Abstract

Objectives: Religiousness is associated with longevity and better physical health, which may be due to lifestyle choices. Here we examine associations between religiousness and health, explained by lifestyle.

Study design: Longitudinal study

Methods: Data came from 23,864 people aged 50+ included in the Survey of Health, Ageing and Retirement in Europe (SHARE) in 2004-05 and followed up during 11 years.

Results: Praying and taking part in a religious organization were associated with lower odds of smoking (OR = 0.82, 95% CI: 0.73, 0.92 and 0.61, 95% CI: 0.53, 0.70), alcohol consumption (0.71, 95% CI: 0.64, 0.78 and 0.76, 95% CI: 0.67, 0.85), physical inactivity (0.88, 95% CI: 0.79, 0.98 and 0.54, 95% CI: 0.48, 0.61) and doing no vigorous physical activity (0.92, 95% CI: 0.85, 0.98 and 0.63, 95% CI: 0.58, 0.68). Further, religious organizational involvement lowered odds of sleep problems (0.83, 95% CI: 0.76, 0.91), whereas being religiously educated lowered odds of high body weight (0.87, 95% CI: 0.79, 0.96). The more religious (people who prayed, took part in a religious organization and were religiously educated) had lower odds of smoking, alcohol consumption, physical inactivity and sleep problems than other respondents, and compared with people who only prayed, they had lower odds of smoking, physical inactivity and sleep problems. People who only prayed had lower odds of alcohol consumption but higher odds of sleep problems than the non-religious.
Conclusion: This study confirms that the positive relations between religiousness and health to an important degree can be explained by lifestyle.

Keywords: Religiousness; smoking; alcohol consumption; physical activity; sleep problems; body weight

Introduction

The majority of studies on religiousness and health have demonstrated that religious involvement predicts greater longevity and is positively related to a variety of physical, behavioural and mental health outcomes. The reasons for the positive associations are multiple and complex, but include, for instance, strong community and psychosocial factors, more positive emotions and a healthier lifestyle. Individuals who participate in religious activities and services are more likely to limit unfavourable lifestyle behaviours such as smoking and alcohol consumption. Further, people with regular church attendance are more often physically active or engage in regular exercise. There is less research on health behaviours such as sleep, and results are inconsistent; however, there is some indication that religious people sleep better, which may influence both physical and mental health. In contrast, research on religion and body weight has shown mixed findings with religiousness being associated with higher body weight in most studies.

The majority of research on associations between religious participation and health comes from the United States, whereas studies in other regions are sparser. For instance, less evidence is available as to whether religiousness-health associations exist in more secular countries or whether associations vary across religious groups. A recent study by Ahrenfeldt et al. examined some of
these associations in various European regions. Using a longitudinal study design based on the Survey of Health, Ageing and Retirement in Europe (SHARE), the authors found that taking part in a religious organization had strong associations with health, in particular activity limitations and depressive symptoms, whereas religious education by parents lowered the odds of poor self-rated health and long-term health problems. However, little evidence was found that prayer was associated with health, which is in agreement with previous research\textsuperscript{15, 16}. Recent cross-sectional evidence from SHARE\textsuperscript{17} investigated associations between praying and being religiously educated and multiple behavioural risk factors (MBRFs) for chronic diseases including high body weight, smoking, risky alcohol consumption and physical inactivity\textsuperscript{17}. They found that both praying and being religiously educated were associated with fewer MBRFs.

Here we aim to verify associations between religiousness and health explained by lifestyle in a large sample of 23,864 middle-aged and older Europeans in SHARE, followed for 11 years. We hypothesize that religiousness lowers the odd of smoking, alcohol consumption, physical inactivity, sleep problems and perhaps high body weight, but that religiousness would have the greatest benefits in those who are more religious. Thus, in addition to single religiosity measures, we also investigate different combinations of religiousness and their associations with lifestyle and examine whether associations differ by gender and religious affiliations.

Methods

Setting and study population

SHARE is a cross-national multidisciplinary survey of community-dwelling Europeans aged 50 and above covering a broad variety of areas including health, lifestyle and socioeconomic status. Data
were collected using computer-assisted personal interviews, supplemented by a self-administered paper and pencil questionnaire given to participants after the interview. The latter was used to ask questions on more sensitive topics such as psychological well-being and religion\textsuperscript{18}.

This study included respondents aged 50 and older from wave 1 of SHARE, who were followed up in waves 2 (2006-07), 4 (2011), 5 (2013) and 6 (2015). Wave 3 does not contain health data and is therefore not included in this study. Ten European countries were eligible; however, Greece was not a part of waves 4 and 5, and the Netherlands did not participate in wave 6. France was not included, because the French questionnaire did not contain questions on religiousness. Response rates varied between countries, being e.g. 40.3 % in Belgium and 67.1% in Denmark in wave 1\textsuperscript{19}.

**Measures of religiousness**

Information about religiousness was available from three questions in wave 1. Taking part in a religious organization was examined as part of the personal interview (“*Have you done any of these activities in the last month?*”) including seven possible answers, one of them being “*taken part in a religious organization (church, synagogue, mosque, etc.)*”, with the possible answers “yes” or “no”. The two other religiosity measures were assessed by the drop-off questionnaire including “praying” (“*Thinking about the present, about how often do you pray?*”) dichotomized into praying and not praying, and religious education (“*Have you been educated religiously by your parents?*”) answered by “yes” or “no”. Further, the question on religious affiliation (“*What religion do you belong or fell attached to mostly?*”) came from the drop-off questionnaire, categorized in Protestant, Catholic, Other (including Orthodox, Jewish, Muslim and Other) and None.

We classified religiousness in three categories: The more religious – people who prayed, had taken part in a religious organization during the previous month and were religiously educated by
their parents; the less religious – people who prayed, without taking part in a religious organization or being religiously educated; and the non-religious – people who did not pray, did not take part in a religious organization, and were not religiously educated. Moreover, three comparisons were constructed: Comparison 1 – the more religious vs all other respondents; comparison 2 – the more religious vs the less religious; and comparison 3 – the less religious vs the non-religious.

**Lifestyle variables**

We assessed self-reported information about current smoking, daily alcohol consumption, physical activity, body weight and sleep. Smokers are people who reported that they were currently smoking, which include cigarettes, cigars and pipes; all others were categorized as non-smokers. Alcohol consumption was defined by intake of any alcoholic beverages, like beer, cider, wine, spirits or cocktails daily or almost every day during the previous three months. In wave 1, alcohol consumption referred to the six months preceding the survey. Information about smoking and alcohol was available in waves 1-5. Physical inactivity was based on two questions: “How often do you engage in activities that require a moderate level of energy such as gardening, cleaning the car or doing a walk?” and “How often do you engage in vigorous physical activity such as sports, heavy housework or a job that involves physical labour?” People who answered “hardly ever or never” were categorized as being physically inactive or doing no vigorous physical activity. High body weight was based on body mass index (BMI) calculated as weight (kg)/height (m²). Individuals were considered to have high body weight if they had a BMI of 25.0 or above. Sleep problems were assessed by respondents reporting “yes” to having trouble sleeping recently.

**Statistical analyses**
Associations between religiousness and lifestyle were analysed by logistic regression models with robust standard errors, estimating odds ratios (ORs) and 95% confidence intervals (CIs). In the overall model, we included all people interviewed in wave 1, who were followed up in at least one of waves 2, 4, 5 and 6. Repeated observations from the same individual was taken into account by clustering and the models were adjusted for region, gender, age at interview (continuous), educational level, marital status and employment. Furthermore, we fitted an interaction model, including terms for interaction between wave and religiosity measures, showing estimates for the associations between religiousness and lifestyle in the individual follow-up waves. The overall model was repeated examining possible interactions between religiosity measures and gender and between religiosity measures and religious affiliations, respectively. In addition, we investigated the associations between religiousness and lifestyle in a cross-sectional design using data from wave 1. This analysis included the cross-sectional individual probability weights supplied by SHARE. We corrected the main analysis for multiple testing using the Holm-Bonferroni method via R version 3.3.1. For all other analyses, we used Stata version 14.2.

Results

In Table 1, we report descriptive statistics of participants in wave 1 and of people from wave 1 who were followed-up in waves 2, 4, 5 and 6, respectively. In wave 1, 68.9% reported praying, 12.0% took part in a religious organization and 76.1% were religiously educated.
Praying was associated with lower odds of smoking (OR = 0.82, 95% CI: 0.73, 0.92) and alcohol consumption (OR = 0.71, 95% CI: 0.64, 0.78) in the overall model (Figure 1A) and in most waves (Supplementary Table 1). The associations were modified by gender, with lower odds of smoking for women (OR = 0.60, 95% CI: 0.51, 0.71) but not for men (OR = 1.05, 95% CI: 0.91, 1.21). Praying was associated with lower odds of alcohol consumption for both sexes, but the odds were slightly lower for women (OR = 0.60, 95% CI: 0.51, 0.69) than for men (OR = 0.78, 95% CI: 0.70, 0.88) (results not shown in table). Moreover, we found associations between praying and physical inactivity, both moderate (OR = 0.88, 95% CI: 0.79, 0.98) and vigorous (OR = 0.92, 95% CI: 0.85, 0.98) (Figure 1A). These associations remained significant in wave 2 (Supplementary Table 1).

Taking part in a religious organization was associated with lower odds of smoking (OR = 0.61, 95% CI: 0.53, 0.70), alcohol consumption (OR = 0.76, 95% CI: 0.67, 0.85), physical inactivity (OR = 0.54, 95% CI: 0.48, 0.61), doing no vigorous physical activity (OR = 0.63, 95% CI: 0.58, 0.68) and sleep problems (OR = 0.83, 95% CI: 0.76, 0.91) in the overall model (Figure 1B) and in most waves (Supplementary Table 1). We found no associations between religious organization and high body weight.

Being religiously educated was associated with lower odds of high body weight (OR = 0.87, 95% CI: 0.79, 0.96) overall (Figure 1C), and in waves 4-6 (Supplementary Table 1). An overall association between religious education and smoking was indicated (OR = 0.89, 95% CI: 0.78, 1.01), but an interaction with gender showed opposite effects for men and women with higher odds of smoking (OR = 1.19, 95% CI: 1.01, 1.41) for men but lower odds for women (OR = 0.65, 95% CI: 0.54, 0.77). A similar pattern was found for alcohol consumption with higher odds for men (OR = 1.17,
95% CI: 1.02, 1.34), but no association for women (OR = 0.94, 95% CI: 0.79, 1.11) (not shown in table).

For the more religious, we found lower odds of smoking (OR = 0.60, 95% CI: 0.50, 0.71), alcohol consumption (OR = 0.83, 95% CI: 0.73, 0.95), physical inactivity (OR = 0.50, 95% CI: 0.43, 0.58), no vigorous physical activity (OR = 0.59, 95% CI: 0.54, 0.65) and sleep problems (OR = 0.78, 95% CI: 0.70, 0.87) compared with all other respondents (Comparison 1) (Figure 1D, Supplementary Table 1). When compared with the less religious (Comparison 2), we found lower odds of smoking (OR = 0.48, 95% CI: 0.36, 0.63), physical inactivity (OR = 0.71, 95% CI: 0.54, 0.93), no vigorous physical activity (OR = 0.73, 95% CI: 0.61, 0.86) and sleep problems (OR = 0.75, 95% CI: 0.62, 0.90) for the more religious (Figure 1E, Supplementary Table 1). For Comparison 3, we found lower odds of alcohol consumption (OR = 0.66, 95% CI: 0.54, 0.81) but higher odds of sleep problems (OR = 1.24, 95% CI: 1.07, 1.44) for the less religious compared with the non-religious (Figure 1F, Supplementary Table 1). Most associations remained significant after adjusting for multiple testing (Supplementary Table 1).

When investigating interactions between religiosity measures and religious affiliations, we only found a few interactions (Table 2), while no differences between affiliations were detected for most associations. No associations were found between religiousness and lifestyle for those who did not have a religious affiliation. The strongest associations were found for people with “other” religious affiliations. In this group, the Orthodox comprised 82.6%, while 1.9% were Jewish, 2.4%
were Muslims and 13.1% reported that they belong to other affiliations. Associations between religiousness and lifestyle were overall similar between Catholics and Protestants with one exception: Praying was associated with lower odds of alcohol consumption in Catholics, whereas no association was found among Protestants.

[Table 2 about here]

Results from the cross-sectional analysis were quite similar to those from the overall longitudinal model; however, being more religious was associated with high body weight in the cross-sectional model (OR = 1.26, 95% CI: 1.08, 1.48), whereas no difference was found in the longitudinal model (OR = 1.02, 95% CI: 0.91, 1.14) (Figure 1).

Discussion

Based on a large longitudinal sample of middle-aged and older Europeans, we found strong associations between religiousness and lifestyle, suggesting that positive associations of religiousness and health could - at least largely - be explained by lifestyle.

The positive findings between religiousness, smoking and alcohol are no surprise, as many religions have recommendations or – in some cases even prohibitions – against alcohol intake and smoking 22. Although few religions have prescriptions and recommendations for exercise or physical activity, we found evidence of a positive effect of religious service attendance on physical activity – both moderate and vigorous in line with the majority of previous research 1, 3. What is at play, then, might be what one could call a religious ecology of the body 23. Thus, for instance, when religious
people believe that the body is the temple of God or the divine spirit, such notions transfer to more subtle ways of taking care of the body. However, despite inverse associations between religiousness and physical activity, research on religion and body weight has shown mixed findings with religiousness been associated with higher body weight in the majority of studies; however, four out of five multivariate analyses in longitudinal studies did not fully support this. In line, we found no associations between praying or taking part in a religious organization and body weight, but our research indicated that being religiously educated by parents lowered the odds of high body weight. Another interesting finding in our study was that taking part in a religious organization and being more religious lowered the odds of sleep problems, possibly due to the effects of religious affiliation and practice on mental health. Another finding in our study was that the more religious people had increased odds of high body weight in the cross-sectional study, whereas no association was found in the longitudinal setting. This might indicate that being more religious could help reduce high body weight over time.

In this study, we also investigated associations between different combinations of religiousness and lifestyle. Recent evidence lends support to the suggestion of two epidemiological forces with opposite directions in religiousness and health with well-integrated and longstanding reliance on religion (“restful religiousness”) being associated with positive health outcomes, whereas the opposite holds for religiousness that has been sparked by crisis and disease (“crisis religiousness”). Crisis religiousness often features negative religious coping elements which may by themselves lead to negative mental and physical health outcomes including higher odds of depressive symptoms. We found that religiousness had the largest benefits in those who were more religious, providing evidence for positive associations between restful religiousness and life style. However, in this study, only sleep problems were associated with crisis religiousness,
showing higher odds of sleep problems for people who only reported praying compared with the non-religious respondents.

Although women are often more religious than men\textsuperscript{34, 35} and that they overall have a healthier lifestyle\textsuperscript{36} few associations between religiousness and lifestyle were modified by gender; however, some associations were modified by religious affiliations. The fact that people with “other” religious affiliations have the most pronounced associations with lifestyle was a surprise finding for which there may be several explanations: First, it may be because they are a minority. Minorities are known to be more adamant in practicing their religious beliefs\textsuperscript{37, 38}. Second, there could be a spillover effect on other healthy lifestyle habits from lifestyle regulating religious practices such as fasting (Orthodox and Muslim) as well as Halal or Kosher regulations\textsuperscript{39}. Thus, religious communities seem to be a major pathway to human well-being\textsuperscript{40}, and our study provides evidence that this is the case also in Europe.

Based on findings from this and current longitudinal studies\textsuperscript{2}, it seems that religiousness - particularly participating in a religious organization – plays a beneficial role in avoiding negative lifestyle habits, which might be a cause of the lower mortality\textsuperscript{41}. Thus, due to the strong association between lifestyle and chronic diseases\textsuperscript{20, 42}, religiousness could be assessed as a potential determinants of disease prevention. Thus, our research suggest that for people who are already religious, taking part in a religious organization might be encouraged as a kind of meaningful social participation influencing lifestyle and sleep quality. Further, it clearly points to the importance of countering loneliness (which is considered a major obstacle to quality of life, health and longevity in modern society\textsuperscript{43} and has even been found to impact bad sleep\textsuperscript{44}) and thus advancing meaningful communities in our societies, even for individual who are not religious.
This paper has several strengths. The study is conducted with data from Europe, where data on religion-health analyses are sparser\(^2\), and included multiple waves of longitudinal data, which is preferable to cross-sectional data, to avoid reverse causation\(^{45}\). We used several measures of religiousness including having received a religious education, an exposure that has been relatively unexamined in prior research\(^2\), and used a number of outcomes on lifestyle and weight. The large sample from 10 European countries allowed us to examine associations by religious affiliation and gender and to adjust for major potential confounders. A limitation in SHARE is the relatively low response rate and attrition from the sample over the six waves. Moreover, misclassification is inevitable due to self-reporting, and measures of religiousness from the self-administrated questionnaire had approximately one-third missing values. In contrast, the question “taken part in a religious organization” had only 2% missing values.

In conclusion, our study showed strong associations between religiousness and lifestyle and aimed to verify that the positive relations between religiousness and health to an important degree can be explained by lifestyle, which might be of particular importance for Public Health.

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**Ethical approval**

University of Mannheim International Review Board

**Competing interests**

None declared.

**Highlights**

- We examine associations between religiousness and lifestyle in Europeans aged 50+
- Religiousness was associated with less smoking, alcohol, inactivity and sleep problems
- Being religiously educated was associated with lower odds of high body weight
- Associations were most pronounced for the more religious people
- Service attendance might be encouraged as social engagement influencing lifestyle

**References**


Figure legend

**Figure 1:** Associations between religiosity measures and lifestyle in a cross-sectional and a longitudinal setting based on wave 1 participants (2004-05) from the Survey of Health, Ageing and Retirement in Europe (SHARE), who were followed up in waves 2-6 (2006-15), adjusted for European region, gender, age at interview, education, marital status and employment.