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Religion as a cross-cultural determinant of depression in elderly Europeans: results from the EURODEP collaboration

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ABSTRACT

Background. The protective effects of religion against late life depression may depend on the broader sociocultural environment. This paper examines whether the prevailing religious climate is related to cross-cultural differences of depression in elderly Europeans.

Methods. Two approaches were employed, using data from the EURODEP collaboration. First, associations were studied between church-attendance, religious denomination and depression at the syndrome level for six EURODEP study centres (five countries, $N = 8398$). Secondly, ecological associations were computed by multi-level analysis between national estimates of religious climate, derived from the European Value Survey and depressive symptoms, for the pooled dataset of 13 EURODEP study centres (11 countries, $N = 17739$).

Results. In the first study, depression rates were lower among regular church-attenders, most prominently among Roman Catholics. In the second study, fewer depressive symptoms were found among the female elderly in countries, generally Roman Catholic, with high rates of regular church-attendance. Higher levels of depressive symptoms were found among the male elderly in Protestant countries.

Conclusions. Religious practice is associated with less depression in elderly Europeans, both on the individual and the national level. Religious practice, especially when it is embedded within a traditional value-orientation, may facilitate coping with adversity in later life.

INTRODUCTION

In the epidemiology of depression in later life, there is growing attention to religion. Studies from Northern America (Koenig *et al.* 1988; Idler & Kasl, 1992; Batson *et al.* 1993; Levin, 1994), as well as from Europe (Braam *et al.* 1997), have suggested that religious involvement generally helps to protect against depression. Although these results seem to be unanimous, there are large differences between the two continents with respect to the religious tradition. Indicators of the religious tradition, such as the

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adherence to traditional Christian beliefs, show a considerably stronger religious orientation in Northern America when compared to most European countries (Halman & De Moor, 1994). Nevertheless, the differences between religious climates among the European countries are also impressive (Davie, 1992). The present study aims to explore the influence of these differences on the prevalence of depression in later life.

Studies on religion and depression are often based on two, partly overlapping, theories (Ellison, 1994). The first emphasizes cognitive-psychological mechanisms, e.g. that people use religion as an aid in the cognitive structuring of their life (Dull & Skokan, 1995), or as a coping-strategy (Koenig *et al*. 1995; Pargament, 1997). The second theory is sociological, i.e. religion protects older adults against depression because it enhances social support (Durkheim, [1897] 1951). Attempts to explain the protective effect of religiousness through social support have not been successful (Idler & Kasl, 1992; Braam *et al*. 1997), suggesting that different social mechanisms may operate. Instead of only influencing depression through social support, religious traditions may affect social organization and the quality of relationships, shape value patterns and moral codes, and allow people to identify with a community, generating a 'sense of belonging' (Ellison *et al*. 1989). Assuming these more complex social mechanisms, religion may exert effects in people who need not be particularly religious, but still belong to a religious and sociocultural tradition.

The present study addresses the association between religious climate and depression in elderly people living in several European countries. The main hypothesis is that religious climate is associated with less depression in elderly Europeans, especially when it extends into public and cultural life. This is likely when the religious climate is more traditional, conservative, and devotional, and is characterized by regular participation in public religious activities. These characteristics may be predominantly encountered within the Roman Catholic tradition, which strongly adheres to traditional doctrines (Halman & De Moor, 1994, Weber, [1904] 1965).

Using data from the EURODEP collaboration, in which 14 research centres from 11 European countries co-operate (Copeland *et al*. 1999), two approaches were employed. First, from six centres, located in five countries (Ireland, England, Netherlands, Germany and Finland), associations were examined between individual religious involvement and depression (Study 1). Special attention was paid to the main religious traditions: Protestantism and Roman Catholicism. Secondly, we examined whether estimates of religious climate, assessed on the national level, explain cross-national differences in the number of depressive symptoms in older citizens from 11 European countries (Study 2). Because cross-national gender-differences in the prevalence of depression may be due to cultural influences (Wolk & Weismann, 1995), we also studied whether these gender-differences are associated with religious climate.

STUDY 1: SIX CENTRE COMPARISON

Method

Sample

The EURODEP Concerted Action is a consortium of 14 research groups from 11 European countries all engaged in population-based research into the epidemiology of late-life depression (Copeland *et al*. 1999). There are three countries (England, Germany and The Netherlands) in which two centres participated in EURODEP. Of the two Dutch samples, only the sample of the Longitudinal Aging Study Amsterdam (LASA) is included in the present study, because it is representative of the total Dutch population.

The six-centre comparison focuses on the EURODEP centres with data on individual religious involvement: Liverpool (Saunders *et al*. 1993); London (Livingston *et al*. 1990); the Netherlands (Beekman *et al*. 1995); Berlin (Helmchen *et al*. 1996); and Ähtäri, Finland (Pahkala *et al*. 1988). From Dublin, the first sample was not used (Lawlor *et al*. 1994), instead we used a second sample from the same research group ($N = 662$), because it included data on religious involvement.

Measures

Outcome variable

The six-centre comparison focuses on prevalence of depression at the syndrome or diagnostic level. The centres from Dublin, Liverpool and

Table 1. *Study* 1: *Characteristics of the samples of the six EURODEP centres with data on religious variables, age-range of* 65–85 *years* (*Berlin*: 70–85 *years*)

	Dublin* $N = 662$	Liverpool ALPHA $N = 3840$	London Gospel Oak $N = 583$	Netherlands LASA $N = 2050$	Berlin BASE $N = 271$	Finland Ähtäri $N = 992$
Female gender, %	61	50	59	51	49	61
Married	56	44	40	57	38	51
Age, mean (S.D.)	73 (5·5)	75 (6·0)	74 (5·9)	75 (5·8)	78 (4·6)	73 (5·4)
Years of education, mean (S.D.)	9·3 (2·0)	9·5 (1·7)	9·6 (2·5)	8·5 (3·3)	11 (2·4)	6·9 (1·8)
Church-attendance, %						
Never†	12	62	64	46	69	34
Occasional	6	13	17	19	24	61
Regular	82	25	20	35	7	6
Religious denomination, %						
Non-member	1	16	40	36	25	
Roman Catholic	97	29	18	30	13	
Protestant	2	42	34	30	60	100
Other Christian	0	11	5	3	2	
Other religion	0	3	3	1	1	
Depressed‡	8·3	9·8	17·5	16·4	15·1	16·4

* Different sample from that included in the pooled EURODEP sample.
† Or, once a year or less.
‡ Instruments: Dublin, Liverpool (ALPHA study) and Berlin (BASE) used GMS-AGECAT; London (Gospel Oak study) used SHORT-CARE-AGECAT; Netherlands (LASA) used CES-D $\geqslant 16$; Ähtäri used clinical examination based on DSM-III criteria.

Berlin used the Geriatric Mental State examination (GMS) to assess depressive symptoms (Copeland *et al*. 1986). In London, the short version of the Comprehensive Assessment and Referral Evaluation (SHORT-CARE) (Gurland *et al*. 1984), was used. From the GMS items and from the SHORT-CARE items in London, an AGECAT diagnosis of depression is derived, according to the procedure described by Copeland *et al*. (1986) for confidence levels of $\geqslant 3$. In the Dutch study, the Center for Epidemiologic Studies Depression scale (CES-D) (Radloff, 1977) was used. CES-D scores are dichotomized, using the validated criterion of scores of $\geqslant 16$ as indicative of a clinically relevant depressive syndrome (Beekman *et al*. 1997). In the Finnish study (Pahkala *et al*. 1988), a diagnosis of depression (major depressive, dysthymic, atypical, or cyclothymic disorder) is based on a clinical interview using the DSM-III criteria (American Psychiatric Association, 1980).

Predictor variables

Religious characteristics include church-attendance and religious denomination. Church-attendance is coded as 'regularly', 'occasionally' and 'never'. When the question was asked in more detail (the Netherlands, Berlin, and Ähtäri), 'regular' church-attendance is defined as visiting church at least once a week; 'never' as once a year or less; and 'occasional' as being in-between 'regular' and 'never'. Religious denominations are rubricated into five categories: no denomination, Roman Catholic, mainline Protestant (Anglican, Calvinist, or Lutheran), other Protestant, and other religion. 'No denomination' is used as the reference category.

Demographic variables

These include age, sex, education, and marital status.

Analyses

Prevalence of depression was compared for regular and occasional attenders *versus* never attenders, using separate logistic regression analyses for each centre, computing odds ratios (OR) and 95% confidence intervals (CI). The analyses were controlled for effects of demographic factors and religious denomination. Next, interaction effects between church-attendance and denomination were evaluated in an additional series of analyses. Finally, interaction effects between church-attendance and gender, as well as between denomination and gender were evaluated.

Table 2. *Study* 1: *depression, regressed on demographics, church-attendance, and religious denomination*; *results of logistic regression analysis*; *OR* (95% *CI*) *of final equations*

	Dublin	Liverpool	London	Netherlands	Berlin	Ähtäri (Finland)
Female *v.* male	1·77 (0·90–3·50)	1·36 (1·08–1·71)	1·28 (0·80–2·04)	1·53 (1·18–2·01)	1·08 (0·49–2·37)	1·39 (0·94–1·39)
Age (years)	0·94 (0·89–0·99)	0·98 (0·96–1·38)	0·99 (0·95–1·03)	1·02 (1·00–1·04)	0·98 (0·91–1·06)	1·04 (1·00–1·07)
Unmarried *v.* married	1·51 (0·81–2·82)	1·72 (1·34–2·20)	2·03 (1·23–3·36)	1·96 (1·51–2·56)	1·68 (0·70–4·02)	1·04 (0·20–5·44)
Education (years)	0·99 (0·86–1·14)	0·91 (0·85–0·98)	0·94 (0·85–1·03)	0·93 (0·90–2·04)	0·94 (0·80–1·10)	0·90 (0·80–1·01)
Church-attendance						
Never	1·00	1·00	1·00	1·00	1·00	1·00
Occasional	0·30 (0·08–1·09)	0·91 (0·66–1·26)	0·93 (0·49–1·77)	0·92 (0·64–1·33)	0·81 (0·35–1·90)	**0·62 (0·43–0·89)**
Regular	**0·20 (0·10–0·37)**	**0·58 (0·43–0·79)**	0·88 (0·41–1·89)	**0·61 (0·43–0·87)**	0·92 (0·18–4·61)	0·65 (0·30–1·42)
Religious denomination						
No denomination		1·00	1·00	1·00	1·00	
Roman Catholic	1·00	**1·60 (1·10–2·32)**	0·99 (0·43–2·27)	0·99 (0·69–1·43)	0·37 (0·07–1·95)	
Protestant		1·25 (0·89–1·75)	1·39 (0·81–2·40)	0·75 (0·53–1·07)	1·44 (0·61–3·40)	1·00
Other Christian		1·00 (0·61–1·63)	1·17 (0·37–3·69)	1·87 (0·95–3·68)	0·00 (0·00–∞)	
Other religion		1·65 (0·81–3·35)	1·78 (0·47–6·72)	1·06 (0·30–3·82)	0·01 (0·00–∞)	
Improvement by religious variables						
LRS (*P*)	21·9 (0·000)	16·8 (0·010)	2·5 (0·867)	24·0 (0·001)	6·3 (0·395)	6·7 (0·036)
df	2	6	6	6	6	2

Significant associations are shown in bold type.

Table 3. *Study* 1: *depression regressed on church-attendance and religious denomination within categories*; *results of logistic regression analysis*; *OR* (95% *CI*) *of final equations*, *controlled for effects of demographic variables*

	Dublin	Liverpool	London	Netherlands	Berlin	Ähtäri (Finland)
Roman Catholics						
Never	1·00	1·00	1·00	1·00	1·00	
Occasional	0·30 (0·08–1·09)	1·05 (0·60–1·85)	1·74 (0·33–9·16)	0·95 (0·52–1·74)	4·40 (0·07–271)	
Regular	**0·20 (0·10–0·37)**	**0·57 (0·37–0·88)**	0·72 (0·16–3·28)	**0·40 (0·22–0·73)**	0·00 (0·00–∞)	
Improvement, df = 2 [LRS] (*P*)	[21·9] (0·000)	[8·3] (0·016)	[1·6] (0·441)	[14·8] (0·001)	[1·2] (0·554)	
Protestants						
Never		1·00	1·00	1·00	1·00	1·00
Occasional		0·70 (0·43–1·13)	0·60 (0·25–1·43)	1·05 (0·51–2·17)	0·78 (0·31–1·96)	**0·62 (0·43–0·89)**
Regular		0·56 (0·31–1·00)	1·34 (0·41–4·41)	0·98 (0·55–1·73)	1·31 (0·24–7·17)	0·65 (0·30–1·42)
Improvement, df = 2 [LRS] (*P*)		[5·7] (0·057)	[2·0] (0·377)	[0·04] (0·980)	[0·4] (0·800)	[6·7] (0·036)
Never attenders						
Roman Catholic		1·00	1·00	1·00	1·00	
Protestant		0·84 (0·59–1·18)	1·39 (0·36–5·40)	**0·48 (0·24–0·95)**	4·21 (0·50–35·2)	
Improvement, df = 1 [LRS] (*P*)		[1·0] (0·319)	[0·2] (0·626)	[4·5] (0·035)	[2·5] (0·117)	
Occasional attenders						
Roman Catholic		1·00	1·00	1·00	1·00	
Protestant		0·54 (0·28–1·04)	0·58 (0·16–2·12)	**0·49 (0·25–0·94)**	1·76 (0·16–19·3)	
Improvement, df = 1 [LRS] (*P*)		[3·3] (0·069)	[0·7] (0.419)	[4·9] (0.027)	[0·2] (0.630)	
Regular attenders						
Roman Catholic		1·00	1·00	1·00	1·00*	
Protestant		0·77 (0·57–1·05)	3·23 (0·81–12·8)	1·20 (0·73–1·95)	1·28 (0·91–1·82)	
Improvement, df = 1 [LRS] (*P*)		[2·7] (0·103)	[2·7] (0·095)	[0·5] (0·471)	MH = 1·9 (0·168)	

* Due to low numbers no control for demographics; improvement tested by Mantel–Haenzel procedure (MH).
Significant associations are shown in bold type.

Results

Sample characteristics

The characteristics of the samples with data on religious denomination and church-attendance available are summarized in Table 1. The mean age is similar in all centres because only the age-cohort between 65–85 years was selected for the comparison. Percentage female and married participants as well as the level of education vary considerably across centres. The percentage of regular church-attendance was highest in Dublin, lower in England and the Netherlands, and lowest in Finland and Berlin. These findings show a very similar pattern to those which emerged from the European Value Survey, described by Halman & De Moor (1994). Because of the different methods of assessment employed among the centres, no direct comparison of prevalences of depression is possible.

Associations between church-involvement and depression

The results of the logistic regression analyses are shown in Table 2. Very similar risks of depression are found for the demographic variables across the six samples. Significant associations between regular church-attendance and depression are found in Dublin, Liverpool, and the Netherlands: regular attenders were at lower risk of depression than never attenders. The odds ratio found in the Irish study is clearly lower than those found in Liverpool and the Netherlands (and outside the 95% CI). In Ähtäri, both regular and occasional church-attenders have a reduced risk of depression. This association is only significant for the occasional church-attenders, due to their ten-fold higher number, compared to the regular attenders. There was no significant association between church-attendance and depression in London and Berlin.

As compared to 'no denomination', Roman Catholics in Liverpool were significantly more depressed, whereas there was a trend among the Calvinists in the Netherlands to be less depressed.

The interaction term between religious denomination and regular church-attendance was significant for the Netherlands (OR = 0·53; CI = 0·30–0·93) and almost significant for London (OR = 0·32, CI = 0·09–1·19, $P = 0·089$). The interaction terms are not significant for Liverpool (OR = 0·86; CI = 0·48–1·54) and Berlin (OR = 0·01, CI = 0·00–∞, which is due to absence of regular attenders among the depressed Roman Catholics). The results of additional analyses, stratified for all categories of church-attendance and denomination, are shown in Table 3 to detect possible patterns of risk on depression for any of the categories. For Roman Catholics from all five centres where Roman Catholics are found, there emerges a pattern of less depression (OR < 1) among the regular church-attenders, compared with non-attenders. In three centres, this association is significant (Table 3). For Prostestant respondents, no clear pattern emerges. When Protestants are compared directly with Roman Catholics within each attendance category, no clear pattern is found. Among the never and occasional attenders, Anglicans from England and Calvinists from the Netherlands tended to have less depression, which is, however, only significant in the Netherlands.

No significant interaction terms were found between gender and church attendance, or between gender and denomination (results not shown).

STUDY 2: MULTI-LEVEL APPROACH

Method

Sample

The overall sample size of the pooled EURODEP dataset amounts to 17739 subjects. Basic demographic characteristics of the 13 study-samples are summarized in Table 4 (references in Table). More detailed information on sampling-frame, interview procedures, and non-response have been described by Copeland *et al.* (1999).

Measures

Outcome variable

In the pooled data-set, the dependent variable is the number of depressive symptoms. Seven centres used the GMS (Copeland *et al.* 1986). Three other centres used the CES-D (Radloff, 1977), one the Comprehensive Psychopathological Rating Scale (CPRS) (Åsberg *et al.* 1978), one used the short version of the Comprehensive Assessment and Referral Evaluation (SHORT-CARE) (Gurland *et al.* 1984),

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Table 4. *Study* 2: *the EURODEP consortium – studies, depression assessment and subjects*

Centre	Instrument of depression assessment	Sample described by	Female %	Married %	Age Mean (range)	EURO-D Mean score	Total
Liverpool, England	GMS	Saunders *et al.* 1993	53	37	79 (65–108)	1·8	5222
Berlin, Germany	GMS	Helmchen *et al.* 1996	49	30	84 (70–103)	2·5	488
Dublin, Ireland	GMS	Lawlor *et al.* 1994	33	—	74 (64–93)	1·3	914
Iceland, Iceland	GMS	Magnusson, 1989	60	28	86 (83–89)	2·0	772
Munich, Germany	GMS	Meller *et al.* 1993	76	19	88 (85–99)	3·6	293
Verona, Italy	GMS	Turrina *et al.* 1991	62	53	74 (65–100)	1·8	202
Zaragoza, Spain	GMS	Lobo *et al.* 1995	53	53	75 (65–98)	1·6	1037
LASA*, Netherlands	CES-D	Beekman *et al.* 1995	51	57	75 (65–86)	2·1	1944
Bordeaux, France	CES-D	Fuhrer *et al.* 1992	58	58	75 (65–101)	2·2	3604
Antwerp, Belgium	CES-D	Roelands *et al.* 1994	47	58	77 (65–99)	1·9	1130
London, England	SHORT-CARE	Livingston *et al.* 1990	60	37	75 (65–99)	2·5	637
Gothenburg, Sweden	CPRS	Skoog *et al.* 1993	70	24	85 (85)	2·1	449
Ähtäri, Finland	Zung SDS	Pahkala *et al.* 1988	61	49	74 (65–95)	3·2	1047
Total			54·3	45·8	77·3	2·1	17739

* LASA: Longitudinal Aging Study Amsterdam.

and one the Zung Self-rating Depression Scale (SDS) (Zung, 1965). To obtain a pooled EURODEP data-set, these five different depression instruments were harmonized according to a procedure developed and validated by Prince *et al.* (1999). This resulted in the EURO-D scale, which comprises 12 items: depressive affect, pessimism, wishing death, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness.

Predictor variables

At the national level, five different religious climate estimates were derived from the European Value Study (EVS) (Halman & De Moor, 1994). This large-scale research programme surveyed basic values held by the populations of most European countries. The EVS observation cycle of 1990 covered all EURODEP countries. From the section 'Churches, Religion and Moral Values', the following estimates have been derived: national percentage of (1) Roman Catholics, (2) Protestants and (3) weekly church-attenders; and mean national scores on the (4) orthodoxy scale and (5) religious devotion index. These two scales have been described by Harding *et al.* (1986), based on an earlier EVS assessment cycle in 1980. The orthodoxy scale (Middendorp, 1979), assesses adherence to traditional Christian beliefs (life after death, a soul, the devil, hell, heaven and sin; range 0–12). The religious devotion index (range 0–5) is based on five items: being a religious person, belief in God, comfort and strength from religion, taking moments of prayer and meditation and importance of God.

Demographic variables

These include gender and age. Marital status is not selected as a control variable, because there are missing data from Dublin. Preliminary analyses, with and without controlling for marital status (data on marital status were imputed for Dublin) did not show any relevant different results. Therefore, the final analyses were performed without control for marital status.

Confounding variables on the centre level

When using the EURO-D scale, it is desirable to adjust the analyses for effects of the depression measurement procedure as applied in each centre. Therefore, dummy-variables have been made specifying the type of instrument (CES-D, CPRS, SHORT-CARE, or SDS centres, *versus* GMS-centres as the reference group). To control for confounding effects of cultural area, a second series of dummy variables was used, defining the European 'building blocks' (Davie, 1992). The following building-blocks were distinguished: Western Isles (Ireland and England), Nordic countries (Sweden, Finland, Iceland), Mediterranean (Spain, Italy) and Western-Europe (Germany, Netherlands, Belgium, France), which is used as the reference category.

Analyses

Hypotheses were tested using multi-level analysis

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Table 5. *Study 2: European Value Survey national estimates for religious climate (Study 2) – percentage Roman Catholics (RC), Protestants, regular church-attenders, and mean scores on the Orthodoxy Scale and the Religious Devotion Index*

	RC %	Protestant %	Regular attendance %	Orthodoxy (0–12)	Devotion (0–5)
Western Europe					
Germany	45	43	18	5·2	3·3
Netherlands	29	17	20	4·7	2·9
Belgium	68	1	27	4·6	3·1
France	58	1	10	4·4	2·3
Nordic					
Iceland	1	94	2	6·4	3·5
Sweden	1	77	4	3·8	1·6
Finland	0	89	4	6·2	2·8
West Isles					
Ireland	93	2	81	9·0	4·3
England	10	45	14	6·4	3·0
Mediterranean					
Italy	83	1	38	6·9	4·1
Spain	85	0	30	5·8	3·4

(Bryk & Raudenbush, 1992). Multi-level modelling facilitates the analysis of associations between higher level qualities and lower level phenomena, while controlling for covariates on both levels. This has the advantage that the results pertain to an individual outcome, adjusted for effects of individual background variables.

In the present study, the unit of measurement on the lower level is that of the individual respondent. Characteristics on this level involve EURO-D score as the dependent variable, and gender and age as confounding variables. The unit of measurement on the higher level is that of the 13 centres. Characteristics on this level are the five religious climate estimates, which represent the independent variables, and the type of instrument and the European building blocks as confounding variables. Furthermore, when significant cross-national gender differences of depression scores are observed, interaction effects are evaluated between religious climate and gender.

First, all five religious estimates are evaluated separately, including the interaction terms with gender (models I–V). After a check for multicollinearity, we determined which religious estimates should be omitted from the final model (model VI). The analyses are based on *z* scores for continuous variables, resulting in standardized coefficients. In additional analyses, the effects of the control variables on the centre level (instruments and building blocks) are assessed. When these variables are included in one model, the results are affected by problems of multi-collinearity, especially when a category of the dummy-variable represents one single centre. Therefore, only effects are evaluated of those dummy variables of which the categories include more centres together, which is carried out in separate models.

Results

EURODEP-sample: basic characteristics

As summarized in Table 4, there is some variation in age ranges between the centres, which is due to different sampling procedures (Copeland *et al.* 1999). The mean age is 77·3 years. High mean EURO-D scores are found in Munich and Finland, whereas the lowest mean EURO-D scores pertain to Ireland and Spain.

European Value Survey estimates

Table 5 summarizes the religious estimates of the countries involved. The predominantly Roman Catholic countries are Belgium, France, Ireland, Italy and Spain. The predominantly Protestant countries are Iceland, Sweden and Finland (all Lutheran). Some countries (Ireland, Italy) show high levels of religious practice, orthodoxy and devotion. Others (France, Sweden) score very low on these indices. In Iceland, Finland and England there is relatively little church-attendance, but the levels of or-

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Table 6. *Study* 2: *standardized coefficients* (*betas*) *from multilevel analyses*, *regressing individual EURO-D scores*, *indicating depressive symptoms*, *on*: (1) *gender and age* [*lower*, *individual level*, $N = 17739$]; (2) *aggregate*, *national estimates of religious climate* [*higher level*, *for* 11 *countries*]; *and* (3) *interactions between gender and national estimates of religious climate* [*interactions between lower-level and higher-level variables*]

	I β (S.E.)	II β (S.E.)	III β (S.E.)	IV β (S.E.)	V β (S.E.)	VI β (S.E.)
(1) Lower, individual, level						
Female (*v.* male)	0·11 (0·02)**	0·11 (0·02)**	0·10 (0·02)**	0·11 (0·02)**	0·11(0·02)**	0·11 (0·01)**
Age	0·08 (0·01)**	0·08 (0·01)**	0·08 (0·01)**	0·08 (0·01)**	0·08 (0·01)**	0·08 (0·01)**
(2) Higher, national level religious climate:						
Roman Catholic	−0·21 (0·14)					†
Protestant		0·24 (0·13)+				0·12 (0·21)
Regular attendance			−0·27 (0·13)*			−0·17 (0·29)
Orthodoxy				−0·16 (0·14)		−0·04 (0·22)
Religious devotion					−0·14 (0·15)	†
(3) Interactions between levels gender ×						
Roman Catholic	0·01 (0·02)					†
Protestant		−0·03 (0·02)				−0·09 (0·02)**
Regular attendance			−0·02 (0·02)			−0·09 (0·03)**
Orthodoxy				−0·03 (0·02)		0·03 (0·03)
Religious devotion					−0·01 (0·02)	†

+ $P < 0·10$; *$P < 0·05$; **$P < 0·01$.

† National percentage of Roman Catholics and mean national religious devotion scores are omitted from the final model because of high intercorrelations with the other estimates (see text).

thodoxy and devotion fall in the middle or high ranges.

Results from multilevel analyses

The inter-centre variance of EURO-D scores amounts to almost 25%. The effect of gender on EURO-D scores differs significantly across centres (1·8% of inter-centre variance, $P = 0·038$). The results of the separate multi-level analyses for each of the national religious climate estimates are shown in the first five columns in Table 6 (models I–V). A significant, positive association between gender and EURO-D score is found in all models, with female respondents reporting more depressive symptoms. There is also a positive association between age and EURO-D scores.

The only significant association between religious climate and EURO-D score concerns the national rate of regular church-attendance: in countries with a high rate of regular church-attendance, EURO-D scores are lower. The coefficient of percentage Protestants is in the opposite direction, and concerns a statistical trend ($P = 0·078$) indicating higher EURO-D scores in Protestant countries. The separate analyses do not show significant interaction effects between gender and any of the religious climate variables.

To avoid problems of multi-collinearity, both the percentage Roman Catholics and the mean national religious devotion score are omitted from further analysis. This was necessary because these two indices show substantial intercorrelations (above 0·70; $P < 0·001$) with the other religious climate indices. The percentage of Roman Catholics strongly correlates with percentage of Protestants ($r = -0·88$), and with percentage of regular church-attendance ($r = 0·78$). Mean religious devotion score correlates with percentage of regular church-attendance ($r = 0·70$), and with mean national orthodoxy score ($r = 0·80$).

Percentage Protestants, percentage regular church-attendance and mean orthodoxy score are incorporated in model VI. Direct effects of these estimates on EURO-D scores are smaller than those from the separate analyses (models II–IV) and no longer significant. On the other hand, two significant interaction effects emerge from this model.

First, a Protestant climate mitigates gender

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differences in levels of depressive symptoms ($\beta = -0{\cdot}09$, $P < 0.001$). Additional analysis of variance shows that there is no substantial gender difference in EURO-D score in predominantly (> 75%) Protestant countries (mean EURO-D scores: males 2·4; females 2·5), whereas in other countries there remains a substantial difference (males 1·8; females 2·2).

Secondly, the percentage of regular church-attendance also mitigates the gender differences ($\beta = -0{\cdot}09$, $P = 0{\cdot}004$). In countries with considerable levels (> 25%) of weekly church-attendance, the gender-difference is small (mean EURO-D scores: male 1·9; female 2·0), whereas it remains more pronounced in other countries with little church-attendance (male 1·9; female 2·2).

The variance explained in EURO-D score by model VI is modest, and amounts approximately 4%. The total contribution by the religious climate variables to the inter-centre variance of EURO-D scores is approximately 24%. The interaction effects between religious climate and gender on EURO-D scores reduce the proportion of inter-centre variance by gender to insignificance (0·7%; $P = 0{\cdot}142$).

The results remain unaffected in all additional analyses (results not shown), separately controlling for centre-effects of either CES-D centres or GMS-centres, and for building-blocks effects of Western Europe, Nordic countries, British Isles and Mediterranean countries.

DISCUSSION

The impact of religion on depression and depression in elderly Europeans was examined as part of the EURODEP collaboration, this was a multi-centre initiative in 11 European countries. Two approaches were employed: a six centre (five countries) comparison, and a 13 centre (11 countries) ecological approach.

Study 1

In the first study, associations were evaluated between religious involvement and depression on the syndrome level. Summarizing the main results, regular church-attendance was associated with a lower prevalence of depression. For Roman Catholics there emerged a pattern of lower depression rates especially among the regular church attenders. These findings are very similar to the results described by Kennedy *et al.* (1996), pertaining to older Roman Catholics living in New York. Roman Catholicism with its emphasis on liturgy and ritual, might therefore be successful in establishing a uniform religious doctrine and practice, which exerts similar, probably protective, effects against depression in different countries.

The question may be raised whether the fairly consistent, inverse association between individual church-attendance and depression in the six-centre comparison could be attributed to other factors that are known to affect depression in later life. Physical health status, health practices, and social ties are frequently mentioned as possible confounders. Nevertheless, recent research from the United States (Idler & Kasl, 1997) and the Netherlands (Braam *et al.* 1997) demonstrates that the role of these variables in the effects of church-attendance on depression is limited.

Study 2

The second study focused on ecological associations between religious climate and depressive symptoms, which were assessed using the EURO-D scale. The main findings of the final model are that both national rate of regular church-attendance and Protestantism mitigated the gender difference with respect to levels of depressive symptoms. In Protestant countries (represented by the Nordic EURODEP populations), male respondents had relatively high depression scores, almost equal to the scores of female respondents. In countries with high levels of church-attendance (all contributing Roman Catholic countries, except France), female respondents had depression scores at almost the same, low level as the scores of male respondents. This latter finding is similar to results described by Neeleman and colleagues (1997), who found lower female, but not male, suicide rates among adults of all ages in countries with high levels of church attendance. These authors employed a very similar approach, also using data from the EVS, expanded with American data.

Explanations and alternatives

The national estimates were aimed at reflecting national culture and did not necessarily pertain to individual subjects. Therefore, the results

tentatively show that religion can influence depression through sociological pathways on a macro-level, which, for example, may relate to group identity, value patterns and moral codes, regardless of personal devotion. Cross-national differences could, however, also be attributed to other factors than religion, such as economical circumstances and national history, especially in countries in which the oldest generation suffered heavily from the World Wars in the twentieth century. Because of the modest amount of variance explained in the depression scores in the present study, other cross-cultural determinants of depression in later life remain to be elucidated.

The present results do not provide insight into the possibility of substitute psychiatric syndromes, as was described by Levav and colleagues (1997), who described an increased vulnerability to depression of male Jewish adults in the US, among whom, in turn, lower rates of alcoholism were found. Therefore, it is recommended that a diversity of psychiatric syndromes should be assessed in future cross-national studies.

Methodological issues

Non-response and differences in sampling strategy are difficult to avoid in large multi-centre initiatives. Many of these problems have been discussed by Copeland *et al*. (1999) and Prince *et al*. (1999). One other limitation concerns the fact that the measurement of depression varied across countries, which reduced the possibility of comparing direct prevalence rates of depression between the centres. Although this was partly solved by the use of a harmonization procedure for depressive symptoms, the resulting EURO-D scale misses some relevant symptoms, such as psychomotor inhibition and agitation. Moreover, the psychometric properties of the EURO-D scale are somewhat lower than those of regular depression scales. This may have lead to underestimation of the associations studied.

Finally, a major concern with studies of the geographical distribution of depression and suicide is the 'ecological fallacy': treating group data as though they were individual data (Van Poppel & Day, 1996). The present method has avoided this shortcoming, as far as possible, by applying the multilevel approach, which allowed controlling for effects of basic demographic variables and inspection of interactions between the levels of measurement.

Conclusion

In the epidemiological study of religion and depression in later life, a cross-national method has not been employed before. In spite of practical and methodological limitations, the results add to the insight that elderly people, and women in particular, benefit from a cultural environment in which religious practices are still accessible. It might be valuable to gain more insight into the macro-sociological mechanisms that foster the relationship between culture and personal resources, such as self-esteem and locus of control, which facilitate coping with adversity in later life.

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