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Association of medical, physiological, behavioural and socio-economic factors with elevated mortality in men of Irish heritage in West Scotland

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Abstract

Background Men with patrilineal Irish descent from the immigrations of the nineteenth and twentieth centuries have higher death rates from 'all-causes' and, specifically, cardiovascular disease (CVD) than the general population of the West of Scotland.

Methods A total of 5766 male employees from 27 workplace settings were examined between 1970 and 1973. Surname analysis identified 15 per cent of these men as of patrilineal Irish heritage. For those who have since died, the date and cause of death was obtained. Cox's proportional hazards model was used to compare the mortality risk of those with Irish and non-Irish surnames, and to investigate established medical, physiological, behavioural and socio-economic risk factors (acting in early and later life) as possible explanations for this excess mortality.

Results The relative risk of death from all causes for the Irish of 1.26 (95 per cent confidence interval (CI) (1.12, 1.43)) was reduced to 1.12 (95 per cent CI (0.99, 1.26)) by including established risk factors in the model. The relative risk of CVD mortality of 1.51 (95 per cent CI (1.29, 1.77)) for the Irish was reduced to 1.35 (95 per cent CI (1.14, 1.58)) by the same adjustments. The elevated all-cause mortality of the Irish was mainly attributable to cardiovascular deaths.

Conclusions Cigarette smoking was only able to 'explain' a small amount of the excess all-cause and CVD mortality of men with patrilineal Irish descent. Relative deprivation during childhood and adulthood contributed to the high Irish mortality. However, there remains a substantial excess of premature deaths among Irish men which is unaccounted for by established risk factors.

Keywords: mortality, risk factors, Irish, ethnic minorities

Introduction

Although the Irish are not usually recognized as a distinct ethnic group in Britain – coming within the ubiquitous 'white' category – there is mounting evidence that in common with many other ethnic and religious minorities, they experience higher morbidity[1] and mortality[2–7] than the general population, and are disadvantaged in terms of socio-economic position. Irish migration to Britain has been substantial since the 1840s, peaking in the middle of the nineteenth century, and reaching its low point in the 1930s. Many of these immigrants settled in the industrial towns of the North and West of Britain where they were largely employed as labourers in heavy industry. There was a small 'second wave' of migration from the 1940s, which was centred on the South East of England but was not evident in Scotland. The Irish-born formed 1.6 per cent of Glasgow's population in 1991; however, Catholics, who are mainly Irish descended, form about 30 per cent of Glasgow's population.[8]

Immigration from Ireland has been associated with high mortality in certain British cities, including Glasgow, since the 1830s, yet mortality in Ireland itself remained low until well into the twentieth century, except during the famine.[9–11] First and second generation Irish living in England and Wales have the highest all-cause standardized mortality ratio (SMR) of any immigrant group.[2–6] This excess Irish mortality risk has not been fully accounted for by migrant selection or social class,[5] therefore other possible explanations must be examined.

Because much of the higher mortality of second generation Irish people living in England and Wales occurs from lung cancer, all cancers and respiratory disease,[5] it has been suggested that 'smoking, and not ethnicity, is a prime candidate for the cause of the excess deaths'.[12] In Britain, certain cause-specific high mortality rates of immigrant Irish have been linked with smoking,[2,3,6,13] although other studies have shown that excess smoking is not a general attribute of the wider Irish descended population.[14]

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Using a single measure of adult social class has been found to be inadequate in fully elucidating the effect of socio-economic circumstances on morbidity and mortality.[15] For a number of broad causes of death in the same data set as that used here, the relative importance of different socio-economic influences was found to vary with stage of life, and a cumulative effect of long-term disadvantage was noted.[15–17] Relative deprivation during early life, reflected by poor growth in the womb[18] or adverse social circumstances during early childhood[15,19–25] have been found to affect risk of cardiovascular disease in later life.

In a recent study of differences in socioeconomic standing and ill health between 'the two communities' in Northern Ireland,[26] areas which are predominantly inhabited by Catholics were found to be worse off on most indicators of deprivation, and to have higher SMRs. However, the authors found that denomination did not have any residual predictive value after socio-economic variables had been taken into account.

In this paper, we consider men of Irish heritage in the West of Scotland, whose families mainly arrived two or more generations ago. Our previous work has shown that these men have an elevated mortality risk from all causes and coronary heart disease (CHD).[7] Deaths from cerebrovascular disease and injury and poisoning were also higher for men with Irish names, but these failed to reach statistical significance at the 5 per cent level. We now investigate whether medical, physiological, behavioural or socio-economic factors can account for the premature mortality of this ethnic group.

Methods

The collaborative study (one of a series of Midspan studies in the West of Scotland) collected medical, physiological, behavioural and socio-economic data from a large cohort of men and women who were recruited from 27 workplaces in Glasgow, Grangemouth and Clydebank between 1970 and 1973. Details of the sample, response rates and examination procedure are given elsewhere.[15,19] The study was initiated at a time of relatively low unemployment, and recruited participants from across the social spectrum. Attention is here restricted to the 5766 men in the study who were aged between 35 and 64 at screening, and who had not subsequently emigrated.

The information collected at baseline examination included:

socio-demographic data: name, date of birth;

health status measures: angina,[27] ECG ischaemia, respiratory symptoms,[28] forced expiratory volume in one second (FEV_1),[19] height, weight, triceps skinfold, blood pressure, serum cholesterol;

health-related behaviours: smoking status, cigarette and alcohol consumption;

indicators of socio-economic circumstances: occupation at survey, at first employment and of father, whether regularly drive a car, number of siblings, age of leaving full-time education.

Social class was coded from occupation according to the Registrar General's classification[29] then summarized into four groups by combining social class I with II and IV with V, giving a minimum of 80 Irish in each group. The cumulative effect of disadvantage was measured by counting the number of occurrences of manual social class over the three time points. Being a regular car driver was taken to be mainly a marker for ownership of a car, which has been used in various studies as an indicator of available income.[30,31] Deprivation category of postal code was scored according to the Carstairs and Morris index,[32] which is based on the 1981 Census proportions of male unemployment, overcrowding, car ownership and social classes IV and V. The FEV_1 was taken as the greater of two expirations.[16] To estimate impairment, the expected FEV_1 was obtained from linear regression equations of age and height among a healthy subset of the population who never smoked and answered 'no' to questions on respiratory symptoms. The FEV_1 score is actual FEV_1 as a percentage of the expected FEV_1. Body mass index was calculated as weight divided by height squared.

Although it is difficult to identify Irish people whose families arrived in Britain several generations ago, Irish surname has proved to be a useful marker for patrilineal Irish descent.[7] A total of 887 men, or 15 per cent of the sample, were classified as Irish on this basis. Validation of this procedure using males currently aged 65 in the localities sample of the West of Scotland Twenty-07 Study[33] resulted in estimates of sensitivity and specificity of 79 per cent and 85 per cent, respectively, as an indicator of Catholic father with Irish heritage.

Mortality over a 21 year follow-up period, ascertained from flagging at the National Health Service Central Registry in Edinburgh, revealed that 1882 of these men had died by the end of 1994. Death certificates coded according to the ninth revision of the International Classification of Diseases (ICD9) were obtained. Mortality differentials according to social class in this survey were similar to those in men of the same age group in Scotland around 1981, the mid-point of the follow-up period. This paper considers 'all-cause' mortality and deaths from cardiovascular disease (ICD9 codes 390–459). One problem in calculating mortality is those lost to the sample. Among non-Irish included in the ONS Longitudinal Study's sample of the 1971 Census, with no record of death in the intervening period, 8 per cent were not recorded at the Census in 1981. Similarly, the figure for those born outside Ireland (i.e. mostly in Britain) of an Irish parent was 9 per cent.[34] This gives us no reason to suppose that the proportion of men lost to follow-up will be different in the two groups.

All data were analysed using SPSS for Windows. For all-cause mortality, and then just for deaths from cardiovascular disease (CVD), Cox's proportional hazards model[35] was fitted to date of death, using Irish name and date of birth as covariates. Exponentiated hazards coefficients are taken as measures of relative rates of mortality – relative risks greater than one

indicating elevated mortality compared with the non-Irish comparison group. Further models were fitted including one risk factor at a time to assess its effect on the patrilineal Irish relative mortality risk. Where the relative risk of death for men with Irish names is diminished on inclusion of an additional 'explanatory' variable, this suggests that part of the excess of deaths for Irish men can be explained by an increased risk or disadvantage with respect to the new variable. Those measures showing a relationship with the Irish mortality risk were included in composite models to see how far the Irish disadvantage could be 'explained' by combinations of other factors. The assumption of proportional hazards in Cox's model was satisfied by these data, as the 'log-minus-log' survival function showed parallel lines for those with and without Irish surnames in this age-range.

Results

Table 1 shows the relative risk of death of the patrilineal Irish, and how it changed when various medical, physiological and behavioural measures were taken into consideration. Although all these factors did show a relationship with subsequent mortality, the inclusion of diastolic blood pressure, ECG ischaemia, serum cholesterol, body mass index, triceps skinfold and cigarette consumption (for current smokers) in turn in the model did not diminish the relative risk of Irish name. Those factors whose inclusion did diminish the Irish mortality risk (although they did not eradicate the excess) were angina, bronchitis, low FEV_1 score, low height, current smoking and high alcohol consumption.

Table 2 gives the relative risk of death for the patrilineal Irish when socio-economic factors acting in early and later life were included in the model. Low social class of father, at entry to the labour force, at survey, and cumulatively, high number of siblings, young age of leaving full-time education, deprived area of residence and not being a regular car driver all displayed a statistically significant relationship with mortality, and resulted in a diminution of the excess risk by Irish name.

The risk factors which diminished the mortality excess associated with Irish name were examined in composite models, first in four groups (medical–physiological, behavioural, and early and later socio-economic position), then all together (see Table 3). The groups of medical–physiological, behavioural and early socio-economic variables all had a similar effect on the relative risk of Irish name, reducing the

Table 1 Relative risk (95 per cent CI) of all-mortality by Irish name and one medical, physiological or behavioural variable at a time, adjusted for date of birth (minimum achieved sample 5726 with 1863 deaths)

Relative risk of Irish name (vs non-Irish)	Additional variable included in model	Relative risk of additional variable
1.22 (1.08–1.38)	None	
1.23 (1.09–1.39)	Diastolic blood pressure: increase of 1 SD	1.22 (1.17–1.28)
1.22 (1.08–1.38)	None	
1.23 (1.09–1.39)	ECG ischaemia (vs no)	1.80 (1.54–2.11)
1.22 (1.08–1.38)	None	
1.21 (1.07–1.36)	Angina definite or possible grade I or II (vs no)	1.64 (1.46–1.86)
1.22 (1.08–1.38)	None	
1.19 (1.05–1.34)	FEV_1 score: decrease of 1 SD	1.18 (1.13–1.23)
1.22 (1.08–1.38)	None	
1.21 (1.07–1.36)	Bronchitis (vs no)	1.85 (1.46–2.36)
1.23 (1.09–1.39)	None	
1.23 (1.09–1.39)	Serum cholesterol: increase of 1 SD	1.05 (1.01–1.10)
1.22 (1.08–1.38)	None	
1.20 (1.06–1.35)	Height: decrease of 1 SD	1.09 (1.04–1.14)
1.22 (1.08–1.38)	None	
1.22 (1.08–1.38)	Body Mass Index: increase of 1 SD	1.06 (1.01–1.10)
1.22 (1.08–1.38)	None	
1.22 (1.08–1.37)	Triceps skinfold: increase of 1 SD	1.02 (0.98–1.06)
1.22 (1.08–1.38)	None	
1.19 (1.06–1.35)	Current cigarette smoker (vs ex- or non-smoker)	2.06 (1.77–2.41)
1.13* (0.97–1.30)	None	
1.13* (0.98–1.31)	Cigarette consumption: increase of 1 SD	1.20 (1.14–1.27)
1.22 (1.08–1.38)	None	
1.17 (1.04–1.32)	Alcohol consumption: increase of 1 SD	1.18 (1.13–1.23)

*Smokers only, for which the achieved sample was 3303 with 1241 deaths.

Table 2 Relative risk (95 per cent CI) of all-cause mortality by Irish name and one early or later life socio-economic variable at a time, adjusted for date of birth (minimum achieved sample 5654 with 1841 deaths)

Relative risk of Irish name (vs non-Irish)	Socio-economic variable included in model	Relative risk of socio-economic variable
1.24 (1.10–1.40)	None	
1.21 (1.07–1.36)	Father in manual social class (vs non-manual)	1.43 (1.28–1.61)
1.24 (1.10–1.40)	None	
1.21 (1.07–1.36)	First job in manual social class (vs non-manual)	1.29 (1.17–1.42)
1.22 (1.08–1.37)	None	
1.17 (1.04–1.32)	Job at survey in manual social class (vs non-manual)	1.37 (1.25–1.50)
1.26 (1.12–1.42)	None	
1.22 (1.08–1.37)	Manual social class at 2 or 3 life-points (vs 0 or 1)	1.41 (1.28–1.56)
1.22 (1.08–1.38)	None	
1.18 (1.05–1.33)	3 or more siblings (vs 0–2)	1.21 (1.10–1.33)
1.22 (1.08–1.38)	None	
1.19 (1.05–1.34)	Left school before aged 15 (15 or older)	1.29 (1.17–1.41)
1.22 (1.08–1.38)	None	
1.19 (1.06–1.35)	Lived in deprivation category 5, 6 or 7 (vs 1–4)	1.19 (1.09–1.31)
1.22 (1.08–1.38)	None	
1.18 (1.05–1.33)	Not regular car driver (vs regular driver)	1.33 (1.21–1.46)

excess by almost a quarter; whereas the group of later-acting socio-economic variables reduced it by nearly a third. When taken together, these factors were able to diminish the all-cause mortality excess by over half, and although the relative risk remained above unity, it no longer reached statistical significance at the 5 per cent level.

Considering just deaths from CVD, Table 4 shows the relative risk of death of the patrilineal Irish, and how that changed when various medical, physiological and behavioural measures were taken into consideration. Although all of these factors except triceps skinfold did show a relationship with subsequent mortality, the inclusion of diastolic blood pressure, ECG ischaemia, bronchitis, serum cholesterol and cigarette consumption (for current smokers) in turn in the model did not diminish the excess risk by Irish name. The factors whose inclusion did diminish the excess mortality risk of Irish men (although they did not eradicate the excess) were angina, low FEV_1 score, low height, high body mass index, currently being a smoker and high alcohol consumption.

Turning again to socio-economic position, Table 5 gives the relative risk of CVD death for the patrilineal Irish when factors acting in early and later life were included in the analysis. Social class of father, at entry to the labour force, at survey, and cumulatively, number of siblings, age of leaving full-time education, deprivation category of area of residence and regular car driving all displayed a statistically significant relationship

Table 3 Relative risk (95 per cent CI) of all-cause mortality by Irish name, adjusted for date of birth and risk factors (achieved sample 5545 with 1808 deaths)

Terms in model	Relative risk of Irish name (vs non-Irish)
Date of birth	1.26 (1.12–1.43)
Date of birth, medical and physiological factors*	1.20 (1.06–1.36)
Date of birth, behavioural factors†	1.20 (1.06–1.36)
Date of birth, early socio-economic position‡	1.20 (1.06–1.35)
Date of birth, later socio-economic position§	1.18 (1.05–1.34)
Date of birth, medical and physiological factors,* behavioural factors,† early and later socio-economic position‡§	1.12 (0.99–1.26)

*Angina status, FEV_1 score, bronchitis, height.
†Cigarette smoking status, alcohol consumption.
‡Father's social class, cumulative social class, number of siblings, age of leaving full-time education.
§Social class at survey, deprivation category of area of residence, regular car driving.

Table 4 Relative risk (95 per cent CI) of cardiovascular disease mortality by Irish name and one medical, physiological or behavioural variable at a time, adjusted for date of birth (minimum achieved sample 5726 with 955 deaths)

Relative risk of Irish name (vs non-Irish)	Additional variable included in model	Relative risk of additional variable
1.46 (1.25–1.71)	None	
1.48 (1.26–1.73)	Diastolic blood pressure: increase of 1 SD	1.41 (1.33–1.49)
1.46 (1.24–1.71)	None	
1.48 (1.26–1.73)	ECG ischaemia (vs no)	2.77 (2.30–3.33)
1.46 (1.24–1.71)	None	
1.44 (1.23–1.69)	Angina definite or possible grade I or II (vs no)	1.92 (1.64–2.26)
1.46 (1.25–1.71)	None	
1.43 (1.22–1.68)	FEV_1 score: decrease of 1 SD	1.12 (1.05–1.19)
1.46 (1.24–1.71)	None	
1.48 (1.26–1.73)	Bronchitis (vs no)	1.45 (1.23–2.45)
1.46 (1.25–1.72)	None	
1.47 (1.25–1.72)	Serum cholesterol: increase of 1 SD	1.21 (1.14–1.28)
1.46 (1.24–1.71)	None	
1.42 (1.21–1.66)	Height: decrease of 1 SD	1.15 (1.08–1.22)
1.46 (1.24–1.71)	None	
1.45 (1.24–1.70)	Body Mass Index: increase of 1 SD	1.20 (1.13–1.27)
1.46 (1.25–1.71)	None	
1.46 (1.24–1.71)	Triceps skinfold: increase of 1 SD	1.04 (0.99–1.10)
1.46 (1.24–1.71)	None	
1.43 (1.22–1.67)	Current cigarette smoker (vs ex- or non-smoker)	1.94 (1.57–2.40)
1.32* (1.09–1.60)	None	
1.33* (1.09–1.61)	Cigarette consumption: increase of 1 SD	1.21 (1.13–1.31)
1.46 (1.24–1.71)	None	
1.41 (1.20–1.66)	Alcohol consumption: increase of 1 SD	1.14 (1.08–1.21)

*Smokers only, for which the achieved sample was 3303 with 631 deaths from cardiovascular disease.

Table 5 Relative risk (95 per cent CI) of cardiovascular disease mortality by Irish name and one early or later life socio-economic variable at a time, adjusted for date of birth (minimum achieved sample 5567 with 931 deaths)

Relative risk of Irish name (vs non-Irish)	Socio-economic variable included in model	Relative risk of socio-economic variable
1.49 (1.27–1.74)	None	
1.43 (1.22–1.67)	Father in manual social class (vs non-manual)	1.62 (1.37–1.92)
1.48 (1.26–1.73)	None	
1.44 (1.22–1.69)	First job in manual social class (vs non-manual)	1.58 (1.37–1.82)
1.46 (1.24–1.71)	None	
1.40 (1.20–1.64)	Job at survey in manual social class (vs non-manual)	1.35 (1.19–1.53)
1.50 (1.28–1.77)	None	
1.45 (1.24–1.70)	Manual social class at 2 or 3 life-points (vs 0 or 1)	1.41 (1.28–1.56)
1.46 (1.24–1.71)	None	
1.41 (1.20–1.65)	3 or more siblings (vs 0–2)	1.23 (1.08–1.41)
1.46 (1.24–1.71)	None	
1.41 (1.21–1.66)	Left school before aged 15 (15 or older)	1.32 (1.16–1.50)
1.46 (1.24–1.71)	None	
1.41 (1.20–1.65)	Lived in deprivation category 5, 6 or 7 (vs 1–4)	1.30 (1.14–1.48)
1.46 (1.24–1.71)	None	
1.42 (1.21–1.66)	Not regular car driver (vs regular driver)	1.27 (1.12–1.44)

Table 6 Relative risk (95 per cent CI) of cardiovascular disease mortality by Irish name adjusted for date of birth and risk factors (achieved sample 5545 with 929 deaths)

Terms in model	Relative risk of Irish name (vs non-Irish)
Date of birth	1.51 (1.29–1.77)
Date of birth, medical and physiological factors*	1.44 (1.23–1.70)
Date of birth, behavioural factors†	1.45 (1.23–1.70)
Date of birth, early socio-economic position‡	1.42 (1.21–1.68)
Date of birth, later socio-economic position§	1.42 (1.21–1.67)
Date of birth, medical and physiological factors,* behavioural factors,† early and later socio-economic position‡§	1.35 (1.14–1.58)

*Angina status, FEV_1 score, height, body mass index.
†Cigarette smoking status, alcohol consumption.
‡Father's social class, cumulative social class, number of siblings, age of leaving full-time education.
§Social class at survey, deprivation category of area of residence, regular car driving.

with mortality from this cause, and all resulted in an alteration towards unity of the relative risk by Irish name.

As for all-cause mortality, the risk factors which diminished the excess CVD mortality associated with Irish name were examined in composite models (see Table 6). The groups of medical–physiological and behavioural variables had least influence on the Irish CVD mortality excess, only reducing it by about a sixth. Early and late socio-economic variables each had a slightly greater effect on the relative risk of Irish name, reducing the excess by almost a fifth. When taken together, these factors were able to diminish the CVD mortality excess by almost a third, although it remained pronounced (and highly significant, statistically).

Relative risks for CVD mortality were much greater than the relative risks of death from all causes. In fact, when all-cause less CVD mortality was analysed separately, we found no Irish excess. The relative risk of non-CVD mortality (adjusted for date of birth) for Irish over non-Irish men was 0.99 (95 per cent confidence interval (CI) (0.82, 1.19)), demonstrating that the elevated all-cause mortality of men with Irish names is mainly attributable to cardiovascular deaths.

Discussion

This research shows that differences in socio-economic circumstances could account for about a third of the premature Irish deaths. In the Longitudinal Study of England and Wales, socio-economic factors did not explain the Irish excess in all-cause mortality. These two studies are not necessarily contradictory, because the characteristics of the samples in terms of generation and occupation are different.[5] In general, the patrilineal Irish sample that we have identified in the West of Scotland is descended through varying numbers of generations from nineteenth- and early twentieth-century migrations to the north and west of Britain, and they are over-represented in manual occupations. By contrast, the sample in the Longitudinal Study comprises children of migrants from later movements focused on the South East of England, and they are over-represented in class III non-manual.

Socio-economic disadvantage among the Irish could be due to respondent characteristics or to anti-Irish or anti-Catholic discrimination. Despite the fact that educational qualifications have been high in Scottish Catholic Schools, controlling for socio-economic background, unemployment of leavers has also been high, controlling for qualifications.[36] There is little acknowledgement that this ethnic group may be subject to exclusionary practices, as the dominant paradigm for studying racism in Britain is based on skin colour. However, such research as there is does indicate that discrimination in the workplace plays a significant role in the current disadvantage of those of Irish origin in Britain.[37,38]

Morbidity and mortality disadvantage may also have been passed on intergenerationally. Gunnell *et al*. have suggested that short leg-length acts as a particularly sensitive marker for poor childhood diet, infectious disease exposure and poor living conditions, which may in turn increase the risk of adult coronary heart disease.[39] Although leg-length was not measured in our study, the height of men with Irish names was on average 1.8 cm less than their non-Irish counterparts and the Irish generally came from larger families, which might indicate a thinner spread of resources.

Finally, collective disadvantage may be reinforced by individual strategies of escape. In this research, Irish name has been used to measure a joint heritage of Irish descent and Catholic background. It may be that, because of the links between Irish Catholic background and socio-economic disadvantage, assimilation to Protestant denominations by men of Irish descent has been associated with, or has even been a strategy for, socio-economic advancement. In particular, sons of Irish Catholic mothers who married Scottish Protestant fathers, four-fifths of whom in this generation followed their father's religion and not their mother's, do not count as of Irish heritage on our definition, and may have done better economically by that very fact.

One problem to note when trying to explain differences by adjustment for risk factors is that there might be misclassification (including differential misclassification).[40,41] For example, Van de Mheen demonstrated that a high proportion of supposedly 'never smokers' were in fact 'ex-smokers'.[42] The effect of misclassifying Irish origin will have diluted associations with mortality, whereas misclassifying the risk factors will have attenuated the degree to which they explain the elevated mortality among the Irish.

Different patterns of smoking and drinking may be partially responsible for the increased all-cause and CVD mortality of Irish men. Mullen *et al*.[14] found no significant differences in smoking and drinking habits between those with and without Irish surnames in the cohort of the West of Scotland 20–07 Study who were aged 35 in 1987. However, it should be noted that our present study represents a previous generation; and that the sample size is about ten times greater, giving more power for the detection of small differences. Of the two behaviours, there is strong evidence for linking smoking with mortality. Confounding between smoking and social class[43] (with smokers over-represented in manual occupations) presents a further complicating factor.

There are, however, other considerations which point to smoking not being the main explanation of excess Irish mortality. As well as being a risk factor for CVD, smoking is known to be associated with excess deaths from respiratory illness and several types of cancer. Although a small Irish excess of deaths was observed in respiratory disease in this group of men, those with Irish names were at a slightly decreased risk of death from cancer.[7] If smoking were the main source of the excess, Irish men would be expected to show a similar elevated risk for other smoking-implicated causes of death.

One lifestyle factor not asked about in the survey was diet. However, the comparison of serum cholesterol levels and body mass index between the two groups does not suggest any obvious difference in eating habits. Exercise data indicate that more physical activity at work for those with Irish names was offset by less leisure exercise. Exercise at work was associated with raised all-cause and CVD mortality, probably because of socio-economic confounding, but this did not in any case statistically 'explain' the Irish excess.

Conclusion

Various indicators of health status, habits and socio-economic position have been examined in the context of raised mortality for men of patrilineal Irish descent. For CVD mortality, the major cause of this excess, the elevated Irish risk remained pronounced even when all measured confounding factors were included in the models. Relative deprivation in childhood and adulthood, and smoking, have some influence on raised Irish mortality, and measures to address these factors would help. But the search for reasons behind the poor health status of the Irish has not been satisfactorily concluded. In particular, the mechanisms underlying the intergenerational transmission of cardiovascular disease risk require further investigation.[44]

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