Int. J. Epidemiol. Advance Access published September 13, 2010

Published by Oxford University Press on behalf of the International Epidemiological Association

International Journal of Epidemiology 2010;1–9
doi:10.1093/ije/dyq141

Religion and assisted and non-assisted suicide in Switzerland: National Cohort Study

Adrian Spoerri,[1] Marcel Zwahlen,[1] Matthias Bopp,[2] Felix Gutzwiller[2] and Matthias Egger[1]* for the Swiss National Cohort Study

[1]Institute of Social and Preventive Medicine, University of Bern, Bern, Switzerland and [2]Institute of Social and Preventive Medicine, University of Zurich, Zurich, Switzerland

*Corresponding author. Institute of Social & Preventive Medicine (ISPM), Finkenhubelweg 11, CH-3012 Bern, Switzerland. E-mail: egger@ispm.unibe.ch

Accepted 1 July 2010

Background In the 19th century, eminent French sociologist Emile Durkheim found suicide rates to be higher in the Protestant compared with the Catholic cantons of Switzerland. We examined religious affiliation and suicide in modern Switzerland, where assisted suicide is legal.

Methods The 2000 census records of 1 722 456 (46.0%) Catholics, 1 565 452 (41.8%) Protestants and 454 397 (12.2%) individuals with no affiliation were linked to mortality records up to December 2005. The association between religious affiliation and suicide, with the Protestant faith serving as the reference category, was examined in Cox regression models. Hazard ratios (HRs) with 95% confidence intervals (CIs) were adjusted for age, marital status, education, type of household, language and degree of urbanization.

Results Suicide rates per 100 000 inhabitants were 19.7 in Catholics (1664 suicides), 28.5 in Protestants (2158 suicides) and 39.0 in those with no affiliation (882 suicides). Associations with religion were modified by age and gender ($P < 0.0001$). Compared with Protestant men aged 35–64 years, HRs (95% CI) for all suicides were 0.80 (0.73–0.88) in Catholic men and 1.09 (0.98–1.22) in men with no affiliation; and 0.60 (0.53–0.67) and 1.96 (1.69–2.27), respectively, in men aged 65–94 years. Corresponding HRs in women aged 35–64 years were 0.90 (0.80–1.03) and 1.46 (1.25–1.72); and 0.67 (0.59–0.77) and 2.63 (2.22–3.12) in women aged 65–94 years. The association was strongest for suicides by poisoning in the 65–94-year-old age group, the majority of which was assisted: HRs were 0.45 (0.35–0.59) for Catholic men and 3.01 (2.37–3.82) for men with no affiliation; 0.44 (0.36–0.55) for Catholic women and 3.14 (2.51–3.94) for women with no affiliation.

Conclusions In Switzerland, the protective effect of a religious affiliation appears to be stronger in Catholics than in Protestants, stronger in older than in younger people, stronger in women than in men, and particularly strong for assisted suicides.

Keywords Suicide, assisted suicide, religion, Switzerland, multi-level modelling, record linkage

Introduction

The relation between religion and suicide has been studied ever since the eminent French sociologist Emile Durkheim argued, in 1897, that stronger social cohesion and social integration among Catholics resulted in lower suicide rates in their communities.[1] Among other data, Durkheim compared suicide rates across Swiss cantons and found higher rates in Protestant compared with Catholic cantons. Durkheim's results, and the results of more recent studies correlating religion with suicide rates in different populations,[2–5] could have been distorted by ecological bias, where aggregate-level associations fail to accurately reflect associations at the individual level.[6–8] On the other hand, the predominant religion of communities could influence suicide rates independent of individual religious affiliation.[9] So far, only few studies have examined the relation between religion and suicide at the individual level.[10,11]

The Roman Catholic and Protestant faith continue to be the largest religious denominations in modern Switzerland, although a growing segment of the population reports no religious affiliation. Suicide is an important public health issue in Switzerland: the incidence is in the top third in Europe, and in the top quintile worldwide.[12] Assisted suicide has become increasingly important in recent years.[13] In Switzerland assisting someone to die by suicide is punishable only if done for selfish motives: assisted suicide is thus legal if the motive is not selfish.[14] Several right-to-die societies offer such assistance: a lethal dose of barbiturate is prescribed by the family physician or a physician working with the organization.

We examined the influence of individual religious affiliation on the risk of suicide, including on suicide by poisoning, in a longitudinal study of the Swiss population.[15] We hypothesized that differences in the risk of suicide would continue to be evident in modern Switzerland, with the highest risk being observed in persons without religious affiliation and the lowest in Catholics, with Protestants in an intermediate position.

Methods

Study population and outcomes

The Swiss National Cohort Study (SNC) is based on the 1990 and 2000 national censuses.[15] Deterministic and probabilistic record linkage[16] used the Generalized Record Linkage System[17] to link census records to a death record or an emigration record, based on a set of key variables that are available in both data sets (sex, date of birth, place of residence, marital status, religion, nationality, profession, date of birth of partner and date of birth of children). Enumeration in the census data is near-complete: for the 2000 census coverage is estimated at 98.6%.[18] The current database includes deaths up to end of 2005. For the present analysis we included all individuals aged 35–94 years recorded in the 5 December 2000 census. We excluded persons <35 years because a smaller proportion of deaths could be linked to census records in this age group.

We examined all suicides [International Classification of Diseases version 10 (ICD-10) codes X60–X84], suicide by poisoning (ICD-10 code X61) and assisted suicide as underlying cause of death between the 5 December 2000 and the 31 December 2005. There is no dedicated code for assisted suicide in ICD-10; however, from 2003 onwards, code X61 (intentional self-poisoning) combined with either code 8 (X61.8, if the name of the right-to-die society was mentioned) or 9 (X61.9, if barbiturates were mentioned) were used by the Federal Statistical Office for assisted suicides.

Religious affiliation

The religious affiliation reported at the census was categorized into three groups: Roman Catholic, Protestant and no affiliation. 'No affiliation' was an explicit response option in the census questionnaire. We excluded all records with missing information on religion and records with other affiliations (non-Roman Catholic, other small Christian congregations, Jewish, Muslim, Buddhist and other religions).

Statistical analysis

We modelled the individual hazard of suicide using Cox regression models. Time of observation started at the date of the census and ended on the date of death, the date of emigration or on 31 December 2005. The models included age (in 10-year bands), sex, education (compulsory schooling, secondary and tertiary education), marital status (single, married, divorced and widowed) and type of household (single person, multi persons and institution). We compared Protestants with Catholics and individuals with no affiliation, for any suicide and for suicides by poisoning or other methods. Models also included language region (German, French and Italian) and degree of urbanization (urban, suburban and rural area) as defined by the Federal Statistical Office. Finally, models included terms for interactions between religious affiliation and age, and religious affiliation and gender.

In sensitivity analyses we considered other causes to examine whether differences in suicide rates could be due to differential coding of causes of deaths. We hypothesized that suicides might be coded as ill-defined and unknown causes of death (ICD10 R96–R99), unclear suicide, murder or accident (ICD10 Y10–Y34), transport accidents (ICD10 V01–V99), unintentional poisoning and drowning (ICD10 X40–X49.9 and W65–W74.9) or other accidents (ICD10 W01–X59). Statistical analyses were done in Stata version 10 (Stata Corporation, College

Station, TX). Results are given as hazard ratios (HRs) with 95% confidence intervals (CIs). The SNC was approved by the cantonal ethics committees of Bern and Zurich.

Results

The 2000 census population included 7 288 010 individuals; 3 194 911 (43.8%) individuals aged <35 years or ⩾95 years were excluded. Another 139 795 (1.9%) persons were excluded because of missing religion, as well as 210 999 (2.9%) individuals with religious affiliations other than Protestant or Catholic. Among the 3 742 305 individuals included in the study, 5082 suicides were recorded during 24.1 million person-years of follow-up, and 4704 of these (92.6%) could be linked to a census record. The percentage of deaths successfully linked increased with age, from 88.2% in those aged 35–44 years to 96.4% in those aged 85–94 years, but was similar across religious groups (Table 1).

Characteristics of study population and rates of suicide by religious affiliation

Table 2 shows the socio-demographic characteristics of the study population and rates of suicides by religious affiliation. Catholics were the largest group (1 722 456 individuals; 46.0%), followed by Protestants (1 565 452; 41.8%) and people reporting no religious affiliation (454 397; 12.2%). The latter was the youngest group, with a mean age of 51.4 years [standard deviation (SD) 12.1 years] compared with 55.5 years (SD 14.3) among Catholics and 58.3 years (SD 14.9) among Protestants. Compared with Protestants and people with no affiliation, Catholics were less likely to have tertiary education, less likely to be divorced, less likely to live in single-person households and less likely to live in urban areas. Crude suicide rates were highest among people with no religious affiliation (39.0 per 100 000 inhabitants), followed by Protestants (28.5 per 100 000) and Catholics (19.7 per 100 000) (Table 2). Crude HRs from Cox regression models, compared with Protestants, were 0.69 (95% CI 0.65–0.74) for Catholics and 1.37 (95% CI 1.27–1.48) for people with no religious affiliation.

The association with religion was strongly modified by age ($P < 0.0001$ from test of interaction) and also differed between men and women ($P < 0.0001$). The protective effect in Catholics and the increased risk of suicide in people with no religious affiliation compared with Protestants became stronger when moving from younger to older age groups, both in men and women (Figure 1). Compared with men, the increase in risk associated with no religious affiliation was somewhat greater in women, and the protective effect of the Catholic faith was slightly weaker in women (Figure 1).

Table 1 Percentage of linked suicides by religion and other characteristics

	Not linked	Linked	Total	Percentage linked
Religion				
Catholic	136	1664	1800	92.4
Protestant	182	2158	2340	92.2
No affiliation	60	882	942	93.6
Sex				
Men	259	3136	3395	92.4
Women	119	1568	1687	92.9
Age, years				
35–44	122	914	1036	88.2
45–54	99	1054	1153	91.4
55–64	68	928	996	93.2
65–74	40	801	841	95.2
75–84	38	712	750	94.9
85–94	11	295	306	96.4
Marital status				
Single	85	789	874	90.3
Married	105	2619	2724	96.1
Widowed	74	620	694	89.3
Divorced	114	676	790	85.6
Language region				
German	244	3495	3739	93.5
French	129	1095	1224	89.5
Italian	5	114	119	95.8
Urbanization				
Urban	129	1551	1680	92.3
Suburban	148	1970	2118	93.0
Rural	101	1183	1284	92.1
Total	378	4704	5082	92.6

Suicide by poisoning

The proportion of suicides by poisoning increased with age in men and women, with particularly prominent increases in men with no affiliation and Protestant women (Figure 2). The percentage of suicides by poisoning that were coded as assisted suicides 2003–05 was similar across religious groups, but higher in people dying by suicide at an older age. In the 35–64-year-old age group, it was 35.3% in Catholics (42/119), 48.0% in Protestants (61/127) and 44.2% in individuals with no affiliation (42/95). Corresponding percentages for the 65–94-year-old age group were 78.8% (67/85), 82.7% (206/249) and 82.7% (81/98). When expressing assisted suicides as a percentage of all suicides (rather than of suicides by poisoning) figures in the younger age groups were 6.5% (42/648) in Catholics, 9.3% (61/656) in Protestants and 14.1%

Table 2 Socio-demographic characteristics of the study population and crude rates of suicide, Switzerland 2000–05

	Catholic		Protestant		No affiliation		All		Rate[a] (95% CI)
	n	%	*n*	%	*n*	%	*n*	%	
Sex									
Men	810 153	47.0	707 727	45.2	249 453	54.9	1 767 333	47.2	36.4 (35.1–37.7)
Women	912 303	53.0	857 725	54.8	204 944	45.1	1 974 972	52.8	16.3 (15.5–17.1)
Age, years									
35–44	510 789	29.7	368 147	23.5	168 720	37.1	1 047 656	28.0	17.3 (16.2–18.4)
45–54	411 747	23.9	359 539	23.0	132 550	29.2	903 836	24.2	23.2 (21.8–24.6)
55–64	342 930	19.9	314 673	20.1	86 382	19.0	743 985	19.9	25.0 (23.5–26.7)
65–74	257 203	14.9	257 640	16.5	43 036	9.5	557 879	14.9	29.7 (27.7–31.8)
75–84	148 750	8.6	192 617	12.3	19 211	4.2	360 578	9.6	44.8 (41.6–48.2)
85–94	51 037	3.0	72 836	4.7	4498	1.0	128 371	3.4	69.1 (61.7–77.5)
Education									
Compulsory	735 262	42.7	482 038	30.8	100 297	22.1	1 317 597	35.2	27.4 (26.1–28.7)
Secondary	721 840	41.9	796 220	50.9	211 248	46.5	1 729 308	46.2	25.2 (24.2–26.3)
Tertiary	265 354	15.4	287 194	18.3	142 852	31.4	695 400	18.6	24.0 (22.5–25.7)
Marital status									
Single	202 149	11.7	173 939	11.1	79 380	17.5	455 468	12.2	35.5 (33.1–38.1)
Married	1 220 248	70.8	1 063 562	67.9	279 470	61.5	2 563 280	68.5	20.7 (19.9–21.5)
Widowed	169 073	9.8	191 342	12.2	21 676	4.8	382 091	10.2	37.0 (34.2–40.0)
Divorced	130 986	7.6	136 609	8.7	73 871	16.3	341 466	9.1	40.2 (37.3–43.3)
Type of household									
Single person	310 153	18.0	322 499	20.6	115 060	25.3	747 712	20.0	43.2 (41.1–45.4)
Multi persons	1 350 307	78.4	1 182 938	75.6	329 344	72.5	2 862 589	76.5	20.9 (20.2–21.7)
Institution	61 996	3.6	60 015	3.8	9993	2.2	132 004	3.5	37.0 (32.1–42.6)
Language region									
German	1 130 625	65.6	1 256 289	80.3	322 957	71.1	2 709 871	72.4	26.4 (25.6–27.3)
French	441 334	25.6	293 266	18.7	118 314	26.0	852 914	22.8	26.3 (24.8–27.9)
Italian	150 497	8.7	15 897	1.0	13 126	2.9	179 520	4.8	13.0 (10.8–15.6)
Urbanization									
Urban	471 606	27.4	400 901	25.6	169 774	37.4	1 042 281	27.9	30.7 (29.3–32.3)
Suburban	761 768	44.2	722 159	46.1	213 528	47.0	1 697 455	45.4	23.7 (22.6–24.7)
Rural	489 082	28.4	442 392	28.3	71 095	15.6	1 002 569	26.8	24.2 (22.9–25.6)
Rate (95% CI)	19.7 (18.8–20.7)		28.5 (27.3–29.7)		39.0 (36.5–41.7)		25.8 (25.0–26.5)		

[a]Per 100 000 persons.

(42/298) in individuals with no affiliation. In persons aged ⩾65 years, percentages were 24% (67/279) in Catholics, 36.0% (206/573) in Protestants and 46.8% (81/173) in individuals with no affiliation. There was little evidence for differences between genders.

Table 3 gives the results from the multivariable Cox regression models. Both in men and women the protective effect associated with the Catholic faith, and the increase in risk in those without religious affiliation were most prominent in individuals aged 65–94 years, for assisted suicide and in general for suicide by poisoning. HRs were attenuated somewhat when adjusting for age, marital status, education, type of household, language region and degree of urbanization in multivariable analysis.

Sensitivity analyses

The HRs comparing Catholics with Protestants were 0.95 (95% CI 0.90–1.00) for ill-defined and unknown causes; 0.98 (95% CI 0.74–1.30) for unclear suicides, murders and accidents; 1.04 (95% CI 0.93–1.17) for transport accidents; 0.72 (95% CI 0.55–0.94) for

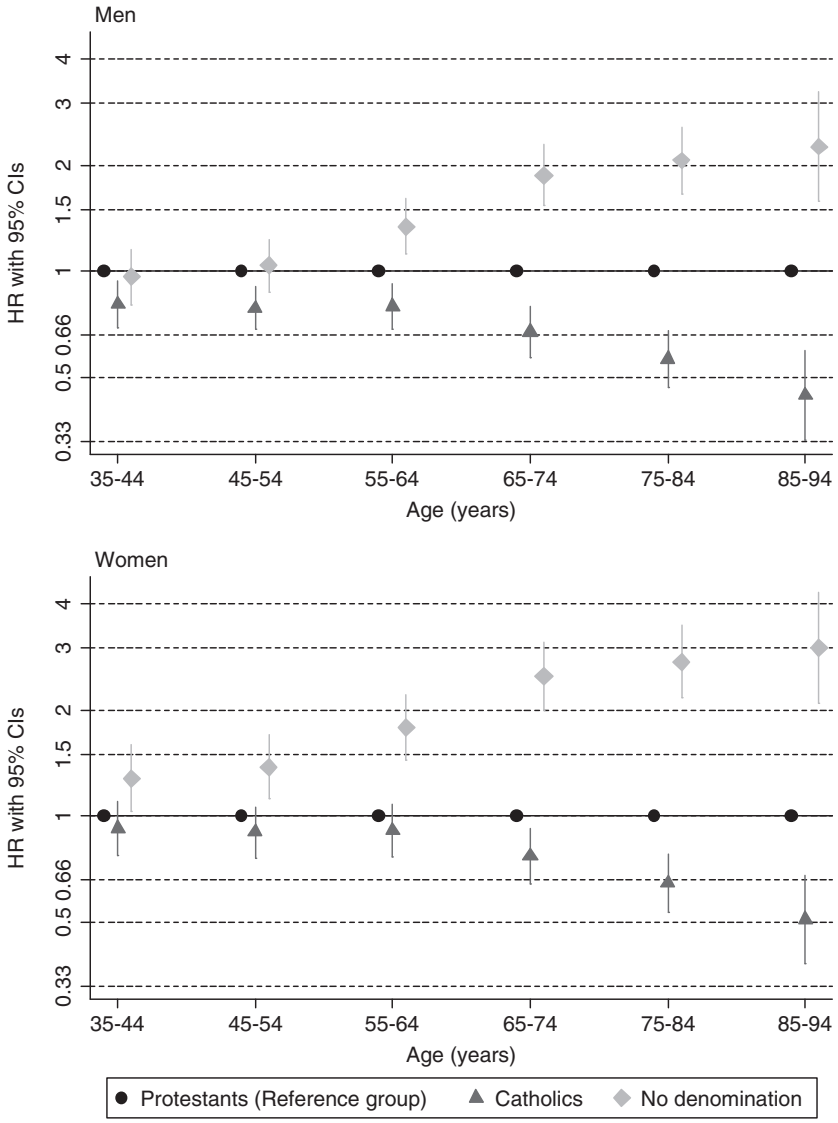

Figure 1 Probability of suicide in Switzerland by gender, age and individual religious affiliation. HRs from Cox models comparing Protestants, Catholics and individuals reporting no religious affiliation, over six age groups. Adjusted for age, education, marital status and type of household

unintentional poisoning and drowning and 0.92 (95% CI 0.87–0.97) for other accidents.

Discussion

This longitudinal study of the Swiss population aged 35–94 years showed that in recent years suicide rates among Catholics were substantially lower than among Protestants and individuals with no religious affiliation, and that this was not explained by socio-demographic factors. The effect was evident in all age groups, but substantially greater among older people, and particularly pronounced for suicide by poisoning. In older people most suicides by poisoning were assisted suicides. The effect of religion was also modified by gender: the increase in risk associated with no religious affiliation was greater in women than in men.

To our knowledge this is the first nation-wide study of individual religious affiliation and the risk of suicide. It was made possible by the fact that in Switzerland religion is recorded in the census, and that a high proportion of deaths can be linked to the census data. Swiss mortality records are virtually complete for deaths that occurred in Switzerland: by linking the two data sets a longitudinal mortality study of the entire Swiss population could be created.[15] Most previous studies of religion and suicide were ecological and correlated suicides rates of counties, states or countries with the predominant religious denomination of the corresponding

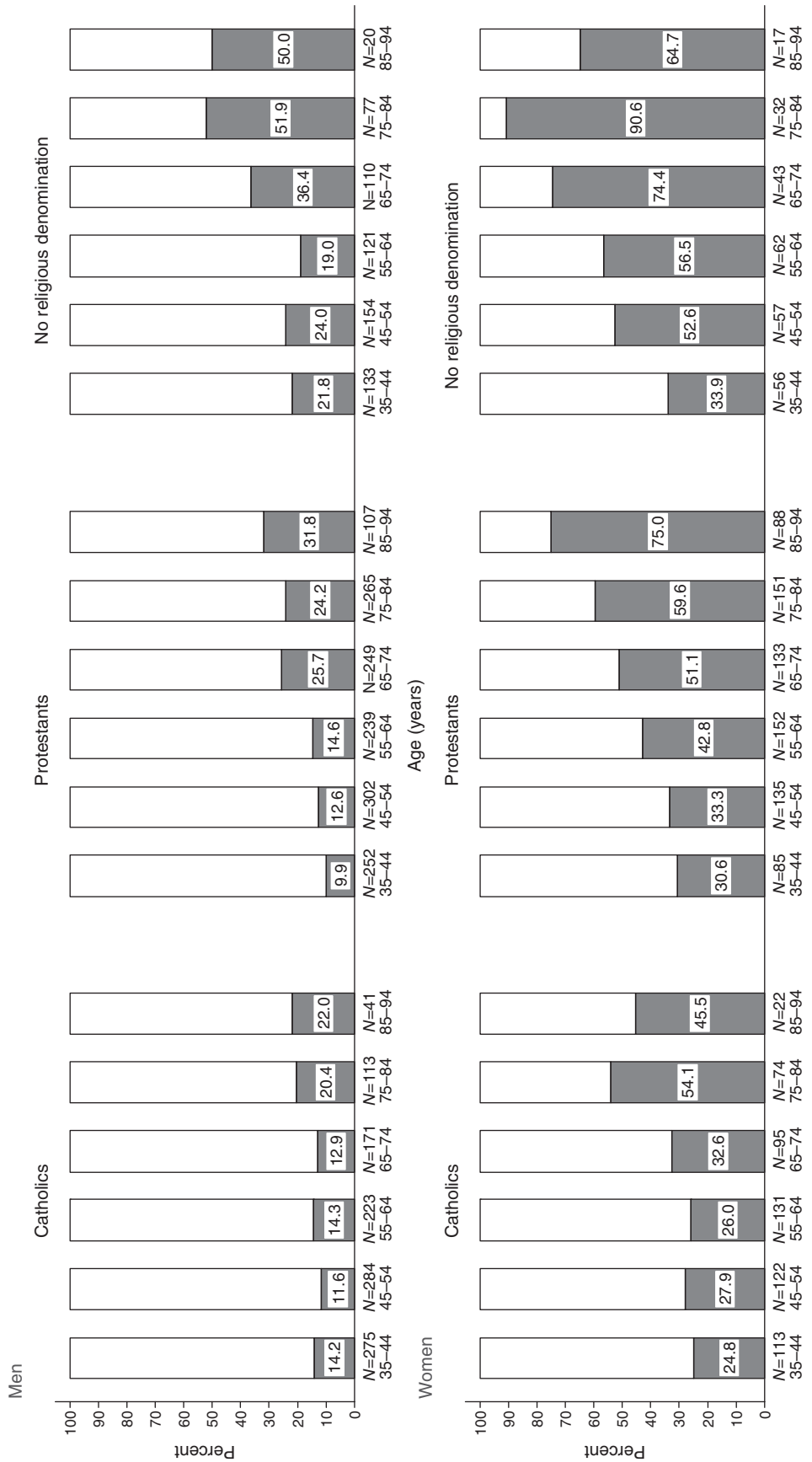

Figure 2 Number of suicides by age, sex and religious affiliation, and percent by poisoning (shaded area of bars)

Table 3 Probability of suicide overall and by poisoning and assistance according to gender, age and religious affiliation, Switzerland 2000–05

	Number of cases	Age (years)	HRs (95% CI) by religious affiliation						*P*
			Catholic		Protestant	No affiliation			
			Crude	Adjusted	(Reference)	Crude	Adjusted		
Men									
All suicides	1983	35–64	0.78 (0.72–0.86)	0.80 (0.73–0.88)	1	1.19 (1.06–1.33)	1.09 (0.98–1.22)		<0.0001
	1153	65–94	0.57 (0.51–0.65)	0.60 (0.53–0.67)	1	1.90 (1.65–2.19)	1.96 (1.69–2.27)		<0.0001
Suicide by poisoning	291	35–64	0.74 (0.59–0.93)	0.78 (0.62–0.98)	1	2.00 (1.58–2.53)	1.67 (1.32–2.11)		<0.0001
	306	65–94	0.42 (0.32–0.54)	0.45 (0.35–0.59)	1	3.19 (2.53–4.03)	3.01 (2.37–3.82)		<0.0001
Assisted suicides	59	35–64	0.59 (0.37–0.92)	0.70 (0.45–1.10)	1	1.76 (1.13–2.75)	1.60 (1.02–2.50)		0.0049
	162	65–94	0.38 (0.26–0.56)	0.45 (0.30–0.66)	1	2.76 (1.95–3.91)	2.53 (1.78–3.60)		<0.0001
Women									
All suicides	913	35–64	0.83 (0.73–0.94)	0.90 (0.80–1.03)	1	1.49 (1.27–1.74)	1.46 (1.25–1.72)		<0.0001
	655	65–94	0.60 (0.53–0.69)	0.67 (0.59–0.77)	1	2.38 (2.01–2.82)	2.63 (2.22–3.12)		<0.0001
Suicide by poisoning	316	35–64	0.67 (0.53–0.85)	0.76 (0.60–0.96)	1	1.97 (1.55–2.51)	1.75 (1.36–2.24)		<0.0001
	377	65–94	0.38 (0.30–0.47)	0.44 (0.36–0.55)	1	3.14 (2.51–3.93)	3.14 (2.51–3.94)		<0.0001
Assisted suicides	86	35–64	0.55 (0.35–0.86)	0.68 (0.43–1.07)	1	1.95 (1.25–3.07)	1.85 (1.17–2.92)		0.0005
	192	65–94	0.35 (0.25–0.49)	0.43 (0.31–0.60)	1	3.06 (2.21–4.24)	2.93 (2.11–4.07)		<0.0001

HRs from Cox models adjusted for age, marital status, education, type of household, language region and degree of urbanization. The analysis of assisted suicides was based on the years 2003–05.

populations, or used other measures, including, for example, levels of religious book production.[19] Only few studies examined the relation between religion and suicide at the individual level, and these were in selected populations, or retrospective and depended on information from next of kin.[10,11] Ecological correlation studies may fail to properly reflect individual-level associations, if other risk factors vary across populations.[20] These risk factors need not be confounders at the individual level.[20] In our study confounding was an issue: age, sex, educational attainment and marital status were all associated with religious affiliation and the risk of suicide, but did not explain the association with religion. Interestingly, the effect of religion differed between men and women. Gender differentials in risk factors have been documented previously: for example, being unemployed appears to increase the risk to a greater extent in men, whereas a history of parental psychotic disorders increase the risk to a greater extent in women.[21,22]

One limitation of the SNC is that linkage is less successful in adolescents and younger adults, who are a highly mobile group. We excluded this group from the present analysis. In the 10–29-year-old age group, 84% of deaths from all causes could be linked, compared with 94% of deaths in older people.[15] The latter percentage, and the percentage obtained for suicide in the present study, are comparable with linkage results between two data sets with a common unique identifier, such as the Social Security number in the USA.[23] Nevertheless, rates of suicide will be slightly underestimated by the present study. Another limitation is the cohort's reliance on routine mortality data for outcomes. It has been estimated that up to 20% of suicides in Switzerland might be misclassified as other causes.[24] Differential misclassification due to incorrect coding of suicides in Catholic areas, or Catholic individuals, because of the stigma attached to suicide is unlikely: the physician completing the death certificate sends the form directly to the Swiss Federal Statistical Office, after removing the name of the deceased. The family or communal authorities do not receive a copy. Of note, we found no excess mortality in Catholics from causes commonly suspected of containing misclassified suicides. Finally, assisted suicides could only be identified in more recent years. Efforts are now underway to systematically ascertain all suicides assisted by right-to-die organizations, prospectively, and back to the year 2001.

Durkheim argued that the high level of social integration associated with the Roman Catholic faith reduced the risk of suicide: Catholics are required to interact with others frequently when going to mass, obtaining sacraments and confessing, and may therefore benefit from a strong supportive social network.[25,26] Durkheim's theory of social integration is related to the modern concept of social capital, which has been described as a 'Durkheimian revival'.[27] If Catholics are more integrated than

Protestants, and Protestants more integrated than people with no religious affiliation, then suicide rates are expected to be highest in people with no religious affiliation, and lowest in Catholics. Our study confirmed this expectation but does not provide direct evidence supporting the theory of social integration. Religion is, however, an important social force and our results thus support a social model of suicide. Of note, rates of suicide were lowest among married individuals, and people living with others, which also indicates that social integration is important.[28]

Normative integration, where individuals accept the social norms and dogmas of a faith, probably also played a role. The Catholic faith condones suicide as self-murder and assisted suicide and euthanasia as assisted self-murder or murder. Religious affiliation will be an imprecise measure of individual religious commitment and non-differential misclassification may therefore have attenuated associations. In cross-sectional surveys, regular church attendance was associated with low approval of suicide, and reduced reporting of suicide attempts, independent of religious affiliation or levels of social support.[29–32] The Catholic faith does recognize that those suffering from mental illness may take their lives without true consent or culpability.[33] Surveys among psychiatric patients found that religious affiliation, religious beliefs and moral objections were often reported as preventing patients from attempting suicide.[32,34] In the stress-diathesis model of suicide, religion is one of the factors that contribute to the diathesis for suicidal behaviour.[34]

The protective effect in Catholics was particularly pronounced for suicide by poisoning in those aged $\geqslant$65 years, which predominantly reflects assisted suicides. Active euthanasia is a criminal offense in Switzerland, but assisting someone to die by suicide is legal if the motive is not selfish.[14,35] The involvement of a physician is not required by law, and the patient does not need to be terminally ill. The respective article of the Swiss penal code (Article 115) is from 1918 and was never intended to regulate assisted suicide, but is used by right-to-die societies to legally offer such assistance to their members.[13] The final step must be taken by the member, by ingesting the lethal dose of barbiturate or starting the intravenous infusion.[13] A review of 748 suicides assisted by one right-to-die society showed that the number of cases increased in 1990–2000.[13] The mean age was 72 years, and 558 cases (75%) were from Protestant cantons. Data on diagnoses were available for the 331 cases from the canton of Zurich: 157 patients (47%) had a malignant neoplasm and only 9 (3%) a mental disorder.[13] Our study indicates that in recent years about 160 assisted suicides took place among Swiss residents each year. A similar number of assisted suicides concerns foreigners who travel to Switzerland to end their lives.[14]

In conclusion, in Switzerland the religious affiliation of individuals is associated with their risk of suicide. The association with religion is particularly strong in older people, and for suicide by poisoning, indicating that religion may have become more important with the increase in recent years of the number of suicides that are assisted.

Funding

Swiss National Science Foundation (grant 3347C0-108806).

Acknowledgements

We are grateful to Andreas Stuck, Katharina Huber and Thomas Abel for helpful comments on a previous draft of this paper. We also would like to thank the Federal Statistical Office whose support made the SNC and this study possible. Finally, we thank two anonymous referees for constructive comments on a previous version of this article.

Conflict of interest: None declared.

KEY MESSAGES

- Studies of suicide and religion, including the classic studies by Emile Durkheim, have generally been at the aggregate-level and could have been distorted by ecological bias. This analysis of the Swiss National Cohort examined the association at the individual level.
- Suicide rates were substantially lower among Catholics than among Protestants and individuals with no religious affiliation. This was not explained by age, sex, marital status, education or other variables.
- The effect was evident in all age groups, but stronger among older people, and particularly pronounced for suicide by poisoning. In older people most suicides by poisoning were assisted suicides.
- Religion is an important social force and the results from this study therefore support a social model of suicide, as proposed by Emile Durkheim in 1897.

References

[1] Durkheim E. *Suicide*. London: Routledge Classics, 2002.

[2] Pope W, Danigelis N. Sociology's ''one law''. *Social Forces (Special Issue)* 1981;**60:**495–516.

[3] Stack S. Religion and suicide: a reanalysis. *Soc Psychiatry* 1980;**15:**65–70.

[4] Breault KD. Suicide in America: a test of Durkheim's theory of religious and family integration, 1933–1980. *Am J Sociol* 1986;**92:**628–56.

[5] Lester D. Ethnicity, religion and suicide in Swiss cantons. *Percept Mot Skills* 1998;**86(3 Pt 2):**1210.

[6] Crosby RA, Holtgrave DR. The protective value of social capital against teen pregnancy: a state-level analysis. *J Adolesc Health* 2006;**38:**556–59.

[7] Neeleman J, Lewis G. Suicide, religion, and socioeconomic conditions. An ecological study in 26 countries, 1990. *J Epidemiol Community Health* 1999;**53:** 204–10.

[8] van Poppel F, Day LH. A test of Durkheim's theory of suicide – without committing the ''ecological fallacy''. *Am Sociol Rev* 1996;**61:**500–7.

[9] Diez-Roux AV. Multilevel analysis in public health research. *Annu Rev Public Health* 2000;**21:**171–92.

[10] Hilton SC, Fellingham GW, Lyon JL. Suicide rates and religious commitment in young adult males in Utah. *Am J Epidemiol* 2002;**155:**413–19.

[11] Nisbet PA, Duberstein PR, Conwell Y, Seidlitz L. The effect of participation in religious activities on suicide versus natural death in adults 50 and older. *J Nerv Ment Dis* 2000;**188:**543–46.

[12] WHO. Suicide prevention (SUPRE). http://www.who.int/mental_health/prevention/suicide/suicideprevent/en/index.html (2 September 2010, date last accessed).

[13] Bosshard G, Ulrich E, Bar W. 748 cases of suicide assisted by a Swiss right-to-die organisation. *Swiss Med Wkly* 2003; **133:**310–17.

[14] Hurst SA, Mauron A. Assisted suicide and euthanasia in Switzerland: allowing a role for non-physicians. *BMJ* 2003;**326:**271–73.

[15] Bopp M, Spoerri A, Zwahlen M *et al*. The Swiss National Cohort – a longitudinal study of 6.8 million people. *Int J Epidemiol* 2009;**38:**379–84.

[16] Fellegi IP, Sunter AB. A theory of record linkage. *J Am Stat Assoc* 1969;**64:**1183–210.

[17] Fair M. Generalized Record Linkage System – Statistics Canada's record linkage software. *Austrian J Stat* 2004;**33:** 37–53.

[18] Renaud A. *Methodology Report - Coverage Estimation for the Swiss Population Census 2000*. Neuchâtel Swiss Federal Statistical Office, 2004.

[19] Colucci E, Martin G. Religion and spirituality along the suicidal path. *Suicide Life Threat Behav* 2008;**38:**229–44.

[20] Greenland S, Morgenstern H. Ecological bias, confounding, and effect modification. *Int J Epidemiol* 1989;**18:**269–74.

[21] Qin P, Agerbo E, Westergard-Nielsen N, Eriksson T, Mortensen PB. Gender differences in risk factors for suicide in Denmark. *Br J Psychiatry* 2000;**177:**546–50.

[22] von Borczyskowski A, Lindblad F, Vinnerljung B, Hjern A. Gender differences in risk factors for suicide: findings from a Swedish national cohort study. *Can J Psychiatry* 2010;**55:**108–11.

[23] Curb JD, Ford CE, Pressel S, Palmer M, Babcock C, Hawkins CM. Ascertainment of vital status through the National Death Index and the Social Security Administration. *Am J Epidemiol* 1985;**121:**754–66.

[24] Rockett IR, Thomas BM. Reliability and sensitivity of suicide certification in higher-income countries. *Suicide Life Threat Behav* 1999;**29:**141–49.

[25] Jarvis GK, Northcott HC. Religion and differences in morbidity and mortality. *Soc Sci Med* 1987;**25:**813–24.

[26] Pescosolido BA, Georgianna S. Durkheim, suicide, and religion: toward a network theory of suicide. *Am Sociol Rev* 1989;**54:**33–48.

[27] Turner B. Social capital, inequality and health: the Durkheimian Revival. *Soc Theory Health* 2003;**1:**4–20.

[28] Stack S. Suicide: a 15-year review of the sociological literature. Part II: modernization and social integration perspectives. *Suicide Life Threat Behav* 2000;**30:**163–76.

[29] Rasic DT, Belik SL, Elias B, Katz LY, Enns M, Sareen J. Spirituality, religion and suicidal behavior in a nationally representative sample. *J Affect Disord* 2009;**114:**32–40.

[30] Siegrist M. Church attendance, denomination, and suicide ideology. *J Soc Psychol* 1996;**136:**559–66.

[31] Stack S, Lester D. The effect of religion on suicide ideation. *Soc Psychiatry Psychiatr Epidemiol* 1991;**26:**168–70.

[32] Dervic K, Oquendo MA, Grunebaum MF, Ellis S, Burke AK, Mann JJ. Religious affiliation and suicide attempt. *Am J Psychiatry* 2004;**161:**2303–8.

[33] Engelhardt HT Jr, Iltis AS. End-of-life: the traditional Christian view. *Lancet* 2005;**366:**1045–49.

[34] Skegg K. Self-harm. *Lancet* 2005;**366:**1471–83.

[35] Schoenenberger AW, Stuck AE. Health care for older persons in Switzerland: a country profile. *J Am Geriatr Soc* 2006;**54:**986–90.