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1 Does equality legislation reduce intergroup differences?
2 Religious affiliation, socio-economic status and mortality in
3 Scotland and Northern Ireland: a cohort study of 400,000
4 people.

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18

19 **Abstract**

20 Religion frequently indicates membership of socio-ethnic groups with distinct health behaviours and
21 mortality risk. Determining the extent to which interactions between groups contribute to variation
22 in mortality is often challenging. We compared socio-economic status (SES) and mortality rates of
23 Protestants and Catholics in Scotland and Northern Ireland, regions in which interactions between
24 groups are profoundly different. Crucially, strong equality legislation has been in place for much
25 longer and Catholics form a larger minority in Northern Ireland. Drawing linked Census returns and
26 mortality records of 404,703 people from the Scottish and Northern Ireland Longitudinal Studies, we
27 used Poisson regression to compare religious groups, estimating mortality rates and incidence rate
28 ratios. We fitted age-adjusted and fully adjusted (for education, housing tenure, car access and
29 social class) models. Catholics had lower SES than Protestants in both countries; the differential was
30 larger in Scotland for education, housing tenure and car access but not social class. In Scotland,
31 Catholics had increased age-adjusted mortality risk relative to Protestants but variation among
32 groups was attenuated following adjustment for SES. Those reporting no religious affiliation were at
33 similar mortality risk to Protestants. In Northern Ireland, there was no mortality differential between
34 Catholics and Protestants either before or after adjustment. Men reporting no religious affiliation
35 were at increased mortality risk but this differential was not evident among women. In Scotland,
36 Catholics remained at greater socio-economic disadvantage relative to Protestants than in Northern
37 Ireland and were also at a mortality disadvantage. This may be due to a lack of explicit equality
38 legislation that has decreased inequality by religion in Northern Ireland during recent decades.

39

40 **Keywords:** UK; mortality; equality legislation; religion; socio-economic status.

41

42 **Introduction**

43 There is strong evidence that religion influences mortality risk through several mechanisms,
44 including by the direct effects of spirituality on health and also by means of shared social capital,
45 values and health behaviours of coreligionists (Sullivan, 2010). Religious involvement and practice
46 has been associated with increased life expectancy (Hummer et al., 1999; McCullough et al., 2000)
47 and variation in mortality rates among religions has been widely reported which is not completely
48 explained by underlying variation in socio-economic status (SES) (Räsänen et al., 1996; O'Reilly and
49 Rosato, 2008; Lerch et al., 2010). Mortality differences have also been found among denominations
50 of the same religion that share a broad ethnic grouping. For example, there is significant variation in
51 mortality among Christian denominations in Northern Ireland, with some conservative Protestant
52 groups having reduced risk of alcohol and lung-cancer related deaths as a result of abstinence from
53 alcohol and tobacco (O'Reilly and Rosato, 2008). Variation among religions extends to the
54 experience of health conditions; some denominations report poorer health than others at a given
55 level of clinical need (O'Reilly and Rosato, 2010) and there are interactions between the protective
56 effects of religiosity and denomination (Sullivan, 2010). The balance between direct and indirect
57 effects of religion on health varies and in some contexts religious affiliation acts primarily as an
58 indicator of underlying sociological, cultural and ethnic identities and health behaviours, rather than
59 as an indicator of religious practice (Field, 2014).

60 Interactions between religious groups may also influence health outcomes regardless of whether
61 affiliation indicates practice or simply group membership, most notably where there is violent
62 conflict (Pedersen, 2002). In less extreme cases where tensions exist between groups it is difficult to
63 untangle the relative influences of group characteristics and between group interactions. For
64 example, migrant groups may face discrimination and difficulty assimilating into settled populations
65 potentially leading to stress and mental health problems (Levecque and Van Rossem, 2015) but
66 these may be offset by greater resilience and better physical health among those prepared to move
67 (Lu and Qin, 2014). To further complicate matters, exposure to intergroup tensions is likely to vary
68 with the distribution of minority and majority groups and there is evidence that health outcomes
69 worsen with increasing dispersion of minority groups among the majority (Bosqui et al., 2014).
70 Associations between group density and health have been investigated extensively in terms of
71 ethnicity (Bécares et al., 2012) but similar mechanisms are likely to apply for other group indicators
72 including religious affiliation.

73 Assessing the balance between intra- and intergroup influences could make a valuable contribution
74 towards targeting of interventions to improve population health. Here we describe an experiment of

75 history and geography comparing mortality rates in two regions of the UK, Scotland and Northern
76 Ireland, sharing the same major religious groups but in which interactions between the groups are
77 profoundly different. Religious affiliation and practice have played major roles in the cultural
78 development of both regions and whilst practice has waned in recent decades, affiliation remains a
79 strong indicator of socio-cultural identity. Geographical proximity has led to frequent mixing of these
80 populations; Scotland is historically strongly Protestant, but with a substantial and somewhat
81 localised Catholic minority (16% of the population at the 2011 Census) descended from mass Irish
82 immigration during the 19th century (Williams, 1994). In recent decades levels of religious affiliation
83 among Protestants have declined sharply and a large proportion of the population describe
84 themselves as having no religion (Raab and Holligan, 2012). In Northern Ireland a large proportion of
85 the Protestant population is descended from Scottish migrants who moved as part of the planned
86 colonisation (Plantation) of Ulster during the 17th Century. Following the partition of Ireland in
87 1921, Catholics formed a minority in Northern Ireland that has increased in subsequent decades
88 (Catholics formed 45% of the population at the 2011 Census).

89 In both regions there is a long history of tension along Protestant/Catholic lines, the recent
90 manifestations of which differ. In Northern Ireland, civil unrest partly fuelled by discrimination
91 against Catholics escalated into a violent sectarian conflict ('The Troubles') that lasted from 1969 for
92 almost 30 years and in which over 3600 people were killed and many more wounded (Morrissey et
93 al., 1999). Throughout this period several pieces of legislation were introduced to promote equality;
94 the Fair Employment (Northern Ireland) Acts (1976, 1989) required employers to adopt fair
95 recruitment and employment practices and regularly report the composition of the workforce by
96 religion. These were superseded by the Fair Employment and Treatment Order (1998 - FETO) that
97 also prohibited discrimination in the provision of goods and service. Following the Good Friday peace
98 agreement of 1998 the Northern Ireland Act was introduced, requiring public bodies to explicitly
99 consider the impact of new policies on equality (Section 75). Composition of the workforce changed
100 over these decades to more closely match the mix of Protestants and Catholics available for work
101 but inequalities in provision of social housing (covered by other legislation) were not reduced to the
102 same extent (Russell, 2012; Cunningham, 2015) and residential segregation of Protestants and
103 Catholics remained widespread (Boal, 2002; Lloyd and Shuttleworth, 2012; Shuttleworth et al., 2013;
104 Doherty and Poole, 1997). In Scotland, although widespread violent conflict has been avoided,
105 debate regarding the prevalence of sectarianism prompted the late introduction of religion
106 questions to the 2001 Census. It has been suggested that prejudice against the minority Catholic
107 population in the employment market has restricted upward social mobility, leading to higher levels
108 of health problems associated with economic deprivation (Walls and Williams, 2004; Walls and

109 Williams, 2003). Equality legislation of the type seen in Northern Ireland was not enacted in Scotland
110 or the rest of Great Britain until the Equality Act of 2010 and there remains no analogue to the FETO.
111 In neither region have the longer term impacts of equality legislation on population health been
112 assessed.

113 We aimed to assess the relative influence of interactions between and characteristics of religious
114 groups on health, quantifying variation in SES and mortality rates in Scotland and Northern Ireland
115 by religion. In doing so we informally tested the hypothesis that equality legislation has been
116 beneficial in terms of reducing health inequalities between denominations in Northern Ireland.
117 There is evidence that Catholics in both Scotland and Northern Ireland have greater mortality risk
118 than non-Catholics, largely explained by lower SES (O'Reilly and Rosato, 2008; Millard et al., 2015)
119 but we expected that the differentials between groups in both SES and mortality risk would be larger
120 in Scotland. We addressed the following research questions: a) Is there evidence Catholics are more
121 disadvantaged relative to Protestants in Scotland than in Northern Ireland? b) Are there differences
122 in mortality risk among religious groups in Scotland and Northern Ireland? c) To what extent might
123 these be explained by differences in SES between groups?

124 **Methods**

125 **Data sources**

126 The Scottish Longitudinal Study (SLS) and Northern Ireland Longitudinal Study (NILS) are prospective
127 record-linkage studies, derived from health card registrations and Census returns to which vital
128 event data (births, marriages and deaths) have been linked. The SLS and NILS contain 5.3% and 28%
129 samples of the respective populations (approximately 274,000 members in Scotland and 500,000 in
130 Northern Ireland) and began with the 1991 and 1981 Censuses respectively. Details of the SLS, NILS
131 and linkage processes are described elsewhere (O'Reilly et al., 2012; O'Reilly et al., 2008; Boyle et al.,
132 2009). SLS and NILS data are held in secure environments at the General Register Office for Scotland
133 (GROS) and Northern Ireland Statistics and Research Agency (NISRA) and the use of these data were
134 approved by the ethics committees of the School of Geography and Geosciences, University of St.
135 Andrews and the Office for Research Ethics Northern Ireland respectively.

136 **Characteristics of the cohort**

137 The cohort consisted of 156,448 people from the SLS and 248,255 people from the NILS, aged
138 between 25 and 74 at the 2001 Census. The follow-up period lasted 6 years 8 months and the cohort
139 experienced a total of 15,955 deaths during follow-up. People living in communal establishments
140 and those reporting a non-Christian religion (1.6% in Scotland and 0.4% in NI) were excluded.

141 In addition to age and sex we selected covariates from Census returns that have previously been
142 associated with variation in mortality risk. Four indicators of socio-economic status were included.
143 Social class was derived using the National Statistics Socio-economic Classification (NS-SEC)(Rose and
144 Pevalin, 2002) of occupations to create seven categories (professional, intermediate, small
145 employers/self-employed, lower supervisory, semi-routine/routine, never worked/long term
146 unemployed, full-time student). A six category classification of educational attainment was used
147 (university degree or equivalent, foundation degree/HNC, A-level/Higher, GCSE/Standard grade/O-
148 Grade, no recorded qualifications) along with three categories describing household car access (no
149 access, one car, two or more). Finally, three categories of household tenure were defined (owner
150 occupied, social rented, other).

151 Current religious affiliation was ascertained using the relevant census questions. The list of response
152 options differed between Scotland and Northern Ireland so responses were classified into four main
153 groups: Roman Catholic, Protestant, people reporting no religion and those that did not respond to
154 the questions. In Northern Ireland, there was a two part question on current religious affiliation.
155 Respondents were first asked if they belonged to any particular religion; those responding negatively
156 constituted the 'no religion' analysis category. Those reporting an affiliation were asked what
157 religion, denomination or body they were affiliated with. Respondents could choose from a list of
158 four major Christian denominations (Roman Catholic, Presbyterian Church in Ireland, Church of
159 Ireland, Methodist Church in Ireland) or specify 'Other' affiliation. For analysis purposes the three
160 Protestant denominations were aggregated. In Scotland, a single question concerned current
161 affiliation with the following response options: None, Church of Scotland, Roman Catholic, Other
162 Christian, Buddhist, Hindu, Jewish, Muslim, Sikh, Another Religion. The Church of Scotland and
163 'Other Christian' groups were aggregated as Protestant for the analysis. Those from all non-Christian
164 religions were considered to have 'Other' affiliation. In both countries, the small number of
165 individuals reporting 'Other' affiliation (NILS = 769; SLS = 2551) were excluded from the cohort prior
166 to analysis.

167 **Analysis strategy**

168 The primary outcome measure was all-cause mortality during follow-up. We estimated mortality
169 rates using Poisson regression models with person-years as the offset to obtain incidence rate ratios
170 (IRRs) and 95% confidence intervals (CIs) comparing those with different religious affiliation,
171 adjusting first for age (using five year age classes) and then for both age and all measured covariates.
172 We fitted separate models for each sex because preliminary analysis revealed interactions between
173 sex and some covariates. We did not estimate mortality rates for people older than 74, censoring

174 these individuals at the age of 75 because beyond this age responses to the NS-SEC and educational
175 attainment Census questions are not required.

176 A key feature of this study is the use of 'eDatashield' methodology to jointly analyse the two
177 longitudinal studies at the individual level without individual level data being released from either of
178 the secure settings (Wolfson et al., 2010). Relevant census questions were selected from each
179 dataset and variables harmonised to ensure that factor levels were equivalent across both (e.g.
180 matching Scottish and Northern Irish educational qualifications). Models were then fitted in the *R*
181 software environment (R Development Core Team, 2015) using specialist code which extracts the
182 score and information matrix at each iteration of a Generalised Linear Model fitting process,
183 combining them and returning them across and to all sites, repeating until model convergence. This
184 is mathematically equivalent to an actual pooled analysis (Jones et al., 2012) which in the case of the
185 NLS and SLS would be prohibited.

186 **Results**

187 Descriptive data from the populations by religion are given in Table 1. In Scotland, Catholics were
188 socio-economically disadvantaged relative to Protestants, having lower levels of education, car and
189 home ownership, although distribution of people among social classes (NS-SEC) was similar across
190 religious groups. Those with no religious affiliation were at a slight advantage in terms of education
191 compared with Protestants. Those who did not respond to the census question on religion had
192 similar socio-economic characteristics to Catholics (Table 1).

193 In Northern Ireland Catholics were disadvantaged relative to Protestants with lower levels of home
194 and car ownership and higher unemployment, despite similar educational achievement (Table 1).
195 People reporting no religious affiliation were younger on average than Protestants or Catholics, were
196 better educated (35% with no qualifications compared with 48% for Catholics and Protestants) and
197 were more likely to hold professional jobs, but were less likely to own homes. Those who did not
198 respond to the census question had very similar characteristics to Catholics.

199 There were substantial differences in the overall SES profiles of Scotland and Northern Ireland. A
200 smaller proportion were in the 'Professional' social class in Scotland than Northern Ireland but this
201 was balanced by a larger proportion with routine occupations and much greater proportion of
202 students. Overall, there was a more even distribution of people among social classes in Scotland
203 than Northern Ireland. The proportion with the highest levels of education (degrees) was similar
204 across both countries but Scotland had far fewer with no qualifications (a third vs. almost half in
205 Northern Ireland). Levels of car access and house ownership were considerably lower in Scotland.

206 There was greater variation between countries in SES profiles (for the two main groups combined)
207 than between Catholics and Protestants within either country. For example, the difference between
208 proportions with no qualifications in Scotland (30%) and Northern Ireland (48%) was larger than the
209 difference between Catholics and Protestants in Scotland (34% vs. 29%) and Northern Ireland (no
210 difference between groups). The differential between Catholics and Protestants (i.e. Catholic
211 disadvantage) was larger in Scotland than Northern Ireland in terms of education, housing tenure
212 and car access. The differential in terms of social class was less consistent, being similar across
213 countries for most classes but notably larger in Northern Ireland for specific classes (e.g.
214 unemployed, intermediate).

215 In fully-adjusted models including a religion by country interaction, mortality rates across both
216 countries increased with deprivation across the majority of observed socio-economic factors (Table
217 2). For both sexes, car and home ownership were associated with decreased mortality risk. The
218 relationships between educational qualifications, social class and mortality rates differed between
219 sexes. Men with degrees had reduced mortality risk relative to all other groups and men with no
220 qualifications were at greatest risk (IRR = 1.37 [1.26, 1.50]). Women with no qualifications were at
221 increased mortality risk relative to degree holders (IRR = 1.37 [1.23, 1.54]) but risks for those with
222 intermediate qualifications were similar to those for degree holders. Men with routine or lower
223 supervisory jobs were at elevated mortality risk compared with those in the top three groups
224 (professional, intermediate or small employers/self-employed) and unemployed men were at still
225 greater risk. There were no significant differences in mortality risk among employed women but the
226 unemployed or students were at increased risk.

227 Overall risk of mortality was higher in Scotland than Northern Ireland for both sexes (fully-adjusted
228 models without a religion by country interaction; Table 3). There was greater variation among
229 denominations in age-adjusted mortality rates for men in Scotland than in Northern Ireland (e.g. IRR
230 ranges for men: 0.96, 1.39 in Scotland; 1.00, 1.21 in Northern Ireland; Table 3). There were similar
231 levels of variation among women in age-adjusted mortality rates in both countries. In Scotland,
232 Catholic men had an estimated 39% higher risk of mortality than Protestant men, not adjusting for
233 socio-economic status (Table 3). The differential was reduced to 14% in fully adjusted models.
234 Among women the same pattern was observed although the age- and fully-adjusted excesses were
235 only 29% and 12% respectively. In Northern Ireland there were no significant differences between
236 Catholics and Protestants in age- or fully adjusted models for either men or women.

237 In Scotland, both men and women reporting no religious affiliation had similar mortality risks to
238 Protestants. People who did not respond to the Census question were at greater risk than

239 Protestants although this effect disappeared for women following adjustment for socio-economic
240 status (Table 3). In Northern Ireland, men but not women reporting no religious affiliation were at
241 greater risk than Protestants. Men who did not respond to the Census question had similar risks to
242 Protestants but women who did not respond were at substantially greater risk (Table 3).

243 Discussion

244 We found considerable variation by religious affiliation in age-adjusted mortality rates and SES that
245 was potentially driven by interactions among groups. The socio-economic differential between
246 Catholics and Protestants was greater in Scotland (e.g. double the percentage difference in house
247 ownership compared with Northern Ireland) as was the differential in age-adjusted mortality rates,
248 especially among men. One explanation for this inequality is sectarian conflict which is most overt in
249 relation to provision of Catholic schools and among fans of rival sports clubs (Bradley, 2006; Flint,
250 2012). More profoundly, lower socio-economic status and concomitant health problems among
251 Scottish Catholics relative to Protestants have been attributed to discriminatory employment
252 practices and latent sectarianism (Walls and Williams, 2003; Walls and Williams, 2004). Other
253 authors dispute the importance of sectarianism in modern Scotland and suggestions that it
254 contributes to the Scottish effect (excess mortality in Scotland in comparison with other regions of
255 the UK that is not entirely explained by socio-economic status (SES) at either the individual or area
256 level (Popham and Boyle, 2011)) have received little support (Graham et al., 2012). In our study
257 Scottish Catholics had higher rates of unemployment than all other groups, consistent with our
258 hypothesis that Catholic disadvantage would be more pronounced in Scotland due to the historical
259 lack of explicit legislation banning discrimination by religion. Furthermore, legal protection may be of
260 greater importance in Scotland due to the smaller relative size of the minority group (Catholics
261 constituted 16% and 38% of the sample in Scotland and Northern Ireland respectively). Individuals in
262 smaller minority groups are potentially exposed to a greater number of negative encounters with
263 members of the majority group, although the spatial distribution of the respective communities is
264 also likely to influence exposure (White and Borrell, 2011). These factors might also explain the
265 differing patterns of SES-adjusted mortality rates across countries; Scottish Catholics were at
266 elevated risk relative to Protestants but in Northern Ireland there was no such differential.

267 We found little evidence that religious affiliation contributed additional mortality risk above that
268 explained by SES, instead finding considerable variation within groups between sexes and countries.
269 The majority of this variation was explained by socio-economic factors, indicating that the main
270 religious groups in Scotland and Northern Ireland have similar lifestyles and health behaviours at
271 given levels of deprivation. A previous study in Northern Ireland found that Catholics had similar

272 risks of mortality in comparison with all other groups combined (including those with no religion) but
273 that some Protestant groups, notably more conservative denominations were at reduced risk when
274 considered separately (O'Reilly and Rosato, 2008). These beneficial health outcomes were attributed
275 to the negative attitudes of these groups to alcohol and tobacco. Similarly, a recent Scottish study
276 reported differentials in social class and deprivation between those raised in the Church of Scotland
277 and 'other Christians' (Millard et al., 2015), differences that were reflected in mortality rates (least
278 deprived and lowest mortality for 'other Christians'). A limitation of our study was that by
279 aggregating across Protestant denominations we were unable to explore these effects.

280 An alternative explanation for the socio-economic and mortality disadvantages for Scottish Catholics
281 is that as many are descended from Irish immigrants who arrived in the 1840s, there has been
282 insufficient time to overcome the socio-economic disadvantages faced by migrant relative to
283 established populations (Abbotts et al., 1997; Williams, 1994). In Britain, successive generations
284 claiming Irish Catholic ethnicity have experienced gradual improvements in health outcomes but
285 inequalities with the rest of the population persist (Abbotts et al., 1997; Raab and Holligan, 2012).
286 The health inequalities faced by the Irish diaspora in England are still detectable in the second and
287 third generation post-immigration even though socio-economic inequalities have decreased (Das-
288 Munshi et al., 2013; S Harding et al., 1996; S Harding and R Balarajan, 2001). Regardless of the causal
289 pathway, Catholics in Scotland remain disadvantaged relative to Protestants in both socio-economic
290 and health terms and so it might be beneficial to explore policies aiming to redress this imbalance,
291 perhaps seeking inspiration from Northern Ireland where interdenominational differences in socio-
292 economic status have been reduced in recent years (Todd and Ruane, 2011).

293 The degree of excess mortality that we found among Scottish men relative to Northern Irish men
294 was consistent with that in a comparison of mortality rates in Belfast and Glasgow (Graham et al.,
295 2012) but we found considerably greater excess risk among Scottish women than was found among
296 women in Glasgow. Although Scottish Catholics remained at slightly higher mortality risk than
297 Protestants when socio-economic conditions were accounted for, religious affiliation is unlikely to be
298 a major contributor to the Scottish effect because Catholics constituted just 16% of the sample and
299 the majority Protestant group were also at elevated risk compared with their Northern Irish
300 counterparts.

301 Protestants and Catholics combined formed the vast majority of the study populations (70% and
302 87% in Scotland and Northern Ireland respectively) but a third group, those reporting no current
303 religious affiliation constituted a quarter of the sample from Scotland. This group is increasingly
304 important; the proportion of the Scottish population describing themselves as belonging to no

305 religion has increased over recent years and is largely formed of younger people with a Protestant
306 heritage (Raab and Holligan, 2012). In our cohort this group was at a slight advantage in terms of
307 education compared with Protestants, reflecting the relative youth of the 'no religion' group. Those
308 in Scotland with no religion had similar mortality risks to Scottish Protestants and so our
309 comparisons along Protestant/Catholic lines are unlikely to have altered if this group of 'ex-
310 Protestants' was included. In Northern Ireland also, the 'no religion' group was slightly younger and
311 more highly educated in comparison with Protestants and Catholics. There was some indication that
312 among men mortality risks were higher for those with no religion but given the relatively small size
313 of the 'no religion' group and that the association was not evident among women, strong
314 conclusions should not be drawn from this result. The 'no religion' group was proportionally much
315 smaller in Northern and Ireland than in Scotland and the fact that a larger proportion of the
316 Northern Ireland population reported either Protestant or Catholic affiliation suggests that these
317 markers of political and national identity retain greater importance in the more openly divided
318 political space of Northern Ireland than in Scotland.

319 In Scotland, those that did not respond to the Census questions on religious affiliation had similar
320 SES and mortality risks to Catholics. In Northern Ireland the similarities between the Catholic and
321 non-respondent groups were less clear; SES of both sexes and mortality risks for men were very
322 similar between groups but estimated mortality risks for women appeared higher for non-
323 respondents than Catholics (although this contrast was not statistically significant given the low non-
324 response rate). These findings indicate that Catholics formed the majority of non-respondents in
325 both regions perhaps due to distrust of government institutions. It is notable that non-response
326 rates were similarly low in both countries, despite the fact that in Scotland response to the Census
327 religion question was voluntary whereas in Northern Ireland responses were compulsory.

328 Religious affiliation and ethnicity are closely interlinked in both Scotland and Northern Ireland. The
329 majority of people who identify themselves as 'white Irish' in Scotland are Catholic (Office of the
330 Chief Statistician, 2004). Similarly Presbyterians, one of the major Protestant groups in Northern
331 Ireland share strong historical and ethnic links to successive waves of Scottish immigration, the
332 largest of which began during the 17th century (Whan, 2013). Despite these ties, our analysis of
333 mortality risks by current religion augments recent studies of interethnic variation in Scotland. Our
334 finding that Catholic men were at increased risk of mortality relative to Protestants was not reflected
335 in comparisons of health outcomes between white Irish and white Scottish people. There were no
336 significant differences in incidence rates for chest pain, angina, heart failure, stroke and several
337 cancers between these two groups (Bhopal et al., 2012b; Bhopal et al., 2012a; Bhopal et al., 2012c;

338 Fischbacher et al., 2007). Therefore, current religious affiliation appears to provide additional
339 information to ethnicity when investigating health outcomes in Scotland.

340 We used a novel method (eDatashield) to simultaneously analyse individual-level data from both
341 datasets without sharing sensitive data between countries, enabling us to make direct comparisons
342 of the patterns present in each country. This approach brings advantages in terms of statistical
343 power over traditional meta-analysis of data from multiple sites. Despite this strength, in common
344 with many longitudinal studies of health determinants, there remains the potential for confounding
345 by unobserved variables. The measures of socio-economic status that we selected are all recognised
346 predictors of mortality but important health-related variables including alcohol consumption or
347 smoking status were not included in the census questionnaires. As linkages between administrative,
348 health and census data become more common the scope for controlling for and investigating these
349 effects should widen.

350 A limitation of this study was that we restricted analysis to people for whom the full range of SES
351 information was available, thus excluding those aged 75 and over. It is possible that this age group
352 may exhibit a different pattern of mortality differentials between Protestants and Catholics as a
353 result of changes in the relationships between the groups over time. In Northern Ireland, older
354 cohorts were potentially exposed to greater sectarian tension prior to the peace agreements and so
355 might exhibit differentials in mortality not seen among the younger cohorts. An interesting line of
356 future work would be to investigate this potential cohort effect and to determine whether mortality
357 differentials have changed over time in Scotland. Data from additional Censuses have recently been
358 added to both the SLS and NILS which now extend for 20 and 30 years respectively and which would
359 now render such an analysis possible.

360 In conclusion, we have shown that mortality differentials among religious groups are not consistent
361 across Scotland and Northern Ireland, countries where religious affiliation has historically been an
362 important cultural identifier.

363 In Scotland, Catholics remain at a greater socio-economic disadvantage relative to Protestants than
364 in Northern Ireland and are also at mortality disadvantage. These disadvantages may result from
365 sectarian discrimination acting on a much smaller minority group that is without the protection of
366 the well- established anti-discrimination legislation enacted in Northern Ireland.

367 **References**

- 368 Abbotts, J., Williams, R., Ford, G., Hunt, K., West, P., 1997. Morbidity and Irish Catholic descent in
369 Britain: An ethnic and religious minority 150 years on. *Social science & medicine* 45, 3-14.
- 370 Bécares, L., Shaw, R., Nazroo, J., Stafford, M., Albor, C., Atkin, K., Kiernan, K., Wilkinson, R., Pickett,
371 K., 2012. Ethnic Density Effects on Physical Morbidity, Mortality, and Health Behaviors: A Systematic
372 Review of the Literature. *Am J Public Health* 102, e33-e66.
- 373 Bhopal, R.S., Bansal, N., Fischbacher, C., Brown, H., Capewell, S., (on behalf of the Scottish Health
374 and Ethnicity Linkage Study (SHELS)), 2012a. Ethnic variations in chest pain and angina in men and
375 women: Scottish Ethnicity and Health Linkage Study of 4.65 million people. *European Journal of*
376 *Preventive Cardiology* 19, 1250-1257.
- 377 Bhopal, R.S., Bansal, N., Steiner, M., Brewster, D.H., on behalf of the Scottish Health and Ethnicity
378 Linkage Study, 2012b. Does the 'Scottish effect' apply to all ethnic groups? All-cancer, lung,
379 colorectal, breast and prostate cancer in the Scottish Health and Ethnicity Linkage Cohort Study. *BMJ*
380 *Open* 2.
- 381 Bhopal, R., Bansal, N., Fischbacher, C., Brown, H., Capewell, S., (on behalf of the Scottish Health and
382 Ethnic Linkage Study), 2012c. Ethnic variations in the incidence and mortality of stroke in the
383 Scottish Health and Ethnicity Linkage Study of 4.65 million people. *European Journal of Preventive*
384 *Cardiology* 19, 1503-1508.
- 385 Boal, F.W., 2002. Belfast: walls within. *Political Geography* 21, 687-694.
- 386 Bosqui, T.J., Hoy, K., Shannon, C., 2014. A systematic review and meta-analysis of the ethnic density
387 effect in psychotic disorders. *Social psychiatry and psychiatric epidemiology* 49, 519-529.

388 Boyle, P.J., Feijten, P., Feng, Z., Hattersley, L., Huang, Z., Nolan, J., Raab, G., 2009. Cohort Profile: The
389 Scottish Longitudinal Study (SLS). *International journal of epidemiology* 38, 385-392.

390 Bradley, J.M., 2006. Sport and the Contestation of Ethnic Identity: Football and Irishness in Scotland.
391 *Journal of Ethnic and Migration Studies* 32, 1189-1208.

392 Cunningham, T., 2015. Monitoring equality - reflexive regulation, planning systems, and the role of
393 discrimination law: lessons from Northern Ireland. *The Equal Rights Review* 14, 119-247.

394 Das-Munshi, J., Clark, C., Dewey, M.E., Leavey, G., Stansfeld, S.A., Prince, M.J., 2013. Does childhood
395 adversity account for poorer mental and physical health in second-generation Irish people living in
396 Britain? Birth cohort study from Britain (NCDS). *BMJ Open* 3.

397 Doherty, P., Poole, M.A., 1997. Ethnic residential segregation in Belfast, Northern Ireland, 1971-
398 1991. *Geographical Review* 87, 520-536.

399 Field, C.D., 2014. Measuring religious affiliation in Great Britain: the 2011 census in historical and
400 methodological context. *Religion* 44, 357-382.

401 Fischbacher, C., Steiner, M., Bhopal, R., Chalmers, J., Jamieson, J., Knowles, D., Povey, C., 2007.
402 Variations in all Cause and Cardiovascular Mortality by Country of Birth in Scotland, 1997-2003.
403 *Scottish medical journal* 52, 5-10.

404 Flint, J., 2012. Catholic Schools and Sectarianism in Scotland: Educational Places and the Production
405 and Negotiation of Urban Space. *Policy Futures in Education* 10, 507-517.

406 Graham, P., Walsh, D., McCartney, G., 2012. Shipyards and sectarianism: How do mortality and
407 deprivation compare in Glasgow and Belfast? *Public health* 126, 378-385.

408 Hummer, R.A., Rogers, R.G., Nam, C.B., Ellison, C.G., 1999. Religious involvement and US adult
409 mortality. *Demography* 36, 273-285.

410 Jones, E.M., Sheehan, N.A., Masca, N., Wallace, S.E., Murtagh, M.J., Burton, P.R., 2012. DataSHIELD -
411 a shared individual-level analysis without sharing the data: a biostatistical perspective. *Norsk*
412 *epidemiologi* 21, 231-239.

413 Lerch, M., Oris, M., Wanner, P., Forney, Y., 2010. Religious affiliation and mortality in Switzerland,
414 1991-2004. *Population* 65, 217-250.

415 Levecque, K., Van Rossem, R., 2015. Depression in Europe: does migrant integration have mental
416 health payoffs? A cross-national comparison of 20 European countries. *Ethnicity & health* 20, 49-65.

417 Lloyd, C.D., Shuttleworth, I., 2012. Residential segregation in Northern Ireland in 2001: assessing the
418 value of exploring spatial variations. *Environment and Planning A* 44, 52-67.

419 Lu, Y., Qin, L., 2014. Healthy migrant and salmon bias hypotheses: A study of health and internal
420 migration in China. *Social science & medicine* 102, 41-48.

421 McCullough, M.E., Hoyt, W.T., Larson, D.B., Koenig, H.G., Thoresen, C., 2000. Religious involvement
422 and mortality: A meta-analytic review. *Health Psychology* 19, 211-222.

423 Millard, A.D., Raab, G., Lewsey, J., Eaglesham, P., Craig, P., Ralston, K., McCartney, G., 2015.
424 Mortality differences and inequalities within and between 'protected characteristics' groups, in a
425 Scottish Cohort 1991-2009. *International Journal for Equity in Health* 14, 142.

426 Morrissey, M., Fay, M., Smyth, M., 1999. *Northern Ireland's Troubles : The Human Costs*. Pluto Press,
427 London, GBR.

428 O'Reilly, D., Rosato, M., 2010. Dissonances in self-reported health and mortality across
429 denominational groups in Northern Ireland. *Social science & medicine* 71, 1011-1017.

430 O'Reilly, D., Rosato, M., Catney, G., Johnston, F., Brolly, M., 2012. Cohort description: The Northern
431 Ireland Longitudinal Study (NILS). *International journal of epidemiology* 41, 634-641.

432 Office of the Chief Statistician. 2004 Analysis of Ethnicity in the 2001 Census - Summary
433 report Scottish Executive Edinburgh.

434 O'Reilly, D., Rosato, M., 2008. Religious affiliation and mortality in Northern Ireland: Beyond Catholic
435 and Protestant. *Social science & medicine* 66, 1637-1645.

436 O'Reilly, D., Rosato, M., Connolly, S., 2008. Unlinked vital events in census-based longitudinal studies
437 can bias subsequent analysis. *Journal of clinical epidemiology* 61, 380-385.

438 Pedersen, D., 2002. Political violence, ethnic conflict, and contemporary wars: broad implications for
439 health and social well-being. *Social science & medicine* 55, 175-190.

440 Popham, F., Boyle, P.J., 2011. Is there a 'Scottish effect' for mortality? Prospective observational
441 study of census linkage studies. *Journal of Public Health* 33, 453-458.

442 R Development Core Team, 2015. R: A Language and Environment for Statistical Computing. R
443 Foundation for Statistical Computing, Vienna, Austria.

444 Raab, G., Holligan, C., 2012. Sectarianism: myth or social reality? Inter-sectarian partnerships in
445 Scotland, evidence from the Scottish Longitudinal Study. *Ethnic and Racial Studies* 35, 1934-1954.

446 Rose, D., Pevalin, D., 2002. A Researcher's Guide to the National Statistics Socio- Economic
447 Classification. Sage, London.

448 Raymond T. Russell. 2012 Fair employment in Northern Ireland: the decades of change (1990 -
449 2010) Northern Ireland Assembly Research and Information Service Belfast.

450 Räsänen, J., Kauhanen, J., Lakka, T.A., Kaplan, G.A., Salonen, J.T., 1996. Religious Affiliation and All-
451 Cause Mortality: A Prospective Population Study in Middle-Aged Men in Eastern Finland.
452 International journal of epidemiology 25, 1244-1249.

453 S Harding, R Balarajan, 2001. Mortality of third generation Irish people living in England and Wales:
454 longitudinal study. BMJ 322, 466-467.

455 S Harding, R Balarajan, R Balarajan, 1996. Patterns of mortality in second generation Irish living in
456 England and Wales: longitudinal study. BMJ 312, 1389-1392.

457 Shuttleworth, I., Barr, P.J., Gould, M., 2013. Does Internal Migration in Northern Ireland Increase
458 Religious and Social Segregation? Perspectives from the Northern Ireland Longitudinal Study (NILS)
459 2001-2007. Population, Space and Place 19, 72-86.

460 Sullivan, A.R., 2010. Mortality Differentials and Religion in the U.S.: Religious Affiliation and
461 Attendance. Journal for the scientific study of religion 49, 740-753.

462 Todd, J., Ruane, J., 2011. Beyond Inequality? Assessing the Impact of Fair Employment, Affirmative
463 Action and Equality Measures on Conflict in Northern Ireland. Debating Affirmative Action.

464 Walls, P., Williams, R., 2004. Accounting for Irish Catholic ill health in Scotland: a qualitative
465 exploration of some links between religion, class and health. Sociology of health & illness 26, 527-
466 556.

467 Walls, P., Williams, R., 2003. Sectarianism at work: Accounts of employment discrimination against
468 Irish Catholics in Scotland. Ethnic and Racial Studies 26, 632-661.

469 Whan, R., 2013. The Presbyterians of Ulster, 1680-1730. Boydell & Brewer Ltd, Woodbridge, UK.

470 White, K., Borrell, L.N., 2011. Racial/ethnic residential segregation: Framing the context of health risk
471 and health disparities. *Health & place* 17, 438-448.

472 Williams, R., 1994. Britain's regional mortality: a legacy from disaster in the Celtic periphery? *Social
473 science & medicine* (1982) 39, 189-199.

474 Wolfson, M., Wallace, S.E., Masca, N., Rowe, G., Sheehan, N.A., Ferretti, V., LaFlamme, P., Tobin,
475 M.D., Macleod, J., Little, J., Fortier, I., Knoppers, B.M., Burton, P.R., 2010. DataSHIELD: resolving a
476 conflict in contemporary bioscience--performing a pooled analysis of individual-level data without
477 sharing the data. *International journal of epidemiology* 39, 1372-1382.

478

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493

494 **Tables**

495 Table 1. Baseline characteristics of populations in Scotland and Northern Ireland aged 25 to 74 by religious affiliation. Percentages given for socio-economic
 496 variables. Sources: Scottish Longitudinal Study and Northern Ireland Longitudinal Study.

	Scotland				Northern Ireland			
	Catholic	Protestant	No religion	Not answered	Catholic	Protestant	No religion	Not answered
<i>N</i>	25366	84126	41083	5873	94 393	122 254	22 659	8949
<i>Deaths</i>	1539	5050	1302	345	2733	4038	619	329
<i>Age</i>	46.9	50.1	41.2	46.4	45.56	48.19	43.51	46.77
<i>Total person years</i>	157116	511329	260491	36025	597325	759772	141742	55560
<i>% men</i>	44.6	45.6	53.4	50.3	47.0	47.3	55.5	51.8
<i>Social class (NS-SEC)</i>								
Professional	20.9	20.2	20.1	20.1	27.1	28.6	35.6	29.2
Intermediate	15.2	15.7	15.2	13.5	9.7	13.2	11.9	13.6
Small employers/self employed	10.3	12.5	12.5	10.6	10.9	10.3	9.2	8.8
Lower supervisory	14.6	15.7	15.4	13.0	8.4	9.8	9.4	9.5
(Semi) routine	24.7	22.5	23.3	27.7	34.9	33.5	27.6	29.7
Never worked/Long term unemployed	10.2	9.4	9.2	9.5	8.6	4.2	5.5	8.7
Full-time student	4.1	3.9	4.4	5.5	0.5	0.3	0.8	0.5
<i>Education</i>								
No qualifications	33.7	28.9	28.1	32.8	48.3	48.3	34.5	45.3
O grade/GCSEs	24.4	24.6	23.6	23.9	16.0	16.7	17.3	16.0
Highers/2 + A-levels	17.4	17.9	18.0	17.0	13.0	14.1	14.7	14.4
HNC/Foundation degree	10.3	11.9	12.5	9.5	5.8	5.7	8.4	6.9
Degree	14.2	16.7	17.8	16.8	17.0	15.3	25.2	17.3

Car access

None	35.7	32.0	34.3	33.6	17.0	12.8	17.0	18.0
One	40.3	39.6	39.9	40.4	44.9	42.5	44.4	45.6
Two or more	24.0	28.4	25.8	25.9	38.1	44.7	38.6	36.4

Housing tenure

Owner occupied	66.2	74.2	70.8	66.0	77.6	81.6	74.8	75.2
Social rented	27.8	19.8	21.2	25.2	17.1	13.6	15.4	18.1
Other	6.0	6.0	8.0	8.7	5.3	4.8	9.8	6.7

498 Table 2. Relationship between socio-economic factors and all-cause mortality risk in Scotland and
 499 Northern Ireland (IRRs and 95% CIs). Models were fitted separately for each sex and adjusted for
 500 age, housing tenure, social class, car access, education, religion and country. Corresponding religion
 501 and country estimates are presented in Table 3. Sources: Scottish Longitudinal Study and Northern
 502 Ireland Longitudinal Study.

	Men	Women
<i>Social class (NS-SEC)</i>		
Professional	1.00	1.00
Intermediate	1.11 (0.99, 1.23)	1.03 (0.93, 1.13)
Small employers/self employed	1.05 (0.97, 1.14)	0.88 (0.75, 1.04)
Lower supervisory (Semi) routine	1.21 (1.12, 1.31)	0.90 (0.78, 1.03)
Never worked/Long term unemployed	1.13 (1.05, 1.21)	1.06 (0.97, 1.15)
Full-time student	1.34 (1.20, 1.49)	1.37 (1.23, 1.54)
	0.97 (0.57, 1.65)	1.70 (1.19, 2.42)
<i>Education</i>		
No qualifications	1.37 (1.26, 1.50)	1.37 (1.23, 1.54)
O grade/GCSEs	1.21 (1.09, 1.34)	1.03 (0.90, 1.17)
Highers/2 + A-levels	1.23 (1.11, 1.38)	1.11 (0.97, 1.27)
HNC/Foundation degree	1.18 (1.02, 1.37)	1.11 (0.91, 1.35)
Degree	1.00	1.00
<i>Car access</i>		
None	2.33 (2.16, 2.50)	1.76 (1.61, 1.92)
One	1.35 (1.27, 1.43)	1.37 (1.23, 1.54)
Two or more	1.00	1.00
<i>Housing tenure</i>		
Owner occupied	1.00	1.00
Social rented	1.42 (1.34, 1.50)	1.60 (1.50, 1.71)
Other	1.32 (1.20, 1.45)	1.37 (1.23, 1.53)

503

504 Table 3. All-cause mortality comparing religious groups in Scotland and Northern Ireland (IRRs and
505 95% CIs). Models fitted separately for each sex. *Adjusted for age, housing tenure, social class, car
506 access, education. Corresponding covariate estimates are presented in Table 2. **Overall
507 comparison of mortality rates in Scotland and Northern Ireland from models without religion by
508 country interactions. Sources: Scottish Longitudinal Study and Northern Ireland Longitudinal Study.

	Men		Women	
	Adjusted for age	Fully adjusted*	Adjusted for age	Fully adjusted*
<i>Scotland</i>				
Protestant	1.00	1.00	1.00	1.00
Catholic	1.39 (1.28, 1.51)	1.14 (1.04, 1.24)	1.29 (1.17, 1.42)	1.12 (1.01, 1.23)
No religion	0.96 (0.88, 1.05)	0.95 (0.88, 1.04)	1.01 (0.90, 1.13)	0.96 (0.86, 1.08)
Not answered	1.32 (1.13, 1.54)	1.20 (1.02, 1.40)	1.35 (1.12, 1.63)	1.19 (0.99, 1.43)
<i>Northern Ireland</i>				
Protestant	1.00	1.00	1.00	1.00
Catholic	1.05 (0.99, 1.12)	0.95 (0.89, 1.02)	1.07 (0.99, 1.15)	0.99 (0.91, 1.07)
No religion	1.21 (1.09, 1.34)	1.12 (1.01, 1.25)	1.16 (1.00, 1.35)	1.09 (0.94, 1.27)
Not answered	1.13 (0.97, 1.31)	1.05 (0.90, 1.22)	1.36 (1.14, 1.61)	1.27 (1.07, 1.51)
Scotland vs. Northern Ireland**		1.19 (1.14, 1.25)		1.26 (1.20, 1.34)

509