

## **Aging, religion, and health**

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## **ABSTRACT**

Durkheim's famous study of suicide is a precursor of a large contemporary literature that investigates the links between religion and health. The topic is particularly germane for the health of women and of the elderly, who are much more likely to be religious. In this paper, I use data from the Gallup World Poll to study the within and between country relationships between religiosity, age, and gender, as well as the effects of religiosity on a range of health measures and health-related behaviors. The main contribution of the current study comes from the coverage and richness of the data, which allow me to use nationally representative samples to study the correlates of religion within and between more than 140 countries using more than 300,000 observations. It is almost universally true that the elderly and women are more religious, and I find evidence in favor of a genuine aging effect, not simply a cohort effect associated with secularization. As in previous studies, it is not clear why women are so much more religious than men. In most countries, religious people report better health; they say they have more energy, that their health is better, and that they experience less pain. Their social lives and personal behaviors are also healthier; they are more likely to be married, to have supportive friends, they are more likely to report being treated with respect, they have greater confidence in the healthcare and medical system and they are less likely to smoke. But these effects do not all hold in all countries, and they tend to be stronger for men than for women.

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## **Introduction**

In this paper, I use Gallup World Poll data from random national samples of individuals from 146 countries to investigate both the determinants of religion and its effects on health. These issues are especially relevant for the analysis of aging because, in almost all countries of the world, the elderly are more likely to report that religion is important in their lives. That the elderly should be more religious is predicted both by secularization theory, which argues that successive cohorts become less religious, at least under some circumstances, as well as by the economic theory of intertemporal choice and capital formation, which predicts that people become more religious as they grow older, Azzi and Ehrenberg (1975). One of the aims of this paper is to document international patterns of how religiosity varies with age and gender, and to produce evidence on the secularization versus aging stories. The second aim is to explore the relationship between religiosity and health. In this I follow a large contemporaneous empirical literature that documents that religious people typically have better health outcomes, see Koenig, McCullough, and Larson (2000) and McCullough and Smith (2003) who summarize many hundreds of studies. Most of these studies use community data, although a few use large national samples, as in Hummer, Rogers, Nam and Ellison's (1999) analysis of religious attendance and mortality in the United States. I am aware of no analysis of within-country effects for a large number of countries, nor for the comparison of those effects between countries.

I shall work with a simple triangular causal structure, in which religiosity and religious practice are caused by income, education, age, and sex, and in which health is caused by religion, income, education, age and sex. I estimate these relationships

separately for each country, and then examine similarities and differences across countries, both in the national averages—essentially cross-country regressions of religiosity and health on national characteristics—and in the coefficients from the within-country relationships. It is easy to think of reasons why this causal framework might be wrong; poor health might cause people to turn to religion, or there could be third factors such as rates of time preference that affect both religiosity and health. However, I do not believe that there is currently any credible way of distinguishing causality. So I shall simply follow the large majority of the literature, assuming the causal structure and examining the plausibility and interest of what I get within it. As we shall see, there are some startling differences in health outcomes and health behaviors by religiosity, and these patterns are worth describing and thinking about. The mechanisms that have been postulated in the literature—that religion is a superstition that is undermined by education, that wage rates or risk preferences affect religiosity and so help explain differences between men and women, and that the religious have healthier lives—have implications for the patterns of correlation in the data, and those I can examine.

The Gallup data cover more countries—particularly poor countries in Africa—and are nationally representative for more countries than previous international data such as the World Values Surveys, which have been widely used in previous examinations of religion in the world, for example by Miller and Stark (2002), Norris and Inglehart (2004), and Inglehart (2009).

The paper is organized as follows. I begin in Section 2 with a brief summary of the literature that is relevant to the hypotheses that we examine here, the various versions of the secularization hypothesis, of aging, gender, and religion, as well as accounts of the

ways in which religion might be good for health. Section 3 contains a brief summary of the survey, including the countries covered and the questions that we use. A major exclusion is China, which is included in the World Poll, but without the questions on religiosity and religious attendance. Section 4 looks at the links between income, education, age, and religion; consonant with previous research, the World Poll provides some support for the secularization story, older people are more religious, and more educated better-off people are less likely to be religious. Yet there is also evidence for pure age effects predicted by economic theory. Section 5 looks at the links between religion and health, conditional on variables such as age, sex, and education that are linked with both.

## **2. Religiosity, age, and other factors**

One of the dominant themes in the literature is the secularization hypothesis, the idea that religious belief and practice will decline over time with economic development, particularly with rising levels of income and education. In one form or another, the argument was made by David Hume, John Stuart Mill, Karl Marx, Max Weber, Sigmund Freud and many others, see Norris and Inglehart (2004), and McCleary and Barro (2006) for reviews. One extreme version of the hypothesis is that religious belief is a superstition that is dispelled by education. A more economic argument is given in Mill's *Utility of religion*. Secularism, Mill argues, can provide all of the benefits of religion save one, the promise of eternal life. But as people become better-off in this life, they will substitute current for future utility, and will have less need of religion, an early argument for the importance of the intertemporal elasticity of substitution. Inglehart (2008) provides an

argument related to Mill's, that there are two routes to the good life, a traditional one through religion, with its emphasis on future bliss over present suffering, and a modern one, through education, higher incomes, social tolerance and political freedom. As countries become richer, better educated, more democratic, and freer, the need for religion will fall. By this argument, economic development can be expected to cause a decline in religious belief, but only beyond the point where "the public of a given society has experienced relatively high levels of economic and physical security," Norris and Inglehart (2004, p. 27).

The secularization hypothesis has implications for the age structure of religiosity at any moment of time. If people's religious beliefs are established early in life, and do not change, secularization implies that, in the cross-section, religiosity be higher among the elderly, and more so in countries where education, life time incomes, or political freedoms have been rapidly expanding. Countries that have had rapid economic growth should show larger gaps in religiosity between young and old, though if Norris and Inglehart are right, this will only be true among the better-off, more secure nations.

Religiosity may also change with age, and in particular, religion may become more important to people as they grow older, and their minds turn to the contemplation of the hereafter. Specific predictions are derived in the important paper by Azzi and Ehrenberg (1975), who model religious practice as a time-intensive accumulation of religious or sacral capital that is valuable only after death. In contrast to the accumulation of human capital, which pays off throughout life, so that the optimal strategy is for people to acquire education when they are young, the accumulation of religious capital is optimally postponed, with the prediction that religious practice will rise with age. Since wages are

lower for women than for men, and are lower for blacks than for whites, women and blacks should be more religious than white men, and they should accumulate religious capital earlier with a subsequently flatter profile than for white males. Azzi and Ehrenburg find support for these predictions using American data, and their model provides a useful lens to interpret patterns of religious activity throughout the world, both within countries and between them.

Azzi and Ehrenberg's prediction that women should be more religious than men has been widely observed to be true, although there is no general agreement on the mechanisms involved. Miller and Hoffmann (1995) and Stark and Miller (2002) propose that the decision not to believe in religion is a form of risk-taking behavior—if religion is true, such a decision has extremely unfortunate long-term consequences—and like most such behaviors, is more common among men, especially young men. Although this account does not explain where risk attitudes come from, it provides a unified way of thinking about religiosity, aging, and gender. It also predicts that in religions that do not threaten eternal punishment for non-believers—reformed Judaism, Shintoism, Hinduism, Bhuddism, in contrast to Christian, Orthodox Jewish and Muslim religions—there will be a smaller gender gap in religiosity, as well as a less pronounced age gradient. This last is also consistent with Azzi and Ehrenberg's model, since there is less need for “sacral capital” to fend off the fires of hell.

In his discussion of this paper, Jim Smith argues that women's religiosity may be linked to the fact that they have the primary responsibility for child-rearing in most countries of the world. David Sloan Wilson (2002) has argued that religion evolved to confer a survival advantage to groups of believers, in which case women would have

responsibility for passing on beliefs from one generation to the next. If so, the gender gap might be expected to diminish as fertility falls, which falls foul of the evidence that the gender gap is largest in the richer, non-traditional societies where women have many options other than childbearing, Miller and Stark (2002).

Another important line of enquiry into secularization focuses on the role of the state, and on the hypothesis that state provision of social welfare and social insurance is a substitute for provision by organized religion, so that the latter are displaced by the former as the state grows over time. This line of thought leads to the examination of state welfare spending and religious practice, as well as to the possibility that religion is more important in places where risk is high—for example in agriculture—or in places where social safety nets are weak—for example in the US South as opposed to the US North. It is also possible that social security in the form of state pensions, or state provided health insurance—in the US focused on the elderly through Medicare—might reduce levels of religious participation throughout life.

There is also a literature on the *consequences* of religion, particularly the extent to which religious people have healthier lives. Idler and Kasl (1997) distinguish three types of mechanisms that they trace back to Durkheim and to Weber. These are “regulative”—religions typically impose rules that cover not only ethical behavior, but also eating, drinking, and sexual activities, rules that usually promote health, “integrative”—religions provide networks that connect people to others who provide tangible economic and psychological support and in some cases, healthcare, and “interpretative”—religion provides meaning and understanding to life that is likely to be especially useful in times of suffering or stress. The empirical literature has found positive health effects of religion



for a wide range of conditions and diseases, for both morbidity and mortality. Much of the association with mortality works through the better health behaviors of the religious, but there is also evidence of effects even conditional on a range of social and health behaviors, as in Hummer et al (2009). A recent review by Michael McCullough and Brian Willoughby (2009), argues that religion enhances self-control; churches promote behaviors and beliefs that support self-regulation. Religious people absorb religious values into their own lives, imbuing their own long-term goals with a sacredness that makes them easier to attain in the face of present temptation. Of course, people who are born with low rates of time-preference and high self-control will also downweight the present relative to the future, including possibly an eternal future, and thus be more likely to join religions that emphasize eternal rewards in exchange for present sacrifice and self-control. Even here, religions may reinforce innate or early-developed dispositions.

The literature in economics has emphasized those aspects of religion that are favorable or unfavorable to economic efficiency and growth, a tradition that goes back at least to Weber. The promotion of self-control is clearly relevant for economic behavior as well as for well-being, as also are the promotion of trust, honesty, and thrift, McCleary and Barro (2006). From its roots in Weber, this literature has also enquired into whether different religions are more or less favorable to economic development, for example through attitudes to usury, Guiso, Sapienza and Zingales (2003), or through the promotion of social trust by developing relationships between coreligionists—Protestantism—or less so by emphasizing relationships between worshippers and priests—Catholicism, see Helliwell and Putnam (2004).

### **3. The Gallup World Poll**

The World Poll is designed to be a continuing survey of all of the world's citizens. It began in 2006, and I use the data from the first three waves, 2006, 2007, and 2008, by which time 145 countries have been included, of which 78 are in all three waves. The 145 countries contained a total of 6.45 billion people in 2006, more than 98 percent of the population of the world. In each wave and in each country, the poll samples around 1,000 individuals aged 15 and over, though in some cases the samples are smaller or larger. With only a few exceptions, the samples are random national samples of the target population. The poll uses an identical core questionnaire in all countries. Here I use two questions about religion ("Is religion an important part of your daily life?") and religious observance ("Have you attended a place of worship or religious service within the last seven days?"); the second of these is potentially more problematic for religions (such as Buddhism) where attendance at places of worship is relatively unimportant. For short, I shall refer to these two questions as religiosity, and worship.

Gallup was unable to ask any of the religion questions in China, which is therefore excluded from the analysis.

The poll also collects information on health and on a number of health-related behaviors. Among the former, I look at self-reported health status, disability status, physical pain, and energy level. All of these are asked as yes or no questions. The wordings are (a) Are you satisfied or dissatisfied with your personal health? (b) Do you have any health problems that prevent you from doing any of the things that people your age can normally do? (c) Did you experience the following feelings during a lot of the day yesterday? How about physical pain? (d) Did you have enough energy to get things

done yesterday? (There are also a number of questions on life-evaluation, and on positive and negative affect, and there are the topics of a companion paper.) Among the social and personal health-related behaviors, I look at marital status, time spent with friends, whether the respondent has a friend who would provide support in time of trouble, and whether the respondent smoked yesterday. Finally, I look for links between religion and whether people have confidence in their country's health and medical system; although this is neither a behavior nor an outcome, it is a health-related component of well-being. It may also reflect the provision of healthcare by religious institutions.

The poll also collects data on a set of socioeconomic and demographic variables, including education (coded into three categories—elementary education or less, secondary or up to three years of tertiary education, and four years or more of tertiary education) and a single question on income. The accuracy and meaningfulness of the income question is doubtful in much of the world and, unsurprisingly, there are a large number of missing values; even so, the question clearly contains some information, and we make some use of it, while acknowledging its problems.

Excluding China, and combining data from all waves, our sample contains 351,250 observations from 144 countries; the sample size for each country ranges from (at the high end) 7,286 observations for India , 6,979 for Russia, and 5,238 for Germany to (at the low end) Puerto Rico (500), Guyana (501), and Belize (502). Only eight countries have less than a thousand observations. The poll includes countries that rarely appear in international surveys of any kind, including Afghanistan, Cuba, Iraq, and Myanmar, as well as 32 countries in Africa, including countries, such as Togo, Sierra Leone and

Zimbabwe, which have the dubious distinction of having the lowest levels of life-evaluation on the planet, Deaton (2008). Apart from the loss of China, the key religion variables are reported by nearly all of the respondents in the survey, so that we have 335,005 valid observations to the worship question and 332,712 to the religiosity question.

#### **4. Aging, income, education, and religiosity**

I begin with the cross-country patterns of religiosity summarized in the top panel of Table 1. The first columns for each measure show that religiosity and worship vary greatly across the regions of the world. Africa is the base region in the table, and the average African country (not weighted by population) has 93 percent of its population religious, and 71 percent worshipping in the last week. South Asian and Middle Eastern countries are almost as religious, while the countries of non-English speaking Northern Europe and East Asia are the least religious, followed by the former communist countries of Eastern Europe. These patterns are only very partially explained by differences in national income; for example, East Asia and Northern Europe are the least religious places, but have very different income levels. In the second column for each measure income is included. Regional effects are not much changed, though income is important, at least for religiosity. The practice of religion, as measured through the worship variable, is not significantly affected by income, conditional on regional effects.

The history and spread of world religions gives good reason to suppose that the regional effects are fundamental, at least in part, and are unlikely to be readily explained by other standard variables. In fact, and apart from income, none of the other country

variables that I consider significantly predict religion conditional on the regions. Of course, the regions have very different levels of education and income, so that conditioning on regions absorbs much of the effect of income and education, and biases against finding evidence for the cross-country version of the secularization hypotheses. The bottom panel of the table shows what happens when the regional effects are excluded. Here, income is a great deal more important, both for religiosity and worship, though the coefficient on the latter is smaller. Average levels of education—as measured in the World Poll—are also associated with lower religiosity, and lower worship, and in this case, the effects are stronger for worship. I have also included a set of dummies for whether the majority religion in each country is Catholic, other Christian, or Muslim—the base category is other religion—data taken from Fox and Sandler’s (2004) Religion and the State Project. These show that, conditional on national income educational levels, people in majority Muslim countries are more likely to report themselves to be religious, while people in majority Catholic countries are more likely to have worshiped in the last seven days.

Table 2 turns to within country analysis of the importance of religion. For each of up to 142 countries, I ran regressions of religiosity (as a 1/0 dichotomous variable for each individual) on a standard set of socio-demographic variables including, in all specifications, age, sex, and education. The country by country results are then averaged, without weights—so that each country is treated as an equally relevant observation—to give the numbers shown in the table. The standard errors are computed from the estimated variances for each country, under the assumption of independence over countries. I also included the logarithm of income and indicators of the individual’s place

of residence along a spectrum from rural to large city; because these variables are not available for all countries, we consider them as variants of the baseline specification. Because of the predictions about the different religiosity of men and women, one of the specifications, Model 2, interacts the age effects with sex.

The baseline specification, Model 1, shows that religiosity increases with age, that women are more religious than men, and that more educated people are less likely to be less religious. Model 3 shows, averaged over eight fewer countries, that people with higher incomes tend to be less religious, and that the income effect appears to operate in addition to the education effect, and largely independently of it, in the sense that the coefficients on education in Model 3 are very similar to those in Model 1. Model 4 shows that, as the religion as insurance theory suggests, rural or farming people are 2.8 percentage points more likely to be religious, with people who live in villages or small towns intermediate between them and people who live in large cities or their suburbs.

The sex and age patterns in the averages hold for most countries of the world. Women are more religious than men in all but 14 of the 142 countries, and in only two of these, India and Guinea, is the negative coefficient on the female dummy more than twice its estimated standard error. Similarly, young people (the 15 to 19 year old group) are less religious than the elderly (70 and over) in all but 16 of the 142 countries, and the only cases where a positive coefficient is more than twice its standard error are Israel, Georgia, the Central African Republic, and Liberia. The Israeli case is particularly remarkable; controlling for sex and education, 15 to 19 year olds are 33 percentage points more likely to be religious than elderly Israelis, presumably because so many Israelis are immigrants, and because the younger immigrants are different than older immigrants.

Model 2 allows the age profiles of religiosity to be different for men and women. Table 2 shows that the age profiles of religiosity for women are typically *steeper* so that the gap in religiosity between women and men, which is always positive, becomes more pronounced with age. Figure 1 looks at this phenomenon in more detail, showing age profiles of religiosity for women and for men for each of the World Bank's four broad income groupings of countries, low income, low middle income, high middle income, and high income. Women are more religious than men at all ages in all four regions, but the gap is largest in the high and high-middle income countries, and smallest in the low income countries, many of which are in Africa. As we move from poor countries to rich countries, religiosity declines, and does so more for men than for women, so that the gap becomes larger. The religiosity gap between men and women *increases* with age, a finding that is much more pronounced in the richer countries.

I have also drawn the counterpart of Figure 1 but with worship (attended a religious service in the last seven days) replacing religiosity. Because the results are similar to Figure 1, the graphs are not shown here. The major differences are first, that worship, unlike religiosity, falls slightly in the highest age group—presumably because of the effect of infirmity on the ability to attend—second, that in the high income group, there is no difference in rates of worship for men and women under age 50, and third, the biggest gap between men and women is now much more clearly in the upper middle income countries.

Another way of looking at patterns of religiosity by age and sex is to divide the world, not by income groups, but by the majority religious grouping. This shows that the female male religion gap is confined to majority Christian countries—of course these are

also the richest countries in Figure 1—particularly majority Catholic countries. These findings are broadly consistent with the Miller and Hoffman risky behavior theory. The gender gap is largest in Christian countries, where there is a threat of damnation, and lower in the “other” group, which contains Buddhist, Hindu, Shinto countries, as well as Israel, where there is no such threat. The accumulation of sacral capital with age is also less rapid in those countries. The majority Muslim countries are something of an exception, but these are countries where very few people are not religious; indeed it is not entirely clear how to measure the size of the gap, as an absolute difference, as the ratio of religious men to religious women, or as the ratio of non-religious men to non-religious women.

Because we are working with what is essentially a single cross-section, we cannot tell whether the patterns in Figure 1 are age, cohort, or period effects, though we can try to interpret them according to each. The leading theory of age and gender effects is the wage theory of Azzi and Ehrenberg (1975), and this is consistent with most, although not all, of the evidence in the figure. The gender gap in religiosity is attributed to the wage gap, which is almost certainly lower in the poorest countries, particularly in Africa where women are often the main earners and providers. Religiosity is predicted to fall with rising wages, which is consistent with the pattern across regions. That religious capital should be accumulated at the end of life is predicted by the theory, and holds true for men and women in all four regions. The higher life expectancy in the richer countries is also consistent with the pronounced postponement of religiosity in the high income countries, and I investigate this further below. Particularly for men, religiosity is almost constant with age, picking up only after age 50. What is *not* consistent with the theory is the



steeper age profile for men; if men's wages are higher than women's wages, women should begin their process of accumulation earlier in life, and the gap between women and men should diminish with age, which is the opposite of what we see in these figures.

Rising religiosity with age is also consistent with secularization which would predict, even in the absence of age effects, that older people—who were born in an earlier, more religious time—will be more religious, even if their religiosity has not changed throughout their lives. In this sense, and as noted by Norris and Inglehart (2004) in their work with the World Values Survey, the age effects in the figure are consistent with secularization, simply as a function of time. One possible model of secularization is that religiosity decreases steadily over time in each country, but at different rates, and that the rate of secularization is slower for women than for men, say a fixed fraction less than unity of the rate of secularization for men. This predicts that women are uniformly more religious than men, and that religiosity increases with age in the cross-section for both men and women. It also predicts that the religiosity gap between the old and the young should be positively correlated with the religiosity gap between women and men, because both are driven by the same process of secularization, and by its different rates in each country. This prediction is strikingly evident in the data; the cross-country correlation between the religiosity gap between old and young (minus the coefficient on the youngest age group in Model 1 in Table 2) and the gap between women and men (the coefficient on female in Model 1) is 0.5 with a  $p$ -value of zero. Even so, this simple model is inconsistent with the rising age gaps in religiosity that we see in Figure 1, especially in the two richest groups of countries. The slower rate of secularization among women implies that the religiosity gap between men and women in the cross section should

*narrow* with age, not widen, as in the data. Put another way, widening with age implies that the religiosity gap was once larger than it is now, which seems implausible, particularly if the poorer countries now are any guide to what the richer countries once were. So neither the wage-based age-effect model, nor the simple secularization model is consistent with all of the evidence. In terms of the wage model, our results seem to imply that women attach a higher value to the afterlife than do men.

Another problem with the simple secularization story is that it appears to work *too* well, in the sense that there are too few exceptions. As noted above, it is only for Israel, the Central African Republic, Georgia, and Liberia that the old are significantly less religious than the young. Yet, there are many countries in the world where religiosity has risen over time, certainly in terms of the growing involvement of religion in politics, the greater religious orientation of many states, and the replacement of once secular states by states in which religion plays a greater role, see Shah and Toft (2009) who argue that “God is winning” in global politics, or Micklethwait and Wooldridge’s (2009) *God is back*. It is not only in the former communist countries that state hostility to religion has diminished. Shah and Toft note that the secularism of Ataturk’s Turkey, Nehru’s India, Nasser’s Egypt, and the Shah’s Iran, not to mention Saddam Hussein’s Iraq, have weakened in favor of states where religion’s role in politics is much larger, and they note that in other countries, the liberalization and democratization of politics has brought increases in the importance of religion in public life. They cite Mexico, Nigeria, Turkey, Indonesia, India, and the United States as examples. Of the four countries with a significantly negative age gradient, only Georgia obviously fits this pattern. In the US, 15-19 year olds are more than 37 percentage points less likely to be religious than those

aged 70 and older (controlling for sex, sex-age interactions, and education). In Iran, the 15-19 year olds are 15 percentage points less likely to be religious than the 70 plus group, and those in their 20s are more than 25 percentage points less religious. In Mexico, the youngest group is 40 points less religious than the oldest group. In Egypt, the age profile is essentially flat, and the same is true in Turkey, India, Indonesia, and Nigeria. In Iraq, the young are more religious, and almost significantly so. Of course, the greater involvement of religion in politics could occur without people becoming more religious, for example if greater democracy leads to a fuller expression of pre-existing views in public life.

Risk-taking theory offers a partial account of the high cross-country correlation between the age and gender gaps in religiosity. Suppose that, for some unspecified reason, there are international differences in the degree of risk taking by young men. Countries with high risk taking would then have both a large gender gap and a large age gap. If true, this would yield a single explanation for both phenomena.

In an effort to explain the age and gender gaps in religiosity, I have run a series of “upper-stage” cross-country regressions using the within-country estimated coefficients as dependent variables. The first column of Table 3 show a regression of the age religiosity gap, estimated from Model 1 in Table 2, on indicators for the World Bank income groups, on indicators for the major religion of each country, on the average rate of GDP growth of the country (measured over as many years as are available in the Penn World Table), on life expectancy at birth in 2000, and on the fertility rate in 2006. This age religiosity gap is the coefficient on the dummy for the 15 to 19 year old age group in a regression where the omitted group is 70 years old and older, so it is typically a

negative number measuring the difference in religiosity between the young and the old. The second column presents the same regressions for the coefficient on the female dummy in the same regression, a measure of how much more religious are women than men, controlling for age and education.

The first column provides some evidence in favor of the Azzi and Ehrenberg interpretation of religiosity and age and against the secularization story. On the latter, the age gap in religiosity is not related to past economic growth in the country, as it should be if it is growth in national income (or more widely, modernization) that is driving the decline in religion. On the former, the age gap is negatively related to life expectancy, which is what would be expected if longer lives make it less important to become religious earlier. The contrast between the two findings is explored further in Figures 3 and 4, which split up the results by income group. Figure 3 shows at least some evidence that, within the income groups, the age religiosity gap is larger where life-expectancy is higher. It is only in the high income countries that this is not true, but even they, as a group, lie in the appropriate position on the general regression line. Figure 4 shows that there is no such pattern for the rate of economic growth; in particular it is not true that economic growth drives secularization in the richer countries but not in the poorer ones. These results are hardly conclusive, but the evidence leans towards the age-effects hypothesis, and is consistent with the accumulation of capital for the hereafter, and leans against the cohort-effects secularization hypothesis, at least if secularization is driven by modernization as represented by increasing per capita GDP. Note also from the first column of Table 3 that the patterns of aging and religiosity do not appear to be different across the different majority religions.

Table 3 also shows a regression of the female religiosity effect on income group, on major religion, on life expectancy and on growth. In contrast to the age regression, life expectancy has no effect on the differential religiosity of men and women. There is a mild and barely significant growth effect—economic growth actually *widens* the gap between men and women—and a marginally significant effect of the income group dummies—the gap is widest in the upper middle income countries. The major effect here is the one that we have already seen in Figure 2, that the greater religiosity of women is most pronounced in the majority Christian countries and much less pronounced elsewhere, as picked up by the negative dummies.

I have also experimented with adding fertility rates to the regressions in Table 3. The age gap in religiosity is strongly positively associated with fertility and fertility is now the *only* variable that is significant. Fertility is *negatively* associated with the gender age gap, so that conditional on income group (now not significant) and majority religion (significant), the gender gap is highest in the low fertility countries, which is inconsistent with the view that the greater religiosity of women is associated with childbearing, or that it occurs in societies where women's primary role is childbearing. The obvious issue here is reverse causality, that religiosity is driving fertility, not the other way round. Given the results in the literature, and those in the next section, that is also an issue for life expectancy, but surely a good deal less so. On a religion to fertility interpretation, fertility depends on the young being relatively religious, and on men being relatively religious. Further exploration of these issues is beyond the scope of this paper.

Table 2 shows that, averaged over countries, the richer and better educated people within each country are less likely to be religious. If income and education are essential

ingredients in “development,” these within-country results can help us understand secularization with development over time. They are also consistent with Hume’s view of religion as a superstition that is dispelled by education, and Mill’s argument that higher incomes induce substitution of present for future pleasures. But in contrast to the effects of sex and age, the signs of these income and education effects are far from uniform across countries. In Model 1, where income is excluded and there are 142 countries, in 58 the coefficient on high school is *positive*; and in Model 3, where both income and education are included for 132 countries, in 52 the coefficient on income is positive. Most of these are countries where average religiosity is high, but they also include (for education) Holland, New Zealand, Finland, and Ireland, and for income, India, Pakistan, Latvia, and Lithuania. In these data, unlike some reported in the literature, the US shows (insignificant) negative effects of education and income on (this measure of) religiosity. The diversity of these results around the world speaks against any universal account of secularization through better education and rising incomes. It is also consistent with the relatively muted role of income and education in the cross-section of countries in Table 1.

Heterogeneity also characterizes the results for whether rural people are more religious than urban people. In a diverse group of 43 of the 125 countries for which we have data, the coefficient on rural residence is negative, and significantly so for Tanzania, Ghana, Benin, Georgia, Estonia, Guinea, Latvia, and Togo. Apart from age and sex, the fundamental drivers of secularization are hardly well-understood, at least if we are looking for explanations that hold universally (or near universally) across the globe.

## **5. What does religiosity do for health?**

I turn now to the correlations between religion and health and health-relevant behaviors. My procedure is essentially the same as before. For each country, and for each of ten outcomes, I run a regression of the outcome on a set of age dummies, on two education group dummies, on a dummy for female, on a dummy for religiosity, and on a dummy for the interaction between female and religiosity. At a second stage, I also add interactions between the religiosity dummy and the age dummies in order to explore whether the effects of religiosity vary by age.

Table 4, for health outcomes and Table 5, for health-related measures, show the results. An overall summary of these results is that, controlling for age, education, and sex, religion is generally beneficial for health and for health-related personal and social behaviors. The word “generally” refers to the average over the countries for which we have data, and that there are always exceptions, so that for some of the outcome measures, there are almost as many countries where the partial correlation with health is negative as there are countries where the partial correlation is positive. The results also show that “generally” holds more often for men than for women, for whom the health benefits of religion are often markedly smaller. Indeed, these are among the main results of this paper, that the beneficial effects of religiosity on health are far from universally apparent. Even so, there are some patterns that are standard across many countries. Men who report that religion is important in their lives are consistently more likely to be married—in 105 out of 142 countries, they are more likely to report that they were treated with respect all day yesterday—112 out of 142 countries, they are less likely to have smoked on the day before the interview—in 70 out of 85 countries, and they are more

likely to trust the health and medical system—in 101 out of 132 countries. Yet the increased prevalence of marriage, of being treated with respect, of being a non-smoker, and of trusting the medical system are markedly less for women than for men. The average coefficient on the interaction of female and religiosity has the opposite sign to that coefficient on religiosity though it is smaller in absolute magnitude, so the differences between religious and non-religious women (the sum of the religiosity and interaction coefficients) are smaller than the differences between religious and non-religious men (the coefficient on religiosity.)

In more detail, Table 4 shows that, averaged over countries, religious people report that they have more energy, and are more likely to be satisfied with their personal health. For both of these outcomes, there is a good deal of heterogeneity across countries; for energy and health satisfaction, the balance is about two-thirds favorable to one-third unfavorable.

For pain and health satisfaction, men and women are different. As is often found in the literature, women are consistently more likely than men to report pain (by 1.1 percentage points), to report less energy (by 3.6 percentage points), to report dissatisfaction with their personal health (by 1.6 percentage points), and to report that they are disabled (by 2.0 percentage points). But although religious men are on average in better health than non-religious men, the same is not true of women. To compare religious and non-religious women, add the first and third coefficients in each cell of the first column, and this shows that there is no health benefit for religiosity for women in either pain or self-reported health status, while religious women are actually more likely



than non-religious women to report disability. Again, it should be emphasized that there is much international heterogeneity in these results.

Table 5 shows the results for outcomes or behaviors that affect health, or have been frequently linked to health in the literature. They vary from clear examples like cigarette smoking, to somewhat less clear cases, such as marriage, which almost always appears as a positive correlate of health, to social capital variables, such as time spent socially with friends and relatives, whether there is a friend or relative who would help in time of need, and whether the respondent is treated with respect. I also include whether the respondent has confidence in the health or medical system; this is hardly a health outcome variable, though it is surely a positive factor in people's lives, and the religion-based provision of healthcare is one of the mechanisms through which religion can affect health..

There is no partial correlation between religiosity and social time, but religiosity is estimated to be a positive force for the other five categories. The benefits of religion are particularly significant and likely to be universal across countries for marriage, for being treated with respect, for smoking, and for trusting the healthcare system. This last may well reflect the role of religious organizations in providing healthcare in much of the world. However, it is notable that these are benefits for religious over non-religious men, and they are typically smaller—and sometimes even non-existent—between religious and non-religious women. Religious women are no more likely to be married than non-religious women, which echoes the effect on health of marriage itself, where the literature often finds health benefits for men but not women, see for example Elo and Preston (1996). For being treated with respect, trust in the healthcare system, and smoking, the coefficient on the interaction between female and religiosity is of the opposite sign to the

coefficient on religiosity, so that the benefits of religiosity among women are smaller than those among men, but remain positive. Note the very large main effect of being female on smoking, over the 85 countries for which we have data, women are 23 percentage points less likely to smoke than men.

Figures 5 through 8 provide further disaggregation of these results, focusing on the cases where religiosity has an effect that varies by age or by income group. In the regressions underlying these graphs, religiosity is fully interacted with the age groups, so that I am allowing different age patterns for the religious and non-religious. I then average the coefficients over the four World Bank income groups, and plot the outcome by age for religious and non-religious people separately. Drawing the graphs this way may suggest that people are either religious or non-religious throughout their lives, which will not be true if there is an age effect in religiosity as I have argued in the previous section. Note also that the graphs are drawn for men; the curves for women are those for men displaced by a constant vertical amount. In some cases, such as pain, this will change the relative position of the religious and non-religious groups.

Figures 5, 6, and 7 are broadly similar. Pain decreases and energy and health satisfaction increase as we move from the low income to the high income countries. In the low income group, religion is protective, but there is little or no effect in the other three groups. Religious people have more energy and more health satisfaction in the low income and lower middle income groups, but do no better in the upper income or high income countries. Religious people are more likely to be treated with respect throughout the income regions of the world though, Figure 8, and once again, the size of the effect is largest in the poorest countries. Remarkably, there is a steady increase in being treated

with respect with country income; higher income comes with better health, and better relationships between people, an important aspect of greater freedom. Finally, Figure 9 shows that religious people smoke less throughout the world, and at all ages. For smoking, rates are lowest in the rich world—presumably because people are more likely to understand the health risks—and highest in the middle income countries—presumably because of the combination of relatively high income and still relatively low health awareness. But everywhere, religion is protective of health through its inhibiting the use of tobacco. This is perhaps the clearest example of a link between religion and self-control.

For the other outcomes in Tables 4 and 5, disability, marriage, having a friend in time of need, time spent with friends, and trust in the healthcare or medical system, the disaggregation by income group and age adds nothing to what we already know because the effects are either absent or similar by age and income group. I have also run regressions of the coefficients on religiosity against dummies for country income group and for the majority religion in each country. In all but three cases, these add nothing to the results already presented. The three cases where there are significant effects of majority religion are self-reported health status, being treated with respect, and having a friend in time of need, all of which are significantly higher in majority Muslim countries than would be predicted by the country's income group.

None of Figures 5 through 9 shows notable effects of interactions between religiosity and age. The estimated effects of religiosity on health and health related outcomes are similar at all ages, at least as far as can be seen in these data. Of course, as shown in the

previous section, religiosity itself rises with age so that the importance of the protective effects of religion also rises with age, simply because of its greater prevalence.

## **6. Conclusions**

This paper has presented a largely descriptive analysis of patterns of aging, gender, religiosity and health throughout the world. In the vast majority of the countries of the world, women are more religious than men, and the elderly are more religious than the young. These two phenomena are related in that the difference in religiosity between men and women is strongly positively correlated with the difference in religiosity between the young and the old. It is difficult to separate out age from cohort effects, but at least some of the evidence is consistent with pure age effect that are roughly consistent with rational choice theory, that religion should be postponed until late in life, that lower wages promote religiosity, and that the acquisition of religion can be postponed when life is longer. There is no obvious link between long-term income growth and the gap in religiosity between young and old, which is contrary to income-driven secularization. The gap in religiosity between men and women is not easily explained, and remains controversial in the literature, but both the wage and risk-taking theories are consistent with at least some of the global evidence.

I also find that, at least on average, over all countries, and over countries sorted into income groups, religious people do better on a number of health and health-related indicators. These protective effects appear to be stronger the poorer is the country—as suggested by Inglehart (2008), religion is a route to a better life in poor countries, but not

in rich ones—and to protect men more than women, though this hypothesis requires more extensive investigation.

None of the results show that the health benefits of religion can be obtained simply by joining a church, or even by undertaking a serious conversion. People who are religious are almost certainly different from non-religious people in ways that go beyond their religiosity and beyond the basic educational and demographic controls that are used here. Even so, some of the correlations presented here are remarkably universal across the religions and countries of the world, and need to be explained and better understood.

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**Table 1: Between country regressions of religiosity and worship**

	Importance of religion				Recent worship			
	Coef	<i>t</i> -value	Coef	<i>t</i> -value.	Coef	<i>t</i> -value	Coef	<i>t</i> -value
Constant	0.93	(38.8)	1.28	(10.7)	0.71	(31.5)	0.906	(8.0)
Africa	--	--	--	--	--	--	--	--
South Asia	-0.03	(0.7)	0.00	(0.8)	-0.13	(3.1)	-0.12	(2.7)
East Asia	-0.56	(9.3)	-0.44	(5.1)	-0.45	(8.0)	-0.37	(5.0)
Latin America	-0.14	(4.0)	-0.05	(1.1)	-0.20	(5.8)	-0.14	(3.2)
Middle East	-0.01	(0.3)	0.06	(1.3)	-0.12	(3.2)	-0.11	(2.5)
Ex-communist	-0.40	(11.6)	-0.32	(6.9)	-0.44	(13.6)	-0.40	(8.9)
S. Europe	-0.29	(4.9)	-0.14	(2.1)	-0.31	(5.5)	-0.23	(3.2)
N. Europe	-0.61	(12.4)	-0.44	(6.1)	-0.49	(10.7)	-0.40	(5.8)
Anglo	-0.48	(8.0)	-0.32	(4.0)	-0.37	(6.6)	-0.28	(3.7)
log <i>y</i>	--	--	-0.049	(3.0)	--	--	-0.028	(1.8)
obs	144		133		144		133	
R <sup>2</sup>	0.725		0.760		0.676		0.693	
Constant	1.680	(13.8)	1.567	(12.6)	1.192	(11.2)	1.160	(10.4)
log <i>y</i>	-0.093	(5.5)	-0.087	(5.1)	-0.060	(4.1)	-0.063	(4.2)
High school	-0.169	(1.7)	-0.149	(1.5)	-0.228	(2.5)	-0.230	(2.6)
College	-0.717	(2.7)	-0.744	(2.8)	-0.798	(3.4)	-0.800	(3.4)
Catholic	--	--	0.091	(1.9)	--	--	0.114	(2.7)
Other Christian	--	--	-0.003	(0.1)	--	--	0.036	(0.8)
Muslim	--	--	0.117	(2.5)	--	--	0.070	(1.7)
obs	131		127		131		127	
R <sup>2</sup>	0.522		0.570		0.507		0.541	

Note: The dependent variables in these regressions are the fractions of people in each country who report that religion is important in their lives and the fraction of people who attended a place of worship in the last week. In the top panel, the first regression contains only regional dummies, the second regional dummies plus the logarithm of GDP per capita. In the bottom panel, regional dummies are excluded. For education, high school is the proportion of the population who have more than elementary education but less than or equal to three years of college, college is the fraction with more than three years of tertiary education, and the omitted category is the fraction who completed elementary education or less. The education variables are calculated from the World Poll. The last three variables come from the Fox-Sandler religion and the state project and are dummies for majority religion Catholic, other Christian, Muslim, and other, which is the omitted category.



**Table 2: Averages of estimated coefficients from country by country regressions**

	Model 1		Model 2		Model 3		Model 4	
Age 15–19	–0.115	(0.005)	–0.092	(0.007)	–0.110	(0.007)	–0.128	(0.006)
Age 20s	–0.110	(0.005)	–0.094	(0.007)	–0.105	(0.006)	–0.121	(0.005)
Age 30s	–0.090	(0.005)	–0.071	(0.007)	–0.086	(0.006)	–0.100	(0.005)
Age 40s	–0.080	(0.005)	–0.065	(0.007)	–0.072	(0.006)	–0.090	(0.005)
Age 50s	–0.063	(0.005)	–0.054	(0.007)	–0.058	(0.006)	–0.069	(0.006)
Age 60s	–0.029	(0.005)	–0.024	(0.008)	–0.030	(0.007)	–0.033	(0.006)
Age 15*fem	--		–0.039	(0.011)	--		--	
Age 20s*fem	--		–0.026	(0.010)	--		--	
Age 30s*fem	--		–0.029	(0.010)	--		--	
Age 40s*fem	--		–0.022	(0.010)	--		--	
Age 50s*fem	--		–0.010	(0.010)	--		--	
Age 60s*fem	--		–0.004	(0.011)	--		--	
Female	0.065	(0.002)	0.085	(0.009)	0.062	(0.002)	0.069	(0.002)
High school	–0.021	(0.002)	–0.020	(0.002)	–0.020	(0.003)	–0.019	(0.003)
College	–0.049	(0.007)	–0.047	(0.007)	–0.047	(0.008)	–0.048	(0.008)
log income	--		--		–0.014	(0.001)	--	
rural	--		--		--		0.028	(0.004)
village	--		--		--		0.015	(0.003)
suburb	--		--		--		–0.004	(0.006)
obs	142		142		134		125	

Notes: These numbers are based on individual level regressions for up to 142 countries. The dependent variable is a 1/0 depending on whether the individual reports that religion is important in their lives. The right hand side variables are a set of age dummies, as shown, with the omitted category people aged 70 or above, a dummy for gender, the logarithm of family income, dummies for education, where the omitted category indicates that the individual completed elementary education or less, and dummies for location, which are (a) rural or on a farm, (b) in a village or small town, (c) in the suburbs of a city, and (d) in a large city, which is the omitted category. In Model 2, the age dummies are interacted with the gender dummy. Not all countries have all categories so the number of countries, shown in the last row, varies from model to model.

**Table 3: Cross country regressions of within-country age and sex effects**

	Age religiosity gap (Young relative to old)		Female religiosity gap	
	coefficient	t-value	coefficient	t-value
Constant	0.224	(2.6)	0.039	(1.3)
Low middle income	0.036	(0.9)	0.009	(0.7)
High middle income	0.011	(0.2)	0.039	(2.4)
High income	0.049	(0.9)	0.004	(0.2)
Majority Other Christian	-0.001	(0.0)	-0.008	(0.7)
Majority Muslim	0.044	(1.3)	-0.066	(5.9)
Majority other	0.058	(1.5)	-0.040	(3.2)
Average GDP growth	-0.434	(0.6)	0.456	(2.0)
Life expectancy	-0.006	(3.7)	0.001	(1.3)

Notes: The dependent variable in the first regression is the estimated coefficient in the religiosity regression of the age-dummy for 15–19 year olds relative to those aged 70 and older. There are 130 countries in the regression. The  $F$ -statistics for the three income groups is 0.51, and for the three majority religion groups is 1.33. Average GDP growth comes from chained real GDP per capita in the Penn World Table, and is calculated over the longest span available for each country. The dependent variable in the second regression is the estimated coefficient in the religiosity regression of the female dummy. There are again 130 countries, and the  $F$ -statistics are 3.47 for the income groups and 14.22 for the majority religion groups

**Table 4: Summary of within-country regressions on effects of religiosity on health outcomes**

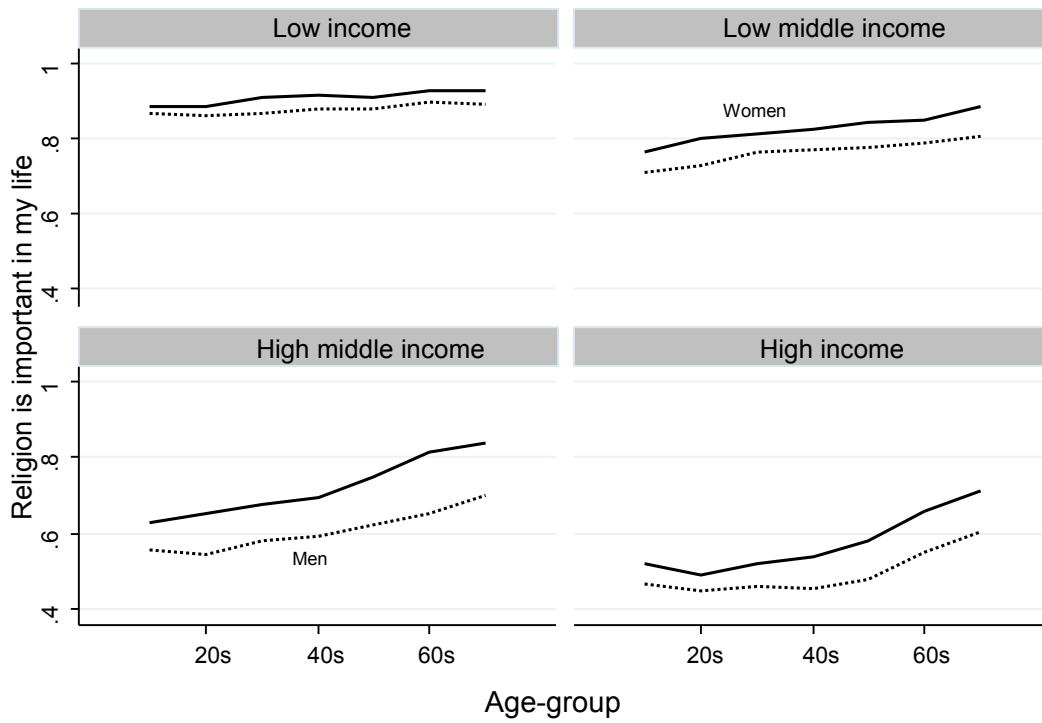
	Mean coefficient	<i>t</i> -value of mean	Number of countries	Countries with coefficients same sign as mean (%)
<i>Pain</i>				
Religiosity	-0.017	(3.4)	142	53
Female	0.011	(1.5)	142	62
Female*religiosity	0.022	(2.9)	142	60
<i>Energy</i>				
Religiosity	0.042	(4.2)	92	72
Female	-0.036	(2.8)	92	72
Female*religiosity	0.004	(0.3)	92	52
<i>Satisfied with health</i>				
Religiosity	0.032	(7.6)	142	63
Female	-0.016	(2.7)	142	70
Female*religiosity	-0.030	(4.6)	142	64
<i>Disabled</i>				
Religiosity	0.001	(0.2)	142	54
Female	0.020	(2.9)	142	65
Female*religiosity	0.016	(2.3)	142	57

Notes: The four questions are for pain “did you experience the following feelings during a lot of the day yesterday? How about physical pain?”, for energy, “did you have enough energy to get things done yesterday?”, for satisfied with health, “are you satisfied or dissatisfied with your personal health,” and for disabled, “do you have any health problems that prevent you from doing any of the things that people your age can normally do?” All are dichotomous, with yes coded 1, and no coded 0. The third column shows the number of countries for which the World Poll asked the question, and the fourth column the percentage of countries for which the estimated coefficient is the same sign as the mean shown in the first column. In each country with data, I ran a regression of each outcome on a set of six age-group dummies, on dummies for educational status, and on religiosity, female, and the interaction of female and religiosity. The first column is the (unweighted) mean across countries of the last three coefficients. The *t*-value tests that this global mean is zero, and is calculated from the estimated variances of the individual regressions.

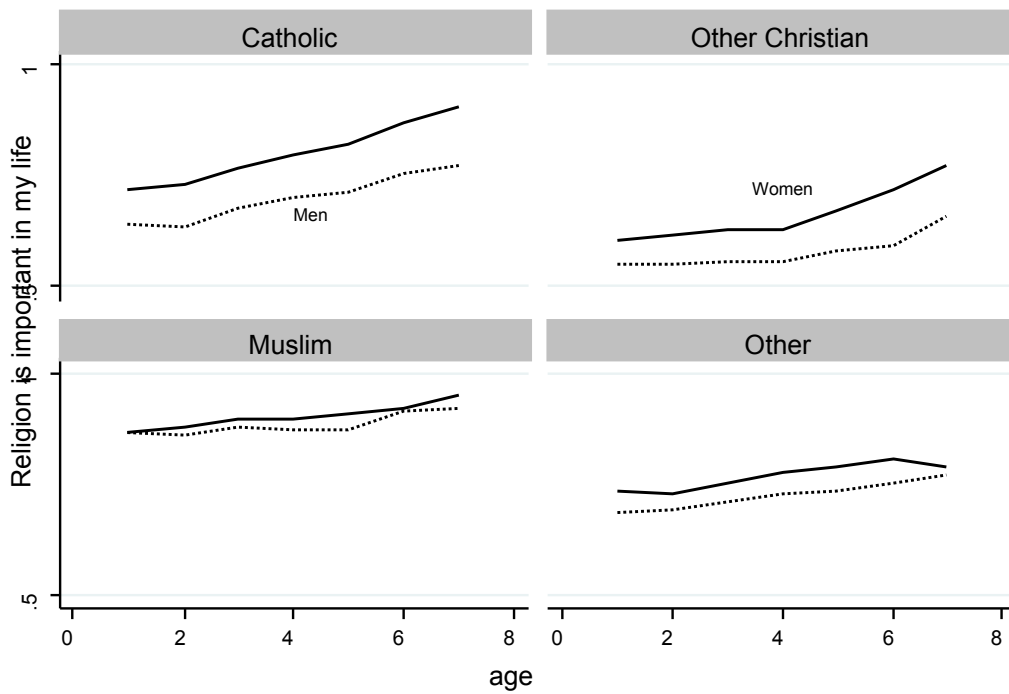
**Table 5: Summary of within-country regressions on effects of religiosity on health-related behaviors and outcomes**

	Mean coefficient	<i>t</i> -value of mean	Number of countries	Countries with coefficients same sign as mean (%)
<i>Married</i>				
Religiosity	0.042	(9.2)	142	74
Female	0.015	(2.2)	142	51
Female*religiosity	-0.038	(5.4)	142	66
<i>Friend in need</i>				
Religiosity	0.026	(5.6)	141	60
Female	0.005	(0.7)	141	70
Female*religiosity	0.007	(1.0)	141	50
<i>Treated with respect</i>				
Religiosity	0.056	(13.4)	142	79
Female	0.021	(3.4)	142	55
Female*religiosity	-0.016	(2.4)	142	55
<i>Time with friends</i>				
Religiosity	0.004	(0.1)	86	47
Female	-0.030	(0.4)	86	52
Female*religiosity	0.148	(1.8)	86	51
<i>Smoker</i>				
Religiosity	-0.080	(13.1)	85	82
Female	-0.225	(27.5)	85	95
Female*religiosity	0.025	(2.8)	85	56
<i>Trust medical system</i>				
Religiosity	0.063	(11.3)	132	77
Female	0.017	(2.1)	132	50
Female*religiosity	-0.017	(2.0)	132	47

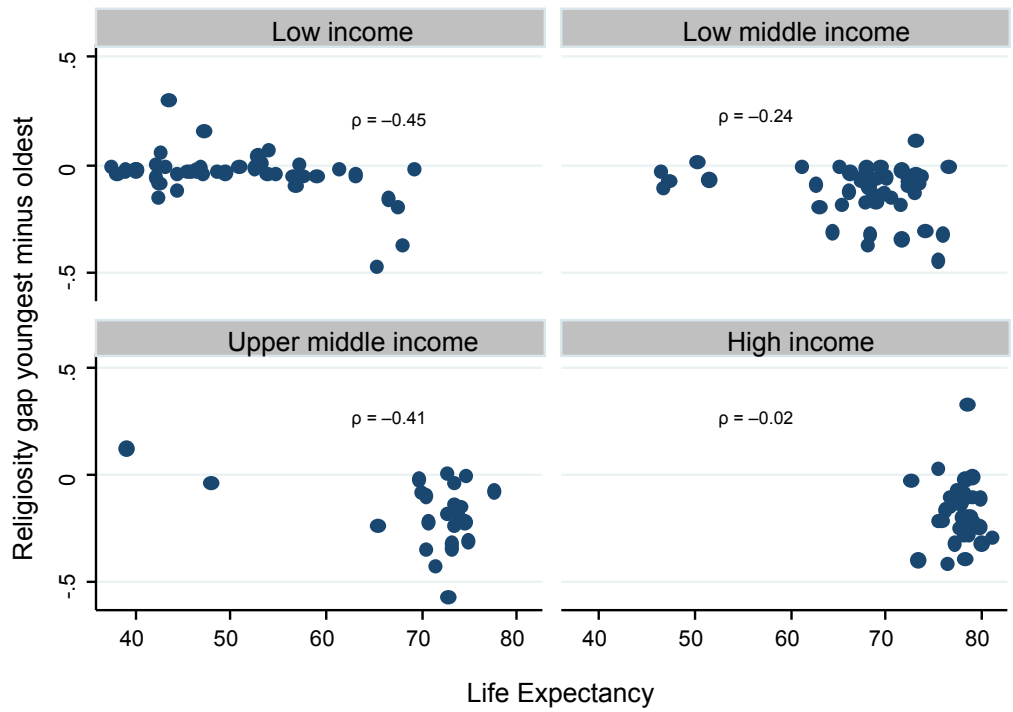
Notes: See Table 4 notes for procedures. The six outcomes analyzed here are defined as follows. Married refers to current marital status, and is defined as 1 if current status is married, and 0 for all other responses, including single, never married, separated, divorced, widowed, or domestic partner. Friend in need is 1 if the respondent answers yes to the question “if you were in trouble, do you have relatives or friends you can count on to help you whenever you need them?” Treated with respect is yes if the respondent says he or she was treated with respect all day yesterday. Time with friends is the answer to “Approximately, how many hours did you spend, socially, with friends or family yesterday?” The interview is instructed to include e-mail or telephone time. This is the only one of the left-hand side variables that is not dichotomous. Smoker is 1 if the respondent said yes to “did you smoke yesterday?” Trust medical system is 1 if the respondent says that he or she has confidence in or trusts the healthcare or medical system.



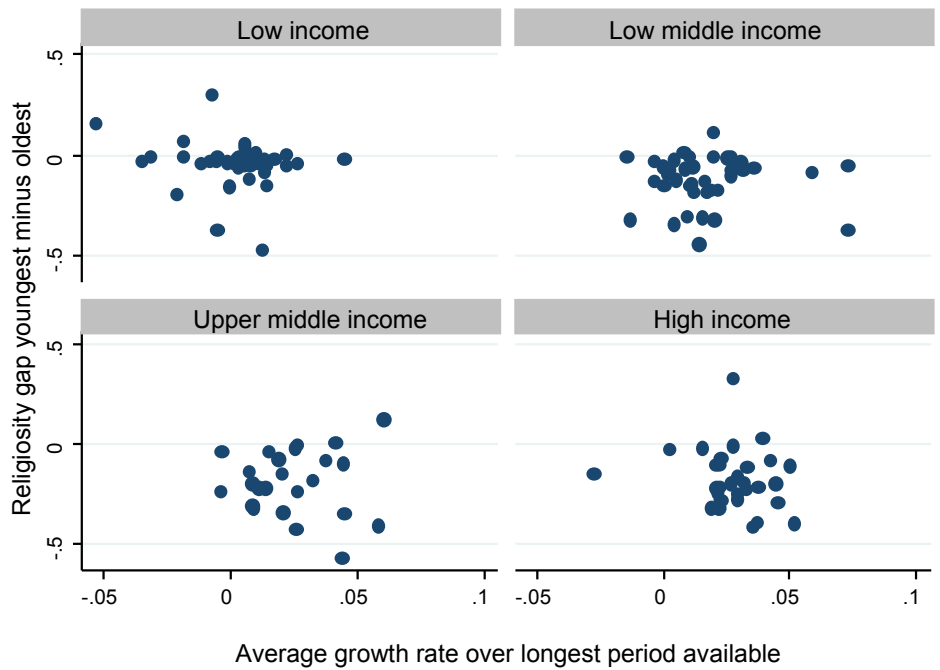
**Figure 1: Religiosity and age by sex and income group**



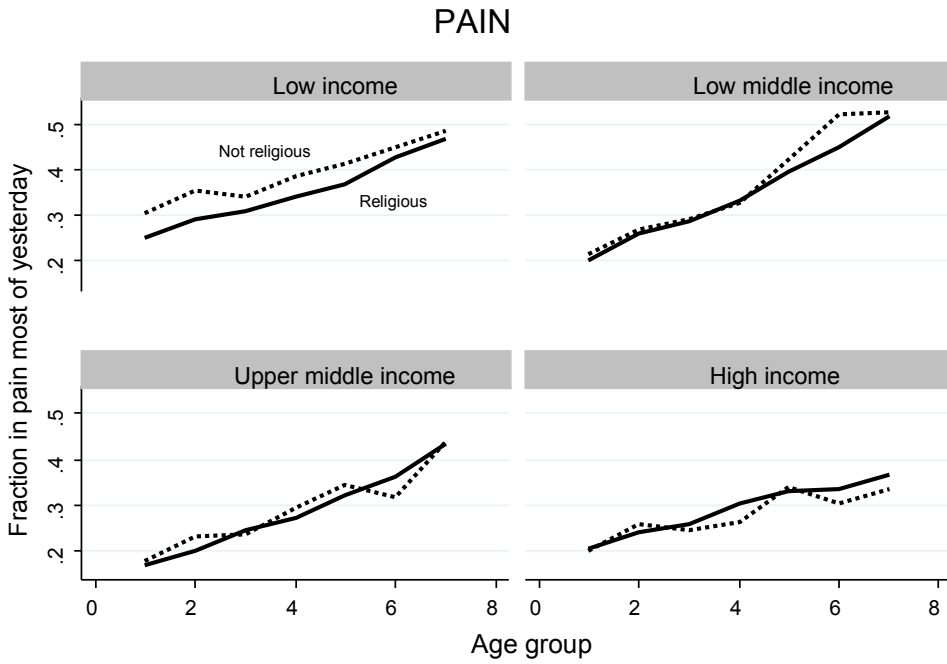
**Figure 2: Religiosity and age by sex and major religion**



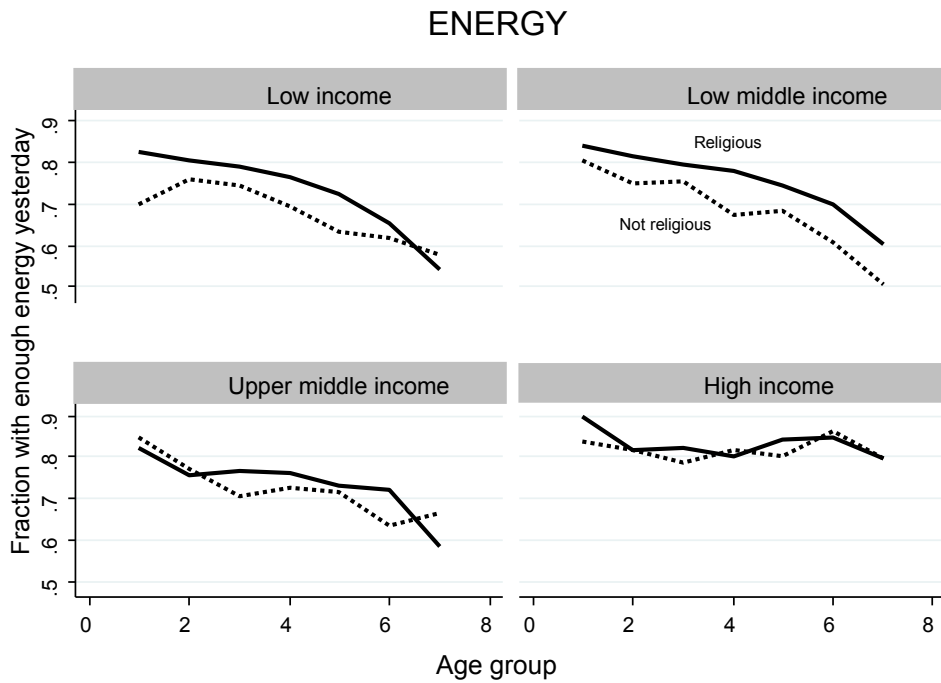
**Figure 3: Religiosity age gap and life expectancy**



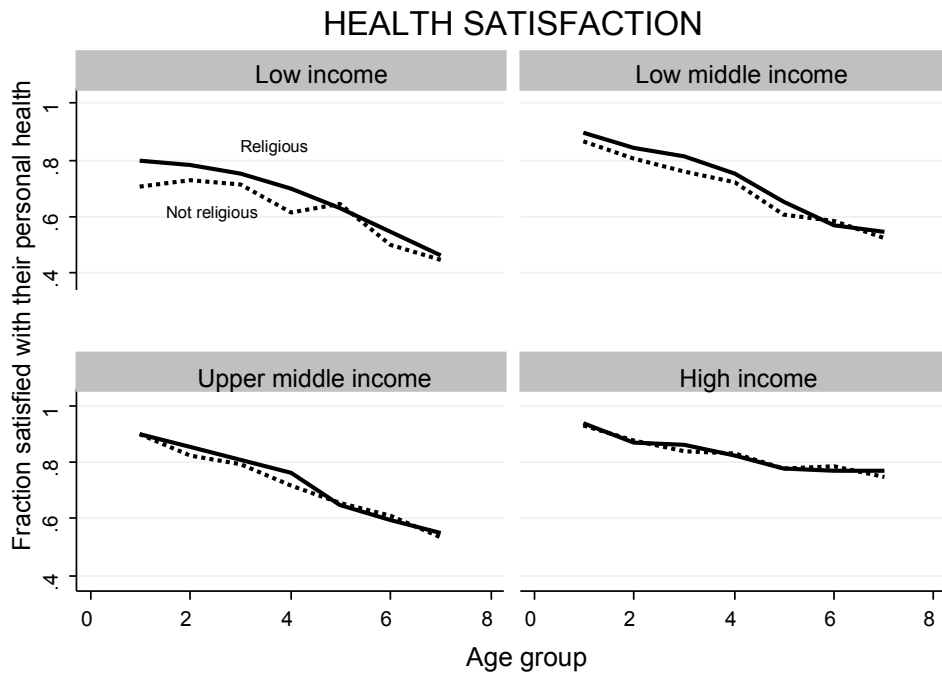
**Figure 4: Religiosity age gap and economic growth**



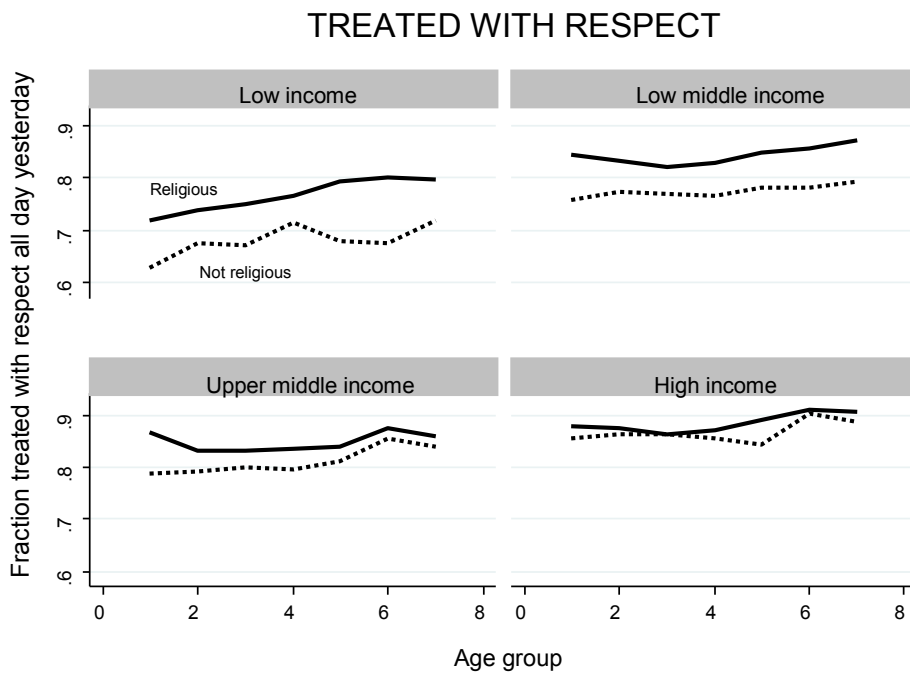
**Figure 5: Pain by religiosity, age, and country income level**



**Figure 6: Energy by religiosity, age, and country income level**



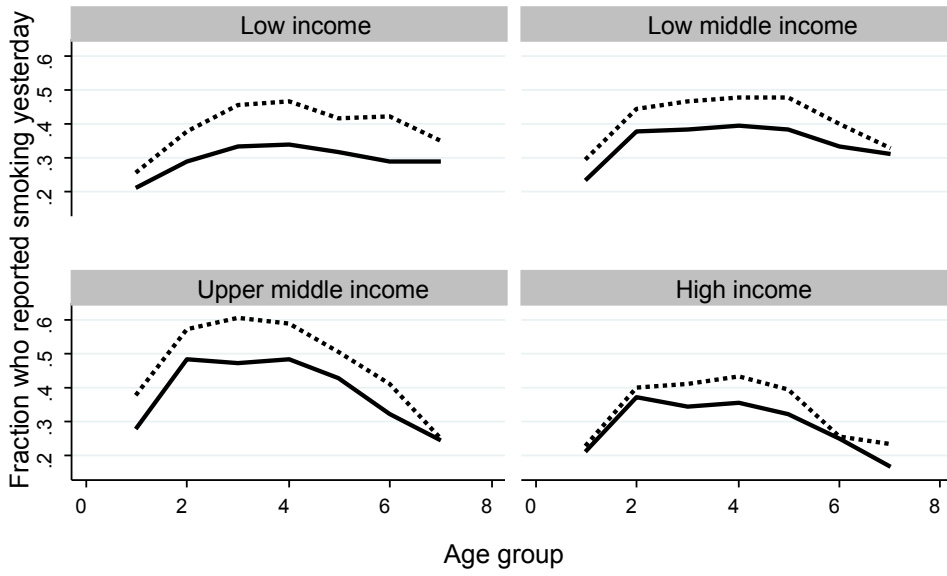
**Figure 7: Health satisfaction by religiosity, age, and country income level**



**Figure 8: Being treated with respect by religiosity, age, and country income level**



## SMOKING



**Figure 9: Smoking by religiosity, age, and country income level**