

Variations in all Cause and Cardiovascular Mortality by Country of Birth in Scotland, 1997-2003

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Abstract

Background and Aims.

Country of birth provides a proxy for ethnic group for recent migrants. Major differences in mortality by country of birth have been demonstrated in England and Wales, but similar published data for Scotland are lacking. We aimed to examine variations in mortality by country of birth for Scottish residents.

Methods.

We calculated standardised mortality ratios by country of birth for Scottish residents aged 25 years and over between January 1997 and March 2003.

Results and Conclusion.

Comparisons with England and Wales showed high all-cause, coronary heart disease (CHD) and stroke mortality among Scottish residents born in Scotland, Northern Ireland, the Republic of Ireland, India and Hong Kong. However, most country of birth groups had similar or lower mortality than the Scottish born. These are the first data on mortality by country of birth in Scotland and they demonstrate major variations. Comparisons within the Scottish population might be interpreted as reassuring, since they do not show the excesses in CHD mortality by country of birth reported in England and Wales. However, the use of England and Wales as a comparison group shows a substantial excess of CHD risk among South Asians in Scotland, comparable to that reported in England and Wales.

Introduction

Country of birth is recorded on death certificates and on census returns in the UK. It is often used as a proxy for ethnic group. Despite some limitations it is thought to be reasonably accurate for this purpose among recent migrants and older members of minority ethnic groups. In the colonial era, substantial numbers of white people were born overseas, returning to reside in the

United Kingdom (UK) later in life. Many younger people from ethnic minorities were born in the UK, so country of birth identifies only a small fraction of them. Although there have been proposals to record ethnic group on death certificates,¹ country of birth remains the main guide to assessing variations in mortality by ethnic group. It has been used for several previous analyses of mortality among residents of England and Wales around the censuses of 1971, 1981, 1991 and 2001.^{2,3,4,5} These analyses showed wide variations in all cause, coronary heart disease (CHD) and stroke mortality, with particularly high rates of CHD and stroke among those born in the Indian sub-continent (the countries that are now India, Pakistan and Bangladesh). CHD and stroke mortality in Scotland is substantially higher than the rest of the UK⁶ but to our knowledge there are no published data on variations in CHD mortality among Scottish residents by country of birth. We aimed to examine variations in mortality by country of birth for Scottish residents.

Methods

Electronic death registrations were obtained from the General Register Office for Scotland (GROS) for people resident in Scotland whose deaths occurred between 1st January 1997 and 31st March 2003. Country of birth was grouped into ten categories: Scotland, India, Pakistan, Bangladesh, other parts of the UK, Northern Ireland, the Republic of Ireland, China, Hong Kong, and the rest of the world (excluding areas already mentioned). The category "other parts of the UK" refers to residents of the UK excluding Northern Ireland and Scotland.

To estimate the denominator population, commissioned tables were obtained from GROS showing the Scottish population from the 1991 and 2001 Censuses by the country of birth categories shown above and in age categories (0-24 years and then in 5 year age bands up to the age of 90, with one category for those aged over 90). Linear interpolation was used to calculate the population denominator for the years between the 1991 and 2001 censuses (with further extrapolation after 2001). This was necessary as the South Asian population in Scotland showed sizeable changes over time, from 0.74% of the Scottish population in 1991 to 1.09% in 2001. Deaths from all causes

and where the primary underlying cause was CHD (ICD10 codes I20-I25, ICD9 410-414) or stroke (ICD10 I60-I67, ICD9 430-437) were studied.

We calculated standardised mortality ratios (SMRs) with 95% confidence intervals for Scottish residents 25 years and over for a 6.25 year period using routine mortality statistics and adjusted census denominators (as above). SMRs were calculated using age-specific mortality rates (a) from Scottish residents born in Scotland and (b) from residents of England and Wales. We also calculated directly age-standardised rates. These are not given in this paper but are available in the full project report.⁷

Many of the deaths among Indian born were probably in white people born in British-governed India before Indian independence in 1947. In order to exclude such deaths as far as possible, all analyses were repeated separately for the 25-69 year old age group. Ethical approval was not sought, as the data used were fully anonymised.

Results

Of 362,029 deaths in Scotland in those aged 25 years and above, there were 38,085 deaths among those born outside Scotland. As expected, cardiovascular diseases were the dominant causes of death: 22% of all deaths were primarily caused by CHD and 11.7% by stroke.

Table I shows that compared to those born in Scotland, those born in other parts of the UK, Northern Ireland (women only), India (men only), Pakistan, Bangladesh (men only), China, Hong Kong (men only) and the rest of the world had significantly lower all-cause mortality. Men born in the Republic of Ireland had significantly higher mortality. Compared with the resident population of England and Wales, all cause mortality was significantly higher for Scottish residents among women born in Scotland, Northern Ireland, the Republic of Ireland and India; and among men born in Scotland, Northern Ireland, the Republic of Ireland and the rest of the world. Scottish residents born in other parts of the UK showed a significantly reduced mortality from all causes of deaths compared to those resident in England and Wales. The numbers of deaths among those born in Bangladesh were too low to interpret and because of small numbers of deaths, those born in Bangladesh are excluded from subsequent tables.

Table II shows mortality from CHD. Compared to those born in Scotland, mortality from CHD was significantly lower among those born in other parts of the UK and in the rest of the world. Compared to the England and Wales resident population, mortality from CHD was significantly higher among Scottish residents born in Scotland, Northern Ireland, the Republic of Ireland, India and (for men only) the rest of the world. Male Scottish residents born in other parts of the UK or in Hong Kong had a significantly reduced mortality rate for CHD compared to England and Wales residents.

Table III shows that compared to those born in Scotland, stroke mortality was lower among those born in other parts of the UK and among men born in the rest of the world. Compared to residents of England and Wales stroke mortality was increased among those born in Scotland, other parts of the UK (women only), Northern Ireland, the Republic of Ireland, India and the rest of the world.

Table IV restricts the analysis to the 25-69 year age group for CHD deaths. Compared to the England and Wales resident population, the highest rates of CHD mortality among Scottish residents were in those born in Pakistan. Mortality differences were much more substantial in comparison with England and Wales rather than in comparison with Scotland, and in this age restricted analysis rather than the all ages analysis shown in table II.

Discussion

We found only modest CHD mortality excesses among Scottish residents born in India, Pakistan, Bangladesh, Northern Ireland and the Republic of Ireland when compared to those born in Scotland. However substantial mortality excesses emerged when residents of England and Wales were used as the reference group, particularly when the age range was restricted to those aged 25-69 years, so reducing the number of white Indian-born people and better reflecting Indian ethnicity. Men and women living in Scotland and born in other parts of the UK (the "UK other" category) showed a significantly reduced mortality from all causes of deaths compared to those resident and born in England and Wales.

The limitations of country of birth analyses as a proxy for ethnic group have already been referred to: they are misleading for younger age groups who are likely to have been born in the UK; they are subject to errors where the country of birth has changed its name or did not exist at the time the person was born (as is often the case for those born in what is now Bangladesh); and they may be subject to bias where the person registering the death does not have accurate information about the place of birth of the deceased. Our analyses involve multiple statistical comparisons, so that p values should be regarded with caution.

The observation that mortality differences were more marked in the 25-69 age group is likely to reflect the fact that many of the deaths among the Indian born were not among people of Indian ethnic origin, but among white people born in India before 1947, when it was part of the British Empire. This interpretation is supported by the observation that there were more deaths among Indian born than Pakistan born, even though the Pakistani ethnic minority population in Scotland is larger than the Indian one. Lower mortality among those born in other parts of the UK is probably due to a healthy migrant effect.

A number of reports have documented increased CHD and stroke mortality in England and Wales among those born in India, Pakistan and Bangladesh,^{5,8,9} increased CHD mortality among those born in Ireland¹⁰ and low levels of CHD mortality among those born in China and Hong Kong. In keeping with previous studies in England and Wales,⁵ all cause and CHD mortality was low among those born in China and Hong Kong. To our knowledge this is the first published analysis of mortality by country of birth in Scotland. It has comprehensive population coverage. Though the size of the minority populations is small, sufficient numbers of deaths were obtained to estimate mortality in a number of groups by combining data for several years and adjusting population denominators to take account of changes in the size of minority ethnic groups - a simple innovation that has not been used in previous similar reports. The use of SMRs has the advantage that, unlike proportional mortality ratios (PMR), they are not affected by the frequency of other conditions. Comparisons within the Scottish population might be interpreted as reassuring for South Asians born outside Scotland and for those born in Northern Ireland and the Republic of Ireland, since they do not show the excesses in CHD mortality by country of birth reported in England and Wales. However, the use of England and Wales as a comparison group emphasises the substantial excess of CHD risk among South Asians and also among those born in Northern Ireland and the Republic of Ireland. This was particularly true among those aged 25-69 years, and indicates an excess risk comparable to that reported in England and Wales. This analysis highlights the importance of the choice of reference, and age, groups in assessing relative mortality risks

in country of birth analyses. The results show the potential for analyses of this kind in building up a picture of the health of recent migrant populations within Scotland. Future work can use methods to examine variations and trends over the period 1971 to the present.

The increased risk of CHD in Scotland compared to England and Wales and the rest of Europe has been well described.⁶ However, in relation to the control of coronary heart disease among South Asians in Scotland and among migrants from Ireland, there is no room for complacency. The massive challenges of securing for Scotland the mortality rates seen in England are made explicit.

Acknowledgements

We thank David Orr, Peter Scrimgeour, Ganka Mueller, Joe Fuchs, Ian Maté, Susan Wallace and Duncan Macniven (General Register Office for Scotland); Professor Phil Hanlon (formerly of the Public Health Institute of Scotland), Dr Rafik Gardee (National Resource Centre for Ethnic Minority Health), Hector Mackenzie and Dr Mac Armstrong (Scottish Executive Health Department), Dr Sarah Wild (University of Edinburgh) and Chris Oswald (Commission for Racial Equality) for advice and support. We thank Jenny Hay and Tori Hastie for secretarial support. We thank the Scottish Executive for funding this study.

Table I. Observed and expected deaths among Scottish residents (25 years and older) from all causes for 6.25 years (Jan 1997 – Mar 2003), by country of birth and sex, with standardised mortality ratios (95% confidence interval) using death rates from England and Wales and from Scotland as reference.

Country of birth	Deaths	Reference group	
		Scotland SMR (95% confidence interval)	England and Wales SMR (95% confidence interval)
Women			
England and Wales	1764645		100
Scotland	171488	100	116.0 (115, 117) ***
UK (other)	12827	82.0 (81, 83) ***	95.3 (94, 97) ***
N. Ireland	1336	93.5 (89,99) *	108.0 (102, 114) **
R/Ireland	1716	101.7 (97, 107)	118.1 (113, 124) ***
India	419	97.2 (88, 107)	114.7 (104, 126) **
Pakistan	110	70.7 (58, 85) ***	87.2 (72, 105)
Bangladesh	5	44.1 (14, 103)	51.9 (17, 121)
China	71	74.5 (58, 94) *	86.8 (68, 110)
Hong Kong	93	86.1 (69, 105)	104.2 (84, 128)
Rest of the world	2760	82.8 (80, 86) ***	97.5 (94, 101)
Men			
England and Wales	1589979		100
Scotland	152456	100	121.9 (121, 123) ***
UK (other)	11889	75.4 (74, 77) ***	92.0 (90, 94) ***
N. Ireland	1204	100.3 (95, 106)	121.8 (115, 129) ***
R/Ireland	1507	108.2 (103, 114) **	129.3 (123, 136) ***
India	473	88.4 (81, 97) **	109.5 (100, 120)
Pakistan	171	62.9 (54, 73) ***	82.4 (70, 96) *
Bangladesh	9	43.6 (20,83) **	58.6 (27, 111)
China	67	72.0 (56, 91) **	88.3 (68, 112)
Hong Kong	103	69.3 (57, 84) ***	89.8 (73, 109)
Rest of the world	3325	86.4 (83, 89) ***	104.1 (101, 108) *

n/a not applicable

(*) Two sided $p < .05$

(**) Two sided $p < .01$

(***) Two sided $p < .001$

Table II. Observed and expected deaths among Scottish residents (25 years and older) from coronary heart disease for 6.25 years (Jan 1997 – Mar 2003), by country of birth and sex; standardised mortality ratios (95% confidence interval) using death rates from England and Wales as reference.

Country of birth	Deaths	Reference group	
		Scotland SMR (95% confidence interval)	England and Wales SMR (95% confidence interval)
Women			
England and Wales	315887		100
Scotland	33785	100	127.8 (126, 129) ***
UK (other)	2448	80.1 (77, 83) ***	102.5 (98, 107)
N. Ireland	275	97.2 (86, 109)	123.5 (109, 139) ***
R/Ireland	369	107.7 (97, 119)	137.4 (124, 152) ***
India	91	107.4 (87, 132)	139.4 (112, 171) **
Pakistan	26	101.5 (66, 149)	140.3 (92, 206)
China	13	69.8 (37, 119)	89.2 (47, 153)
Hong Kong	18	92.8 (55, 147)	124.1 (74, 196)
Rest of the world	536	82.4 (76, 90) ***	106.5 (98, 116)
Men			
England and Wales	385800	100	
Scotland	37445	100	122.6 (121, 124) ***
UK (other)	3011	80.1 (77, 83) ***	96.3 (93, 100) *
N. Ireland	328	97.2 (86, 109)	137.0 (123, 153) ***
R/Ireland	371	107.7 (97, 119)	128.8 (116, 143) ***
India	136	107.4 (87, 132)	126.2 (106, 149) **
Pakistan	64	101.5 (66, 149)	129.8 (100, 166)
China	15	69.8 (37, 119)	81.6 (46, 135)
Hong Kong	17	92.8 (55, 147)	62.5 (36, 100) *
Rest of the world	870	82.4 (76, 90) ***	114.6 (107, 122) ***

(*) Two sided $p < .05$
 (**) Two sided $p < .01$
 (***) Two sided $p < .001$

Table III. Observed and expected deaths among Scottish residents (25 years and older) from stroke for 6.25 years (Jan 1997 – Mar 2003), by country of birth and sex, with standardised mortality ratios (95% confidence interval) using death rates among those born in Scotland as reference.

Country of birth	Deaths	Reference group	
		Scotland SMR (95% confidence interval)	England and Wales SMR (95% confidence interval)
Women			
England and Wales	225313		100
Scotland	24001	100	129.1 (127, 131) ***
UK (other)	1862	85.7 (82, 90) ***	110.5 (106, 116) ***
N. Ireland	207	101.5 (88, 116)	130.8 (114, 150) ***
R/Ireland	261	109.8 (97, 124)	141.2 (125, 159) ***
India	63	111.1 (85, 142)	143.9 (111, 184) **
Pakistan	13	83.0 (44, 142)	109.4 (58, 187)
China	12	91.8 (47, 160)	118.0 (61, 206)
Hong Kong	13	106.0 (56, 181)	137.9 (73, 236)
Rest of the world	405	93.3 (84, 103)	120.0 (109, 132) ***
Men			
England and Wales	136064		100
Scotland	13934	100	133.4 (131, 136) ***
UK (other)	1061	73.5 (69, 78) ***	97.9 (92, 104)
N. Ireland	123	110.2 (92, 131)	146.7 (122, 175) ***
R/Ireland	143	104.1 (88, 123)	138.5 (117, 163) ***
India	53	114.8 (86, 150)	154.0 (115, 201) **
Pakistan	19	103.6 (62, 162)	140.4 (85, 219)
China	5	59.7 (19, 139)	79.8 (26, 186)
Hong Kong	9	85.3 (39, 162)	115.0 (53, 218)
Rest of the world	324	88.4 (79, 99) *	117.6 (105, 131) **

(*) Two sided $p < .05$
 (**) Two sided $p < .01$
 (***) Two sided $p < .001$

Table IV. Observed and expected deaths among Scottish residents (25 – 69 years) from coronary heart disease for 6.25 years (Jan 1997 – Mar 2003), by country of birth and sex, with standardised mortality ratios (95% confidence interval) using death rates from England and Wales as reference.

Country of birth	Deaths	Reference group	
		Scotland SMR (95% confidence interval)	England and Wales SMR (95% confidence interval)
Women			
England and Wales	38017	64.4 (64,65) ***	100
Scotland	5466	100.0 (97,103)	155.0 (151, 159) ***
UK (other)	282	57.1 (51,64) ***	89.0 (79, 100)
N. Ireland	36	92.2 (65,128)	143.2 (100, 198) *
R/Ireland	54	107.6 (81,140)	165.6 (124, 216) ***
India	23	135.0 (86,203)	209.8 (133, 315) **
Pakistan	19	164.3 (99,257)	258.4 (156, 404) ***
China	1	32.3 (1,180)	50.0 (1, 279)
Hong Kong	3	55.6 (11,163)	88.0 (18, 257)
Rest of the world	66	62.1 (48,79) ***	96.8 (75, 123)
Men			
England and Wales	118464	73.5 (73,74) ***	100
Scotland	13944	100.0 (98,102)	136.0 (134, 138) ***
UK (other)	967	67.7 (64,72) ***	92.6 (87, 99) *
N. Ireland	111	108.9 (90,131)	148.4 (122, 179) ***
R/Ireland	100	97.2 (79,118)	131.7 (107, 160) **
India	61	101.5 (78,130)	137.8 (105, 177) *
Pakistan	49	117.2 (87,155)	159.9 (118, 211) **
China	3	35.8 (7,104)	48.5 (10, 142)
Hong Kong	8	37.5 (16,74) **	51.3 (22, 101)
Rest of the world	209	84.2 (73,96) *	114.7 (100, 131)

(*) Two sided $p < .05$

(**) Two sided $p < .01$

(***) Two sided $p < .001$

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