Journal of Religion and Health
https://doi.org/10.1007/s10943-025-02424-1

ORIGINAL PAPER

Becoming a Believer in Old Age or in Poor Health: What Estonian Census Data Reveal

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Accepted: 5 August 2025

Abstract

Religion, or spirituality, is often mentioned by people of advanced ages as an important source of emotional support in their lives. However, it is not entirely clear whether being religious helps individuals live longer, or whether its positive impact becomes more pronounced with age and with deteriorating health. The positive effects of religion on health have been extensively studied, but our research took a different approach, focusing on the impact of health and aging on a person's religiosity. We compared data from voluntary responses to questions on religiosity in two successive censuses collected by the government agency Statistics Estonia to identify people who became believers between these censuses. Our goal was to determine whether being declining health and increasing age are related to being and becoming religious. Our study covered the Estonian population, who were alienated from religious traditions during the Soviet Union's occupation between 1940 and 1991, and now is among the world's most secular societies. In this study, we used descriptive analysis and a logistic regression method. We found that the probability both being religious and becoming a religious person increased with a higher age. Among birth cohorts, the most striking difference emerged between those born before and after World War II, with older generations being largely more religious than younger ones. Poor health was associated with being or becoming a believer at any age and applied for both men and women. Regardless of age, the retirement status of people also seemed to positively influence their conversion to religion. The study confirmed that increasing age, especially reaching retirement age, was linked with becoming a believer while people with poor health were more likely to be or become religious than those without significant health problems.

Keywords Self-declared religiosity · Becoming a believer · Health status · Aging · Census data · Estonia

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Published online: 27 August 2025

Introduction

In aging research, it is essential to study psychosocial factors that may overshadow the genetic and biological factors that influence life expectancy. Notable among these factors are religion and spirituality, as people in old age often refer to their faith, spiritual feelings and sense of purpose in life as part of their secrets to longevity (Araújo et al., 2021; Archer et al., 2005; Opsahl et al., 2021; Wallace et al., 2018).

There is considerable interest in the relationship between religion and health, particularly in the sciences of psychology and medicine (Balbon et al., 2022; Chida et al., 2009). A meta-analysis based on 42 studies by McCullough et al. (2000) in different populations showed that among psychosocial factors, faith was positively associated with lower mortality, and thus longer life expectancy. Mineau et al. (2004) also showed that Mormon people had a lower risk of mortality compared with non-Mormons. Spiritual beliefs have been found to help individuals cope with serious illnesses, thusly including religion and spirituality as important factors in longevity (Zimmer et al., 2016). However, Firdausya et al. (2021) found that even when the life satisfaction of 100-year-old believers and non-believers did not differ significantly, and the positive association between faith and life satisfaction increased toward the end of life, centenarians who attributed their longevity to non-religious factors outlived those who attributed their longevity to religion. Additionally, Mineau et al. (2004) study of Mormon individuals found that the beneficial effects of religiosity were most prominent in middle age, and that these benefits declined with age. Thus, it remains unclear whether religiosity is a factor in longevity, or whether faith becomes an important factor near the end of life.

Participation in social and group activities is generally considered to be beneficial for one's health, but not all activities may be available or suitable in old age, or when an individual's health is deteriorating. Religion can act as an alternative that supports physical and mental health. The experience of hardship and misfortune has been considered a reason for the deepening of one's faith (Ogletree & Blieszner, 2015). Petrie and Reynolds (2007) argued that in middle and old age, when chronic diseases pose a major challenge to adaptation and coping with everyday life, people tended to turn to faith as a source of support. As a result, religious worldviews may become relatively more frequent among older population groups.

Research Context and Hypothesis

Given that the majority of people around the world now live to be at least 60 years old, there is a growing interest in understanding how religion and spirituality affect human life in old age. Although studies investigating the relationship between health and religion often concluded that religious people were more

likely to have healthier lifestyles that can contribute to a longer life, this conclusion may contradict the fact that in today's societies, where life expectancy is increasing, the number of believers is on a downward trend. In this context, another perspective is of interest: Does age and health status affect people's faith? It is of particular interest to study whether people who face health problems or whose lives are coming to an end in a predominantly secular society, turn to religion more than younger people or those who consider themselves healthy.

Estonia's religious traditions were broken under the socialist regime, which discouraged the perpetuation and intergenerational transmission of traditional religious practices and beliefs based on family and community ties, which particularly affected generations born during the Soviet era. In such a society, where religious traditions and beliefs are not inherited as part of family and community traditions, personal factors become the primary influence on an individual's beliefs. The situation may lead to a person being unaffiliated with any religious community, but still believing in God, whose existence may explain life without interfering with it (Davie, 1997). This method of personal selection affects the spiritual or religious worldview of those who turn to religion in such a society. It remains unclear whether individuals who identify as believers participate in religious rituals and are member of a religious community, or if their choice is only a reflection of their ancestral religious background. However, if a person claims to be a believer, but not affiliated to a religious community, they may nonetheless have some kind of relationship with religion considering that, in Estonia, "the majority of religious phenomena remain outside the conventional frames of religious commitment, centered on religious belief and belonging" (Remmel & Uibu, 2015, p.16). We therefore use the terms "believer" and "religious person" with the understanding that they have the same meaning.

In this study, we examined the relationship between health and religion in the Estonian society where most people are not religious. Religion nevertheless continues to have various influence on society including through the public holidays, and different population groups, especially younger and older age groups, may differ in their religious views. Since health usually deteriorates with age, their effects on religious behavior can occur simultaneously. In this context, it is important to distinguish between the effects of health and aging on religiosity. If getting poorer health is the reason a person turns to religion, we could assume that people with poor health are more likely to be believers than healthy people in the same age group at any stage of life. However, if getting older itself is a reason for reconsidering one's faith, we should monitor the increase in individual interest in religion over time with age, even among those in relatively good health. In relation to these issues, we addressed the following research questions:

1. Does religiosity increase with age?

This can be examined at both the population and individual levels. Changes in a population's religiosity may be cohort-specific, while changes in individual religiosity may result from aging itself, which may be of greater influence in specific life

stages, such as retirement. Retirement can provide more time for self-reflection and contemplation on life and the world. Given the Estonian background, older generations born at a time when religious rituals were often part of family traditions may feel a greater need for faith as they grow older. This can lead to the revival of their childhood religious traditions. In other words, we expected to observe a higher prevalence in religious individuals in the older birth cohorts associated with their aging.

At the same time, people tend to be less healthy in higher age, and therefore the fact that people become religious may also be related to the state of their health.

2. Is religion related to health status regardless of age?

We examined whether people in poor health, regardless of age, had a greater tendency to be or become believers than those without health problems. Our hypothesis was that poor health has a positive association with conversion to faith. Therefore, the proportion of people with poor health among religious people should be higher than among those who are non-religious. When looking for the link between religion and health, we should also take into account the different socioeconomic characteristics that may influence this relationship.

Data and Measures

In this study, we used the exhaustive data from the 2000 and 2011 Population and Housing Censuses, whose data collection was conducted following the methodology recommended by the UNSD, UNECE and Eurostat and evaluated according to strict rules. Estonia offers a unique environment for studying the role of religion in secular society. From the sixteenth century up to World War II, the Lutheran Church was the largest religious institution in Estonia, where three quarters of the population was Lutheran (Kiviorg, 2015). Like other countries affected by Soviet politics, religion in Estonia experienced brutal repression during the communist regime, which significantly reduced religious education and participation (Dimova & Dimov, 2021; Stark, 2001). The post-Soviet-era restoration of religious freedom in Estonia enabled older generations to continue previously forbidden religious practices and allowed the younger generations to choose their beliefs for themselves. Nevertheless, less than a third of the adult population has considered themselves religious in 2011 (Statistics Estonia, 2022).

The population we studied included individuals listed in both the 2000 and 2011 censuses whose data are linked anonymously. The study focused mainly on census questions regarding their health status and religiosity. In order to ensure appropriate comparisons, we included only people living in Estonia in 2011 who were born in 1980 or earlier, ensuring that they were at least 20 years old by 2000. A total of 771,415 people met these criteria, of which 759,491 (322,959 men and 436,532 women) were analyzed, and 11,924 cases were excluded due to incomplete information regarding their religiosity or health status in the 2011 census. Religion was considered a dependent variable in this study, while health status and age

Table 1 Studied Population and its Sociodemographic Characteristics according to 2011 census

Variable	Population	Believers	% of believers
Total population	759,491	254,819	33.6
Men	322,959	86,829	26.9
Poor health	126,262	39,935	31.6
Good health	196,697	46,894	23.8
1970 or later	82,247	17,898	21.8
1960–1969	76,525	18,092	23.6
1950–1959	72,589	19,627	27.0
1940–1949	50,311	14,141	28.1
1930–1939	32,142	12,613	39.2
Before 1930	9,145	4,458	48.7
Single	56,868	13,278	23.3
Married or cohabiting	223,281	60,165	26.9
Divorced	29,668	8,702	29.3
Widowed	13,142	4,684	35.6
Primary or lower level of education	76,228	18,707	24.5
Secondary education	179,821	48,404	26.9
Higher education	66,910	19,718	29.5
Not retired	218,320	51,571	23.6
Retired between 2000 and 2011	66,213	19,723	29.8
Retired before 2011	38,426	15,535	40.4
Estonian	223,343	40,238	18.0
Russian	79,930	37,134	46.5
Other ethnicity	19,686	9,457	48.0
Women	436,532	167,990	38.5
Poor health	196,296	92,871	47.3
Good health	240,236	75,119	31.3
1970 or later	84,119	23,654	28.1
1960–1969	86,351	25,779	29.9
1950–1959	91,781	32,756	35.7
1940–1949	76,359	30,733	40.2
1930–1939	66,705	35,618	53.4
Before 1930	31,217	19,450	62.3
Single	68,024	22,373	32.9
Married or cohabiting	214,797	73,767	34.3
Divorced	65,563	26,576	40.5
Widowed	88,148	45,274	51.4
Primary or lower level of education	90,759	40,277	44.4
Secondary education	234,680	87,056	37.1
Higher education	111,093	40,657	36.6
Not retired	249,546	76,329	30.6
Retired between 2000 and 2011	75,807	31,163	41.1
Retired before 2011	111,179	60,498	54.4
Estonian	293,195	82,267	28.1
Russian	118,148	70,434	59.6
Other ethnicity	25,189	15,289	60.7

Table 1 (continued)

Authors' calculations based on Statistics Estonia's Population and Housing Census database

were considered independent variables. Additional variables, including sex, were included in the analysis as controls (Table 1).

Religious Feeling

Data on religion collected in both the 2000 and 2011 censuses were provided on a voluntary basis. However, the possible answers to the question on religion were different in each census. Respondents were able to choose between several options in 2000, including an explicit answer such as "religious," "atheist" and "unconcerned," as well as "don't know" or "refusal." In contrast, the 2011 census suggested only three options: "yes," "no" or "refusal." The analysis showed that in 2000, when the "don't know" option existed, it was often chosen instead of the clear "yes" or "no" answer chosen by the same person in 2011. To facilitate the interpretation of the results, the counted population was divided into two groups—those who clearly indicated that they were believers, and others, the non-believers which included those who were unsure or refused to respond. Thus, in our analysis, the answers "unconcerned" and "atheist" given in the 2000 census were also classified as "non-believer."

Health Status

The data on the health status of the respondents were based on their responses in the 2011 census. Similar data from the 2000 census could not be used due to the differing definitions of "health status" in the two questionnaires. In 2000, data were collected only on illnesses or disabilities confirmed by the Medical Committee, and the survey question was phrased as: "Have you any long-term illness or disability which has been determined by the medical commission of experts and has lasted and probably will last for one year or longer?" (Statistics Estonia, 1999, p. 71). In 2011, the updated question allowed self-assessment without such a limitation. It was phrased as: "Do you have long-term health problems?" (Tiit, 2014, p. 94). Due to this update, it was not possible to reliably track the changes in the health status between the two censuses. Considering these differences, our analysis only used the data on the health status collected in 2011, and the responses were grouped into two categories: "no disease or disability" and "has a disease or disability."

Other Variables

The control variables included in the analysis were sex (male and female), year of birth (classified in ten-year groups), ethnicity (Estonian, Russian, other), marital status (single, married or cohabiting, divorced, widowed), level of education (primary or lower level of education, secondary education, higher education) and employment status (not retired, retired between 2000 and 2011, retired before 2000).

Methods

We used descriptive analysis method and binary logistic regression method for checking our hypotheses. Our descriptive analysis examined the distribution of men and women by religion, health status and birth cohort. Comparing the data collected on the same people at two points in time showed changes in religious feelings in the context of aging. The logistic regression method was then used to analyze the impact of sociodemographic indicators on both the distribution of religious and non-religious people and the transition from a non-religious to a religious status. Regression models made it possible to assess whether the likelihood of being or becoming a believer differed significantly when taking into account the birth cohort, sex, and state of health. Overall, our approach allowed for a detailed insight into the relationship between religious feeling the factors of health status and age, taking into account the heterogeneity of the sociodemographic composition of the population. This made it possible to study these complex interactions in the unique socio-religious context that Estonia presents.

Results

Religious Population Grouped by Sex, Age and Birth Cohort

Over a quarter of the adult population reported that they were believers in the 2000 census, while in 2011, this percentage increased to about a third. When comparing the two censuses, the proportion of people who said they were believers increased in all birth cohorts except for the oldest women. In both censuses, the proportion of believers among women in all cohorts was higher than the proportion of believers among men, and the difference remained relatively unchanged between the two time points (Table 2). For both men and women, the proportion of religious people increased in older cohorts. The proportion of religious people among the older cohorts varied considerably, as the number of religious people born during and after World War II was significantly lower than in older cohorts, while the younger birth cohorts had little variation.

The logistic regression models computed with data from 2011 showed that the odds of being a believer were 1.521 times higher for women compared with men. In separate models for men and women, cohort patterns were similar, but the difference between younger and older cohorts was more pronounced among women (Table 3).

Religiosity and Health Status in 2011

The first analysis of the relationship between religion and health showed that believers reported poor health more often than the rest of the population. As shown in Table 4, in 2011, one-third of men and almost half of women reporting poor health considered themselves to be believers, while less than a quarter of

Table 2 Believers among people enumerated in both the 2000 and 2011 census by sex and birth cohort

Year of birth	Believers in 2000	% of believers in 2000	Believers in 2011	% of believers in 2011
All men and women	207,483	27.3	254,819	33.6
Men				
1970 or later	12,115	14.7	17,898	21.8
1960–1969	13,181	17.2	18,092	23.6
1950–1959	14,455	19.9	19,627	27.0
1940–1949	10,944	21.8	14,141	28.1
1930–1939	10,164	31.6	12,613	39.2
Before 1930	4,362	47.7	4,458	48.7
Total	65,221	20.2	86,829	26.9
Women				
1970 or later	19,177	22.8	23,654	28.1
1960–1969	20,967	24.3	25,779	29.9
1950–1959	25,733	28.0	32,756	35.7
1940–1949	25,077	32.8	30,733	40.2
1930–1939	31,318	47.0	35,618	53.4
Before 1930	19,990	64.0	19,450	62.3
Total	142,262	32.6	167,990	38.5

Authors' calculations based on Statistics Estonia's Population and Housing Census database

Table 3 Odds of Being a Believer in 2011 by Sex and Birth Cohort (1970 or Later Birth Cohort as Reference), where differences in marital status, level of educational and ethnicity within population groups are taken into account

	Global model	Model for men	Model for women
Men	1.000		
Women	1.521***		
1970 or later	1.000	1.000	1.000
1960–1969	1.017***	1.044***	0.998
1950–1959	1.166***	1.140***	1.188***
1940–1949	1.557***	1.396***	1.680***
1930–1939	2.752***	2.476***	2.954***
Before 1930	4.464***	4.115***	4.720***

***values significant with $p < 0.001$

Authors' calculations based on Statistics Estonia's Population and Housing Census database

men and less than a third of women in good health considered themselves to be believers. Almost half of religious men and more than half of religious women reported poor health, while just over a third of non-believing men and women reported poor health. This can be partly explained by the higher share of believers in older age groups, which generally included more people with health problems (Table 5). This was particularly true for women, who made up a large proportion of the elderly population. Nevertheless, in all birth cohorts and among both

Table 4 Population enumerated in both the 2000 and 2011 census by religiosity, sex, and health status in 2011

	Believers		Non-believers		All people	
	Men	Women	Men	Women	Men	Women
People with poor health	39,935	92,871	86,327	103,425	126,262	196,296
People with good health	46,894	75,119	149,803	165,117	196,697	240,236
Total	86,829	167,990	236,130	268,542	322,959	436,532
Share of believers and non-believers among people with poor health	31.6%	47.3%	68.4%	52.7%	100.0%	100.0%
Share of believers and non-believers among people with good health	23.8%	31.3%	76.2%	68.7%	100.0%	100.0%
Share of people with poor health by religiosity	46.0%	55.3%	36.6%	38.5%	39.1%	45.0%
Share of people with good health by religiosity	54.0%	44.7%	63.4%	61.5%	60.9%	55.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

'Non-religious' includes all individuals who did not report that they were religious

Authors' calculations based on Statistics Estonia's Population and Housing Census database

Table 5 Percentage of persons with poor health in 2011 among the persons enumerated in the 2000 and 2011 census by religiosity, birth cohort and sex

Year of birth	Believers		Non-believers		All people	
	Men	Women	Men	Women	Men	Women
1970 or later	22.3	20.1	18.0	15.3	18.9	16.6
1960–1969	32.2	32.8	26.8	25.1	28.1	27.4
1950–1959	46.0	50.8	42.8	41.5	43.6	44.8
1940–1949	59.7	63.3	54.7	53.2	56.1	57.3
1930–1939	72.2	77.8	67.2	68.5	69.2	73.5
Before 1930	79.6	81.5	75.1	75.8	77.3	79.4
Total	46.0	55.3	36.6	38.5	39.1	45.0

'Non-religious' includes all individuals who did not report that they were religious

Authors' calculations based on Statistics Estonia's Population and Housing Census database

men and women, there were more people in poor health among believers than non-believers. In both religious and non-religious groups, more women born in the 1950s and earlier had poorer health than men, but the opposite was true in younger cohorts.

The correlation coefficient between religiosity and poor health was positive and statistically significant, but relatively weak (0.139). When controlled for birth cohorts, this coefficient decreased by half (0.070), while adding sex to the model did not significantly alter it. In our unadjusted logistic regression models, in which only religiosity and health status were considered, the odds for being religious were significantly higher for individuals in poor health compared with those in good health (1.806). However, when considering sex, birth cohort, marital status, education, and ethnicity in logistic regression models, the odds decreased substantially (1.380 in global model, 1.321 for men and 1.439

Table 6 Odds of being a believer for individuals in poor health in 2011 compared with those in good health, by sex and birth cohorts (With 1970 or later Birth Cohort as Reference), controlled by compositional effects of marital status, level of education, and ethnicity

	Global model	Model for men	Model for women
Good health	1.000	1.000	1.000
Poor health	1.380***	1.321***	1.439***
Men	1.000		
Women	1.520***		
1970 or later	1.000	1.000	1.000
1960–1969	0.979	1.034***	0.985
1950–1959	1.065***	1.089***	1.119***
1940–1949	1.374***	1.299***	1.533***
1930–1939	2.336***	2.235***	2.584***
Before 1930	3.747***	3.670***	4.115***

***values significant with $p < 0.001$

Authors' calculations based on Statistics Estonia's Population and Housing Census database

for women), suggesting that sociodemographic characteristics mediate religiosity among individuals with poor health (Table 6).

Becoming a Believer Between 2000 and 2011 Grouped by Sex, Cohort, and Health Status

Of the 552,008 individuals who were not religious or did not answer the question on religion in the 2000 census, 120,298 later reported being religious in 2011. The logistic regression results showed that the odds of becoming a believer between the two censuses tended to increase with older birth cohorts, notably among individuals born in the 1950s and earlier. This tendency was especially pronounced for people born before World War II. For the latter group, the odds were two to three times higher compared with the youngest birth cohorts (Table 7). Models computed for men and women separately showed a similar pattern, but differences between birth cohorts were more pronounced among women.

Another way to uncover whether people are more interested in religion in old age is to test whether retirement, which may leave more time for their spiritual needs, is related to the conversion to religion in later life. For this purpose, we calculated the probability of converting to religion in birth cohorts that reached pensionable age in or just before 2000, which included people born in the 1930s and 1940s. There were 148,014 people in these birth cohorts who were not religious in 2000, and among them, 39,754 people reported being religious in the 2011 census.

In Estonia, the legal retirement age was 55 years for women and 60 years for men until 1994. Since then, the retirement age for younger birth cohorts has risen to varying degrees for men and women, with the aim of equalizing it for both sexes by 2016 at age 65. Regardless of the legal retirement age, people have the right to choose whether to retire sooner or later. Thus, people may retire at a different age. The retirement status of respondents was part of the census questionnaire, and so our analysis was able to compare people who retired before 2000 or between 2000 and 2011 with those who had not yet retired in 2011. As shown

Table 7 Odds of becoming a believer between 2000 and 2011 by sex and birth cohorts, controlled by compositional effects of marital status, level of education, and ethnicity

	Global model	Model for men	Model for women
Men	1.000		
Women	1.332***		
1970 or later	1.000	1.000	1.000
1960–1969	0.950***	0.965	0.939***
1950–1959	1.081***	1.047**	1.116***
1940–1949	1.372***	1.262***	1.475***
1930–1939	2.179***	2.004***	2.341***
Before 1930	3.010***	2.698***	3.259***

***values significant with $p < 0.001$; **values significant with $p < 0.01$

Authors' calculations based on Statistics Estonia's Population and Housing Census database

Table 8 Odds of becoming a believer between 2000 and 2011 by sex, associated with retirement status in the 1930–1949 birth cohorts, controlled by compositional effects of marital status, level of education, and ethnicity

	Global model	Model for men	Model for women
Men	1		
Women	1.491***		
Not retired in 2011	1.000	1.000	1.000
Retired 2000–2011	1.098***	1.086**	1.121***
Retired before 2000	1.124***	1.112**	1.127***

***values significant with $p < 0.001$; **values significant with $p < 0.01$

Authors' calculations based on Statistics Estonia's Population and Housing Census database

in Table 8, the probability of becoming a believer between 2000 and 2011 was higher for those who retired during the reference period or had already retired before 2000 compared with those who were still working in 2011. Although the timing of retirement varied by year of birth, retired men were about 10% more likely to become religious than those still working, and women were slightly more (about 13%) likely to do so.

The odds of becoming a religious person between 2000 and 2011, considering the health status in 2011 (poor compared with good), was estimated using logistic regression models that included the differences between sexes and birth cohorts (Table 9). The odds of becoming a believer were more than a third higher for those in poor health compared with those in good health, with higher the odds of becoming a believer among women having poor health compared with men.

In these models, ethnicity appeared to influence the regression results related to becoming religious. Additionally, the highest level of education was associated with relatively higher odds of becoming religious for both sexes, and divorced men and widowed women, both living without partners, showed higher odds than men and women in other marital statuses.

Table 9 Odds of becoming a believer between 2000 and 2011 by sex and birth cohorts, associated with health status in 2011, and controlled by compositional effects by marital status, level of education, and ethnicity

	Global model	Model for women	Model for men
Good health	1.000	1.000	1.000
Poor health	1.357***	1.315***	1.387***

***values significant with $p < 0.001$; **values significant with $p < 0.01$

Authors' calculations based on Statistics Estonia's Population and Housing Census database

Discussion

There are different approaches to studying the relationship between health and religion and the impact of aging. Some researchers focused on the impact of religion on health, finding that religion was positively associated with better health and longer lives (McCullough et al., 2000). Other studies have shown that people were more likely to have religious feelings during some difficult times in life, such as the appearance of chronic diseases, which are often associated with aging (Petrie & Reynolds, 2007). In our research, we examined this second perspective between religion and health. Specifically, our goal was to determine whether religion becomes more important with age, and whether poor health also plays a significant role.

We studied the relationship between religiosity and the factors of age and health in the Estonian population, which is of particular interest due to the small proportion of current believers resulting from the disruption of religious family and social traditions between World War II and the early 1990s. Using Statistics Estonia's 2000 and 2011 Population and Housing census data, an increase in the religiosity of the population was observable despite the relatively small number of believers. In 2000, a little more than a quarter of the adult population counted in the two consecutive censuses reported that they were believers. In 2011, that number had risen to a third. While some of this increase could result from more restrictive answer options in the second census, the data nevertheless showed that there was a tendency for religiosity to increase with age.

In all birth cohorts of the population we studied, the proportion of believers was higher in 2011 than in 2000 confirming the findings of previous studies (Bailly, 2012; Davie, 1997). However, our results showed different tendencies—the increase in religiosity was higher toward the older cohorts, but this trend was not linear. Specifically, we found a sharp difference between cohorts born before 1940 and those born later, under the Soviet regime, who are less religious than older generations.

Our research into the relationship between a person's religious beliefs and health status in 2011 showed that people in poor health, regardless of their age and birth cohort, were more likely to be believers than those in good health. This observation may seem contradictory to what has been found in studies where religiosity is generally associated with better health (McCullough et al., 2000). However, this finding is consistent with studies suggesting that lower quality of life is often accompanied by increased spiritual needs (Balboni et al., 2022). Although both religiosity and poor health are more common among older people, such a positive relationship was also observed among younger cohorts in the population we studied, suggesting that religiosity can provide support even for younger people during difficult times.

In a more in-depth analysis considering the different birth cohorts, we focused on the people who became believers during the reference period, combining the data from the two consecutive census questionnaires. We found that the probability of becoming a believer varied between birth cohorts. More specifically, those

born in 1960 and later expressed less interest in becoming religious between 2000 and 2011 than any older birth cohort. The probability to become religious was somewhat higher in cohorts born in the 1940s, who were around 60 years old in 2000, but it was significantly higher among those born before 1940, among whom the percentage of believers was already higher in 2000. This difference in birth cohorts indicates an impact of age, with people in old age more likely interested in religion and identified as believers. Considering retirement and comparing those in the same age group who were already retired and who were not, there were more believers among those aged 50–70 who were retired in 2000, as well as among those who retired between 2000 and 2011. This suggests a possible link between retirement and increased interest in religion, but further clarifying research is needed. The greater likelihood of older cohorts becoming believers may be related to their need for emotional support when their lives change due to aging. Those whose professional lives ended have more private time to reflect on their spiritual needs, and contemplate life in a way that could influence their religiosity. Retirement can also reduce opportunities for social interaction, and joining a religious community can help meet that need.

We also examined whether there was a link between becoming a believer during the reference period and the state of the respondent's health in 2011. Specifically, we examined whether people who were not believers in 2000, but considered themselves believers eleven years later, had good or bad health in 2011. We found that there were significantly more believers among people who reported poor health than there were among people who reported good health. Thus, based on 2011 census, both being and becoming a believer were associated with poorer health. Given that being and becoming religious is positive associated with having poorer health and with aging, our finding may suggest that religion becomes increasingly important as individuals approach the end of their life. In a way, this fits with Firdausya et al.'s (2021) finding that centenarians who did not attribute their longevity to religious factors lived longer than their religious counterparts.

The data we have at our disposal are valuable not only because the data are exhaustive but also because they allowed us to analyze the change in the religious feelings of respondents between the two censuses, identify those who become believers, and pinpoint the life stage where the change took place. We also received an answer to our hypothesis that bad health promotes turning to religion.

The main limitation of this study was the lack of comparable health data at the start and end of the observation. Therefore, when analyzing the relationship between health status and religious feelings, it was not possible to look at the deterioration of a respondent's health status during the reference period, but only note the condition at the end of the reference period. The second limitation was that the question on religiosity differed between the two censuses. This may have had some influence on the results of the analysis regarding changes in religiosity, especially for those who were unsure of their religious feelings when answering the question in the first census, and who were regardless included in the analysis as non-believers. However, a significant bias in the results is not to be expected, as in the second census, these unsure individuals were equally divided between believers and non-believers. By evidence, further research is needed, especially research that would include

socio-psychological variables and more detailed health indicators, such as information that tracks the changes in each individual's health over time. Additionally, even though our control variables included ethnicity, the migration background of a relatively large portion of the Estonian population may have influenced the results of this study, and thus, further investigation around this topic is needed.

Conclusion

This study is the first to analyze the possible association between increased religiosity, aging and health issues in the whole adult population of Estonia enumerated in the 2000 and 2011 censuses. The anonymous linkage of the responses of all persons aged 20 years and above in 2000 allowed us to access self-reported data on religiosity and health and identify those who became believers between the two census dates. The cross-analysis of the data collected in the two censuses revealed that people were more likely religious when they aged as well as when their health was poor.

Funding This article was funded by Sihtasutus Eesti Teadusagentuur, PRG2248

Declarations

Conflict of interest We have no known conflict of interest to disclose.

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