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Review

Religion and reduced cancer risk – What is the explanation? A review

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ARTICLE INFO

Article history:

Received 27 June 2008

Received in revised form 30 July 2008

Accepted 1 August 2008

Available online 12 September 2008

Keywords:

Cancer risk

Religion

Christianity

Lifestyle

Spirituality

ABSTRACT

Several studies of members of Christian religious communities have shown significantly lower risks for certain cancers amongst members than in the general population. We identified 17 epidemiological studies of the risk for cancer amongst members of Christian communities published during the past 40 years. In the studies in which adjustment was made only for age and sex, reductions were observed in the risks for lifestyle-associated cancers, i.e. those associated with tobacco smoking, alcohol consumption, diet, physical activity and reproductive factors. In the studies in which adjustment was also made for healthy habits, no reduction in risk for cancer was observed. We conclude that the most important factor in the correlation between membership in a religious Christian community and risk for cancer is the healthy lifestyle inherent in religious practice in these communities. The epidemiological studies reviewed did not, however, differentiate the effect on cancer risk of the meaning that a certain lifestyle can give to an individual.

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1. Introduction

The risks for a number of cancers are reduced in individuals who avoid tobacco smoking, consume alcohol moderately, have some physical activity and have a high intake of fruit and vegetables.¹ Recently published reviews indicate that psychological factors, such as the experience of major life events, depression and certain personality traits, are not the causes of cancer.² Despite several studies on the subject, the protective effect of religious belief against cancer remains unclear. In many religious communities, it is anticipated that religious belief and practice have beneficial effects on health,

including decreased risks for cancer. In accordance with this belief, a number of epidemiological studies have shown that members of certain religious communities are at decreased risk for certain types of cancer,^{3–5} have lower mortality rates^{6,7} and live longer than the general population.⁸

Members of the Seventh-day Adventist Church are encouraged to limit their consumption of meat, coffee and drinks with a high caffeine content, to avoid tobacco and alcohol and to be physically active.⁷ In addition, they are encouraged to educate themselves and to have stable social relations.^{9,10} In a study in California, USA, more than 50% of the members of a large Seventh-day Adventist community defined

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doi:10.1016/j.ejca.2008.08.001

themselves as vegetarians.⁷ In a study in Denmark of 781 Seventh-day Adventists, the risks for colorectal cancer and lung cancer were more than 80% lower than those of the general Danish population.³

Mormons are encouraged to lead a lifestyle that is close to that of Seventh-day Adventists.^{5,11} In addition, members of this community marry at an early age and are encouraged to have many children.⁵ In a study of more than 27,000 patients with cancer in UT, USA, Mormons had a 25% significantly lower risk than the general population of Utah, the risk reduction being greatest for smoking-associated cancers.¹²

Another means for understanding this association is to compare the cancer incidence amongst different religious communities in the same area. In a study in Australia of 715 cases of colorectal cancer, the incidence rate was found to range from 43/100,000 persons amongst Protestants, over 37/100,000 amongst Catholics, to 21/100,000 amongst persons who identified themselves as members of the Seventh-day Adventist Church, the Mormon Church, Jehovah's Witnesses or a Pentecostal church.¹³ Reduced risks for cancer have also been reported amongst members of non-Christian religious communities.⁴ In contrast to these observations, a number of prospective studies did not show associations between membership in a religious community and reduced risks for cancer.^{14,15}

As in studies on associations between social status and risks for cancer, many exposure measures have been proposed in the literature to explain the reduced risks amongst members of religious communities, including a healthy lifestyle; religious fellowship and spiritual support; psychological factors such as the emotional impact of worship; the healthy nature of religious beliefs; the impact of faith, hope and optimism; and spiritual hypotheses, such as the impact of prayer, the connection of body–mind–spirit or even divine action.¹⁶ Although some studies show no association, they acknowledge the problem of exposure assessment and the results do not exclude the possibility that there is a relation between religion and health.¹⁷ In order to explore this association further, we reviewed the epidemiological literature on this topic published during the past 40 years.

2. Materials and methods

We searched the Medline database for the period 1966–2006 with the combined search terms 'cancer', 'religion', 'religious' and 'religiousness' and with the combination 'cancer', 'spiritual' and 'spirituality'. With this procedure, we identified 2257 papers, of which 272 (12%) were reviews, 362 (16%) focused on palliative care and 409 (18%) addressed spirituality and survival, leaving 1214 papers (54%) for inclusion in this present review. These were further selected on the basis of whether the study population had been exposed to a Christian religion, whether the end-point was risk for cancer with cancer mortality excluded as an outcome, and whether they included a control group that belonged to another religion or were not exposed to Christianity. We identified 18 studies that fulfilled these criteria, including studies which reported both morbidity and mortality, and obtained detailed information from some of the authors of these papers in order to clarify the measure of exposure in the study.

In the studies reviewed, the information about the exposure was quantitative, such as membership or duration of membership in a religious community,^{3–5,8,9,14,15,18–22} participation in religious activity^{18,23} or position in a religious community.²⁴ The information was either self-reported^{13,14,19,22} or obtained from an administrative source, e.g. a church membership file²⁵ or various sources within the church community.²³

3. Results

Table 1 summarises the results of 11 studies in which adjustment was made for age, sex and in some studies race. All found lower risks for cancer overall or for specific cancers associated with lifestyle, such as cancers of the respiratory tract, urinary bladder, colon and cervix.

The seven studies summarised in Table 2 included adjustment not only for age and sex but also for one or more known confounders. Only one showed a significantly reduced risk for the cancer site under study amongst people who perceived themselves as religious.¹⁹ One study showed a higher risk for cervical cancer amongst Mormons than non-Mormons,²⁶ another showed a decreased risk associated with short duration of membership in the Seventh-day Adventist Church,²¹ and a third showed a protective effect against breast cancer of longer membership in the Seventh-day Adventist Church.²⁰ The other four studies found no significant reduction in risk for cancer amongst members of religious communities when compared with a control group.

4. Discussion

In the studies in which adjustment was made for age and sex, we observed associations between religious affiliation and reduced risks for certain cancers known to be associated with lifestyle. In studies in which adjustment was also made for one or more known confounders, however, this association was not observed.

These results indicate that lifestyle is probably the most important explanation for the reduced risks for cancer observed in these studies. It is well known that people who do not smoke, who eat a low-fat diet, who regularly perform physical exercise and have moderate alcohol consumption are at decreased risk for several cancers. In a prospective study of 10,998 vegetarians and non-vegetarians, the adjusted relative risk for colorectal cancer was non-significantly reduced (relative risk [RR], 0.85; 95% confidence interval [CI], 0.55–1.32),²⁷ and an adequate intake of fruit and vegetables appears to reduce the risks for several types of cancer, especially of the gastrointestinal tract.²⁸ In a review of seven high-quality cohort studies, the odds ratio for endometrial cancer amongst physically active women was 0.77 (95% CI, 0.70–0.85).²⁹ One may add that the duration of exposure as expressed by the age of membership in the religious community supported the finding that lifestyle was responsible for the reduced risk observed. In one study members aged 25 at entry had a risk reduction which was smaller than those who entered the community during adolescence.²¹ Likewise another report from the same group found a clear 'dose-response' relationship as expressed by the duration of membership

Table 1 – Studies of the association between religiosity and risk for cancer, with no adjustment for lifestyle factors

Reference, location	Study design	Follow-up (years)	Exposure measurement	Results	Adjustments
⁵ UT, USA	Population-based case-control (n = 10,013 cases)	8	Membership	Male Mormons had a 54% lower risk for smoking-related cancer (252.9/100,000) than non-Mormons (344.6/100,000)	Age, sex
²³ UT, USA ^a	Population-based case-control (n = 1354 cases)	4	Church adherence	Mormon women tending to have strong church adherence had reduced risks for lung cancer ($p = 0.01$) and cervix cancer ($p = 0.22$)	Age, sex
²⁴ UT, USA ^b	Population-based case-control (n = 1819 cases)	4	Lay priesthood level	In comparison with all male Mormons, SRR for cancer was 0.78 (90% CI, 0.73–0.84) amongst male Mormons at highest level of lay priesthood and 1.44 (90% CI, 1.36–1.53) amongst male Mormons at no level or lowest level of lay priesthood	Age, sex
³ Denmark	Cohort (n = 781)	34	Membership	SMR for all cancers amongst male Seventh-day Adventists, 0.69 (significant). After exclusion of lifestyle-related cancer, SMR = 0.93 (non-significant)	Age, sex
¹⁵ Los Angeles, USA	Cross-sectional (n = 94,886)	Not applicable	Membership	In comparison with average Protestants, Seventh-day Adventists had a significantly reduced PIR for lung cancer (M: 0.7; F: 0.4); Roman Catholics had significantly elevated PIR for oesophagus cancer (M: 1.4; F: 1.5)	Age, sex
¹³ Melbourne, Australia	Case-control (n = 715 cases)	1	Self-reported religion	Incidence rate per 100,000 person-years for colorectal cancer was 21 for 'other Christians', 24 for Orthodox, 31 for 'no religion', 37 for Catholics, 37 for Church of England, 43 for 'other Protestants' and 66 for Jews	Age, sex
²⁵ Norway	Cohort (n = 7253)	26	Membership and age at entry to Church	SIR for all cancers amongst Seventh-day Adventists was 0.91 (95% CI, 0.81–1.03) for males, 0.91 (95% CI, 0.89–1.06) for females. No significant association between duration of membership and risk for cancer for either sex	Age, sex
³⁷ UT, USA	Population-based case-control (n = 49,182 cases)	14	Membership	Incidence of cancer 288.7/100 000 amongst Mormons and 479.3/100 000 amongst non-Mormons	Age, sex
³⁸ CA, USA	Cohort (n = 34,198)	6	Membership	SMR for Seventh-day Adventists was 0.73 (95% CI, 0.66–0.82) for males, 0.92 (95% CI, 0.84–1.00) for females	Age, sex, race
³⁹ UT, USA	Population-based case-control (n = 9619 cases)	14	Membership	Breast cancer incidence rate was 107.6/100,000 person-years (95% CI, 103.9–111.3) amongst female Mormon, 130.5/100,000 person-years (95% CI, 123.2–13.9) amongst female non-Mormons	Age, sex, race, prognostic factors (marital status, stage, histological grade and treatment)
¹² UT, USA	Population-based case-control (n = 81,617 cases)	4	Membership	Cancer incidence rate was 428.0/100 000 (95% CI, 419.9–436.2) amongst Mormons, 483.4/100,000 (95% CI, 468.4–498.4) amongst non-Mormons	Age, sex

CI, confidence interval; SIR, standardised incidence ratio; SMR, standardised morbidity ratio; SRR, standardised rate ratio; PIR, proportional incidence ratio.

a,b, Same study population, but gender-specific analyses.

Table 2 – Studies of associations between religiosity and risk for cancer, with adjustment for age, sex and lifestyle factors

Reference, location	Study design	Follow-up (years)	Exposure measurement	Results	Adjustments
²⁰ CA, USA	Nested case-control (n = 59 cases)	20	Membership	Dose-response relationship observed between duration of Seventh-day Adventist Church membership and reduced risk for fatal breast cancer amongst women (p for trend = 0.09)	Age, sex, tobacco use, race and other lifestyle factors
²¹ CA, USA	Prospective cohort (n = 34 198)	6	Membership	RR for bladder cancer was 0.36 (95% CI, 0.14–0.93) amongst Seventh-day Adventists who entered the Church at 16–24 years and 0.68 (95% CI, 0.37–1.23) amongst those who entered at >25 years compared with those who entered at 7–15 years	Age, sex, tobacco use, marital status, socioeconomic factors, educational level
¹⁹ Melbourne, Australia	Case-control (n = 715 cases)	>5	Self-reported religiousness	RR for colon cancer amongst persons who perceived themselves as religious was 0.7 (95% CI, 0.6–0.9; p = 0.002)	Age, sex, family history of colorectal cancer, number of children, age at first parity, diet
²⁶ UT, USA	Population-based case-control (n = 266 cases)	3	Self-reported membership and church attendance level	OR for cervical cancer amongst female Mormons was 1.22 (95% CI, 0.80–1.87)	Age, sex, tobacco use, alcohol consumption and sexual habits
¹⁴ Scandinavia	Population-based case-control (n = 156 cases)	4	Self-reported membership	No association between religious affiliation and risk for cancer	Age, sex, height, weight, body mass index, exercise level, use of medicines
¹⁸ NC, USA	Case-control (n = 637 cases)	4	Self-reported religious affiliation and church attendance level	OR for colon cancer amongst persons attending church less than once per month was 1.34 (95% CI, 0.94–1.91) compared with persons attending church once per week or more OR for colon cancer amongst persons who were not members of any church was 1.47 (9% CI, 1.08–2.01) compared with persons who were members of a church	Age, sex, race, tobacco use, alcohol consumption, diet and socioeconomic factors
²² CA, USA	Case-control (n = 285 cases)	2	Self-reported childhood religion	OR for breast cancer amongst women not raised in an organised religion was 0.39 (95% CI, 0.17–0.91) compared with women raised in Protestant religion	Age, sex, use of tobacco, alcohol consumption, body mass index, family history of breast cancer, age at menarche, age at menopause, use of contraceptive pills, socioeconomic factors

CI, confidence interval; OR, odds ratio; RR, relative risk.

without including age at entry.²⁰ These results probably points to a beneficial effect of the lifestyle recommendation if followed through the entire life of a member in a religious community compared to more recent changes in personal lifestyle.

We cannot exclude the possibility that the observed associations are due to selection bias, which would lead to underestimation or overestimation of the effect. It has been shown that self-reported religious activity is often over-reported.³⁰ In addition, the membership files of religious communities may exclude members who have left the community, who die or who are no longer paying their membership fee.³¹ This could lead to a 'healthy member effect', falsely indicating a protective effect of membership in a Christian community. Further, publication bias might explain the relatively large number of studies that indicate a protective effect of membership in a religious community. In addition one may speculate how the general secularisation of Western countries influences the cancer risk in members of Christian religious communities. However, we have no information about the risk for cancer in such members who left a religious community.

We limited the exposure under study to membership in a Christian community, without qualification of this exposure metric. Membership information does not indicate the impact of religious activity, the religiousness of a person or religious practice. By limiting our review to studies of persons who were members of minority religious communities with a number of lifestyle recommendations, we anticipated that the persons included had religious activity that distinguished them in quantity and quality from the background population. Our exposure assessment nevertheless has limitations that we were unable to address. Some members of religious communities might be members for reasons other than religion, which would lead to underestimation of an effect. For this reason, studies in which membership is the only indicator of religiosity have been criticised for not using methods for assessing subjective religiosity.³² It is therefore interesting that the only study reviewed that did show an effect, after exclusion of lifestyle-related cancers, was based on self-reported religiousness, although this might have led to misclassification. Further one may consider if the lowered

cancer risk was due to some other behavioural factor such as more isolation from the public life in general. The studies included in this review did not encompass religious groups or communities characterised by such behaviour and we have no reasons to believe that social isolation would explain our results.

We also limited this review to studies of cancer risk and excluded those in which mortality was the end-point, thereby minimising the risk for misclassification of the outcome under study. Notification of cancer on a death certificate can lead to misclassification as in only a minor proportion of deaths is the cause verified by autopsy.³³

Lifestyle in itself may thus reduce the risk for cancer, but it is also possible that lifestyle and religious affiliation mutually support each other. The estimates of cancer risk in the studies of vegetarians, physically active persons, non-smokers and teetotallers point to possible differences in the effect of each of these behaviours and the combined effect of several types of behaviour and religious affiliation. The risks for some cancers could be affected by specific lifestyle recommendations in religious practice, resulting in a healthy lifestyle, which would therefore function as an intermediate factor in the link between religious affiliation and risk for cancer (Fig. 1). The studies, in which a decreased risk for cancer was reported, were carried out in different countries and with different methods, strengthening the possibility of a causal link between religious affiliation and reduced risk. If such a link exists, however, it is not clear which of the factors associated with religious affiliation is the predominant causal factor.

It has been claimed that certain biological measures are influenced by religious activity. In a cross-sectional study of 106 men infected with human immunodeficiency virus (HIV), an association was found between religious activity and CD4 leucocyte count, although no definite conclusion was reached.³⁴ None of the studies reviewed, however, reported a decreased risk for hormone-related cancers, such as those of the breast, ovary or prostate.

Further, it might be speculated that some psychoneuro-immunological mechanism can explain the observed association;³⁵ however, none of the studies reviewed showed

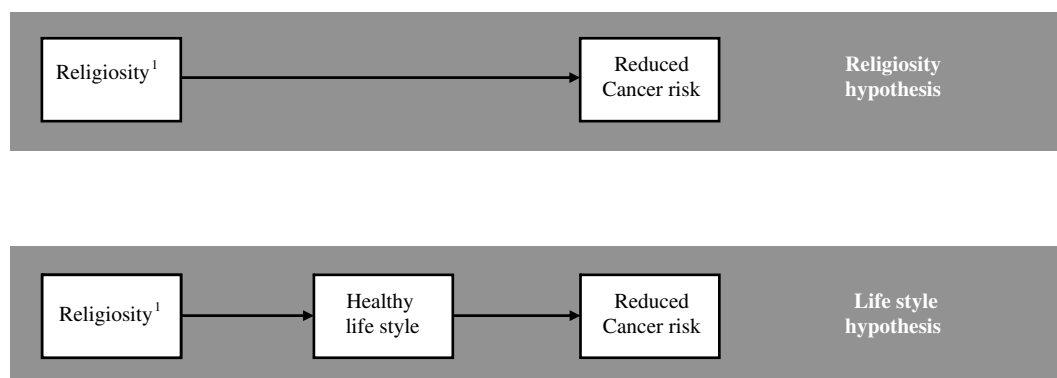


Fig. 1 – The upper box describes the religiosity hypothesis: Religious belief results in a reduced risk for cancer. The lower box describes the lifestyle hypothesis: Being affiliated with a religious community can alter lifestyle, which can reduce risk for cancer. ¹‘Religiosity’ covers all measures of religious belief or religiousness as expressed in membership in religious communities, religious behaviour and spiritual dimensions of religious belief.

a decreased risk for cancers associated with immune function, such as leukaemia, lymphomas and liver cancer.³⁶

In addition, it would be expected that the risks for all types of cancer would be decreased amongst members of religious communities, given the *a priori* hypothesis that the many independent factors associated with religious affiliation have equal impacts on the risk for cancer. This review, however, provides substantial support for the hypothesis that lifestyle is the most significant factor in the decreased risk. Finally, the results of these studies cannot be explained by chance, given the systematic findings illustrated in this review.

5. Conclusion

In our review of studies in which cancer morbidity was the outcome, we found no indication that members of certain Christian communities characterised by various lifestyle recommendations are at lower risk for cancers associated with these lifestyles than the general population. The studies reviewed do not, however, exclude the possibility that other characteristics associated with religious affiliation or religious belief influence the risk for cancer. In the epidemiological studies cited, it was impossible to separate the interaction between individual reasons for assuming a healthy lifestyle, the religious meaning of this lifestyle for the individual and subsequent cancer risk.

Conflict of interest statement

None declared.

Acknowledgments

The financial support from religion in the 21st Century, University of Copenhagen, Denmark.

Danish Cancer Society, Psychosocial Cancer Research Foundation (Grants # PP05021 and PP06020) is greatly acknowledged. The sponsors had no involvement in the collection, analysis and interpretation of data; in the writing of the manuscript; nor in the decision to submit the manuscript for publication.

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