durkheim [1902] 1947; Green, Deschamps, and Paez 2005; Putnam 2000; Tonnies [1887] 1963).

A major limitation of the reported analyses, shared by many meta-analyses, is the file drawer effect, or more specifically the nonreporting in the literature of nonsignificant findings (Berman and Parker 2002; Egger and Davey-Smith 1998). This tendency may lead to an over estimation of the mean HRs. Therefore, one should be especially careful in interpreting mean HRs that are relatively close to 1, even when these are significant (as is the case with some of the results in the current meta-analysis). When publication bias is not a problem, a scatterplot of the log HRs against sample size (funnel plot) will appear symmetric and roughly triangular. In our case, the funnel plot conformed to this shape (see Figure 2). This suggests that publication bias is not likely a serious problem in our analysis. To further examine this issue, we supplemented the visual analysis of the funnel plot with Peters's test (Moreno et al. 2009; Peters et al. 2006), a statistical procedure meant to detect deviations from symmetry. The results of this test indicated a nonsignificant level of publication bias ($p = .815$), suggesting that our sample did not omit key publications that may have considerably changed the results of our analyses.

Figure 2
Funnel plot of hazard ratios (logged) versus sample size
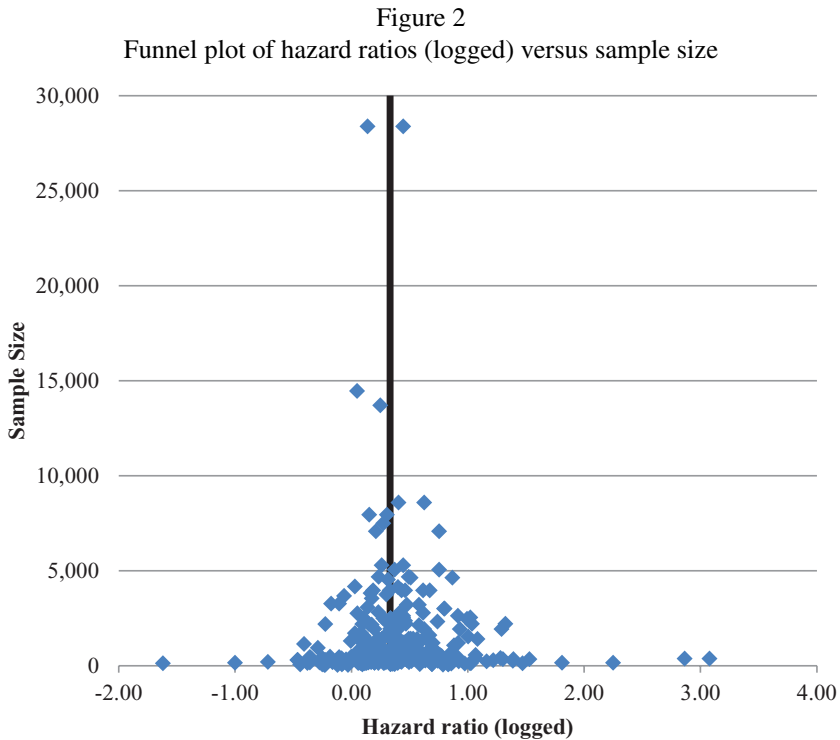
A second limitation stems from the nature of the data. Almost all of the research on group participation and mortality was conducted in the developed world (mostly the United States and Western Europe, with a small number of publications from Japan, Australia, and Israel). Only one study has looked at a developing nation (China). This fact means that sample sizes in the developing world are too small (or nonexistent) to make any meaningful conclusions about the nature of the relationship in Middle Eastern, East European, Asian, African, South American, Caribbean, and Pacific Island nations. Therefore, the findings from the different analyses presented here should not be extrapolated to populations in developing countries.

Finally, we wish to add a word of caution regarding our measurement of religious participation. We chose this measure to try and isolate to the best of our ability the effects of participation (of any kind) from those of additional factors (such as belief systems or personal motivations). Religious attendance represents a direct measure of behaviors and actions rather than attitudes or beliefs. We therefore chose to exclude measures of private religiosity from our analysis, in order to both reduce heterogeneity and maintain a more precise comparison with other, nonreligious participation practices. However, we acknowledge that religious participation itself is a somewhat heterogeneous variable. Those who report high levels of religious participation may also be more likely to believe in a higher power, use prayers as a way to cope with stress, and associate with friends and sexual partners who share their religion. Therefore, we cannot claim that we have entirely isolated the distinctive and "clean" contribution of religious participation and conclusions should be made in a careful manner.

CONCLUSION

The association between high levels of religious participation and reduced mortality risk is often thought to derive from a social participation component and from a religious efficacy component. The analyses reported here, however, do not support the religious efficacy hypothesis.

Low levels of group participation, in general, were associated with an increased relative risk of death, but the specific form of participation (i.e., religious vs. nonreligious) did not have a significant effect on the magnitude of the relative risk. This suggests that the main protective benefits of religious and nonreligious participation derive from similar sources, namely the increase in social support and sense of self-worth they provide. Future research should focus on understanding the health, socioeconomic, physiological, and behavioral factors through which the effects of participation on mortality are manifested. In addition, further research in developing countries is needed to help explain not only the cultural differences in the experience of group participation, but also the differential mechanisms that mediate the risk of death following social participation.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web site:

Appendix S1. Additional study information