

ORIGINAL ARTICLE

Mortality for Alcohol-related Harm by Country of Birth in Scotland, 2000–2004: Potential Lessons for Prevention

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Abstract — **Aims:** Deaths caused by alcohol have increased in the UK, and Scotland in particular, but the change in the rates of alcohol-related deaths for migrants are uncertain, and could yield insights for the general population. **Methods:** Alcohol-related mortality in immigrants among Scotland's residents was assessed using 2001 census data and mortality data from 2000 to 2004. **Results:** Mortality from direct alcohol-related causes accounted for nearly 1500 deaths per year in Scotland. Age-standardized mortality ratios were comparatively low for people born in Pakistan, other parts of the UK (largely England and Wales) and those from elsewhere in the world. **Conclusions:** Scotland's propensity to alcohol-related deaths is not shared by all its residents. Studying such variations in more depth could yield lessons for prevention.

INTRODUCTION

Excess alcohol consumption causes cirrhosis of the liver and increases the risk of certain cancers, stroke, vascular disease and neuropsychiatric disorders as well as external causes, such as suicides, accidents and sudden deaths (Rehm *et al.*, 2009). Excess alcohol consumption is one of the major avoidable risk factors for mortality globally, and actions to reduce the burden and health-related costs associated with alcohol are urgently needed (Rehm *et al.*, 2009).

Alcohol-related deaths more than doubled between 1991 and 2006 in the United Kingdom (Office for National Statistics, 2010; Scottish Health Survey, 2009): they are known to vary by country of birth in England and Wales, with men and women born in Scotland and Ireland being at especially high risk (Bhala *et al.*, 2009a). Mortality from liver cirrhosis (the major cause of alcohol-related death) has also risen more steeply in Scotland than elsewhere in the UK (Leon and McCambridge, 2006). Alcohol consumption in Scotland is also increased compared with the rest of the UK in cross-sectional studies, such as the Scottish Health Survey (Scottish Health Survey, 2009). Although a survey in Glasgow found that ethnic minority groups are likely to under-report alcohol consumption (NHS National Services Scotland, 2009a), reliable data are not available by country of birth or ethnic group. Scotland continues to consult on a revised alcohol strategy, and several actions are already being implemented, e.g. banning 'happy hours' and 'two-for-one' offers, although no culturally specific strategies are currently proposed (Scottish Government, 2010).

In all, ~12% of the Scottish population are born outside Scotland—the majority from the rest of the UK but also from Ireland, Pakistan and India (General Register Office for Scotland, 2003). In the absence of ethnicity data *per se*, country of birth can be a valuable proxy, as shown in previous analyses of heart disease, cancer and alcohol-related disease (Bhala *et al.*, 2009a; Fischbacher 2009a; Wild and McKeigue, 1997; Wild *et al.*, 2006). We examined, for the first time, the variations in alcohol-related mortality by

country of birth for residents of Scotland, to ask the question whether Scotland's propensity to alcohol-related diseases, presumably social and cultural, affected all residents or whether some were protected. If all are affected, Scotland's imminent alcohol strategy needs adapting to meet the needs of minorities, and if not, potentially we can extract lessons for the entire population.

METHODS

Mortality data

Data on deaths among Scottish residents were obtained from the General Register Office for Scotland (GROS) from 2000 to 2004 inclusive by age, sex, country of birth and underlying cause of death. The underlying cause of death was coded using the International Classification of Diseases, Tenth Revision (ICD-10) and alcohol-related deaths (deaths wholly attributable to alcohol) were defined as those coded to E24.4, F10, G31.2, G62.1, G72.1, I42.6, K29.2, K70, K86.0, P04.3, O35.4, Q86.0, R78.0, T51.0, T51.9, X45, X65, Y15, Y90 and Y91. (12) Data for mortality from alcoholic liver disease (K70) and mortality partly attributable to alcohol are included in online Supplementary material, Appendix (NHS National Services Scotland, 2009a,b).

Population data

Population data by age, sex and country of birth from the 2001 Scottish Census were provided by GROS. Place of birth was categorized by individual country or country group (rest of the UK [principally England and Wales]), Northern Ireland, Republic of Ireland, India, Pakistan and elsewhere, as for previous studies (Fischbacher *et al.*, 2007). Analyses are not presented for countries in which fewer than 20 alcohol-related deaths were expected in this time period: hence, Bangladesh (two deaths expected, zero observed), China (four expected, one observed) and Hong Kong (11 deaths expected, 3 observed) were excluded on the grounds

of insufficient precision (detailed analyses available from authors on request).

Statistical analysis

Indirect standardization was used to adjust for differences in age distribution between the populations of interest. Age- and cause-specific mortality data for the Scottish-born population were used as the standard. Conventional methods were used to estimate standardized mortality ratios (SMRs) and 95% confidence intervals (CIs) by country of birth for males (M) and females (F). Confidence intervals for SMRs for partly attributable deaths were based on the number of deaths rounded to the nearest whole number. The estimates for mortality partly attributable to alcohol (indirect mortality) do not take account estimates of deaths prevented by alcohol.

Presentation of results

All comparisons in the following text are with mortality in the Scottish-born population. The results are presented in an order defined by geographical groupings. As a consequence of the large numbers of deaths among people born in Scotland, these findings are closer to the population average, as in previous analyses (Fischbacher *et al.*, 2007).

RESULTS

Number of deaths according to the type of mortality

Table 1 shows that the number of deaths changed considerably according to the type of mortality caused by alcohol, and it indicates the size of the problem in Scotland, with nearly 1500 deaths per year using the conservative estimates based on direct alcohol-related conditions (wholly attributable deaths), on which we have focused below. Over a period of 5 years, there were 4429 deaths due to alcoholic liver disease, 6355 deaths due to direct alcohol-related causes and a total of 14,183 deaths from causes wholly or partially attributable to alcohol.

Mortality from alcohol-related conditions by country of birth

The data are presented in Fig. 1 and Table 2. Mortality from direct alcohol-related deaths was particularly low for people born in Pakistan (M SMR 27.8; F SMR zero); other parts of

the UK (mainly England; M SMR 36; F SMR 41.3), and people born elsewhere in the world (M SMR 41.3; F SMR 60.5). Alcohol-related mortality was not different for those born in the Republic of Ireland (M SMR 109.2; F SMR 79.5), Northern Ireland (M SMR 65.6; F SMR 89) or India (M SMR 69.5; F SMR 75.4).

The patterns by country of birth were similar for alcoholic liver disease deaths, and wholly and partially alcohol attributable deaths (see online Supplementary material, Appendix), although the precision was less with the former and more with the latter, reflecting the number of cases.

DISCUSSION

Principal findings

Alcohol-related mortality is a problem in Scotland whether assessed by alcoholic liver disease mortality, directly alcohol-related mortality or deaths partially attributable to alcohol (indirect mortality). There were differences in mortality ratios from alcohol-related causes by country of birth in Scotland (Bhala *et al.*, 2009a), in line with those reported in England and Wales (Association of Public Health Observatories, 2007; Haworth *et al.*, 1999). Alcohol-related mortality in men and women was highest among those born in Scotland and Ireland, and lower among those born in Pakistan, other parts of the UK and elsewhere in the world. The markedly lower mortality in England- and Wales (other UK)-born Scottish populations are particularly notable. These observations have potentially important implications for Scotland's alcohol strategy, and could have international relevance.

Limitations and strengths of the study

Limitations of mortality by country of birth analyses are well understood and include errors in population estimates, return migration, misclassification of country of birth, numerator-denominator bias (e.g. when country of birth for an individual is recorded differently in the census and on a death certificate), and inaccurate reporting of the cause of death (Bhala *et al.*, 2009a; Fischbacher *et al.*, 2007a; Wild and McKeigue, 1997; Wild *et al.*, 2006). In theory, people could go to die in other parts of the UK after being diagnosed with

Table 1. Observed deaths due to alcoholic liver disease, from causes wholly attributable to alcohol and total deaths (both wholly and partly attributable to alcohol), by sex and country of birth, Scotland 2000–2004

Country of birth	Female			Male		
	Alcoholic liver disease	Wholly attributable to alcohol	Wholly and partly attributable to alcohol	Alcoholic liver disease	Wholly attributable to alcohol	Wholly and partly attributable to alcohol
Scotland	1284	1746	4512	2875	4203	8475
Northern Ireland	8	12	31	13	21	46
Other UK	52	74	297	109	167	467
Republic of Ireland	6	10	33	20	29	63
India	3	4	11	6	11	21
Pakistan	0	0	2	4	4	9
Elsewhere	21	29	88	28	45	129
Total	1374	1875	4974	3055	4480	9209

Note: Deaths from alcoholic liver disease are included in the total for deaths wholly attributable to alcohol. The estimate for partially attributable deaths does not take account of deaths prevented by alcohol.

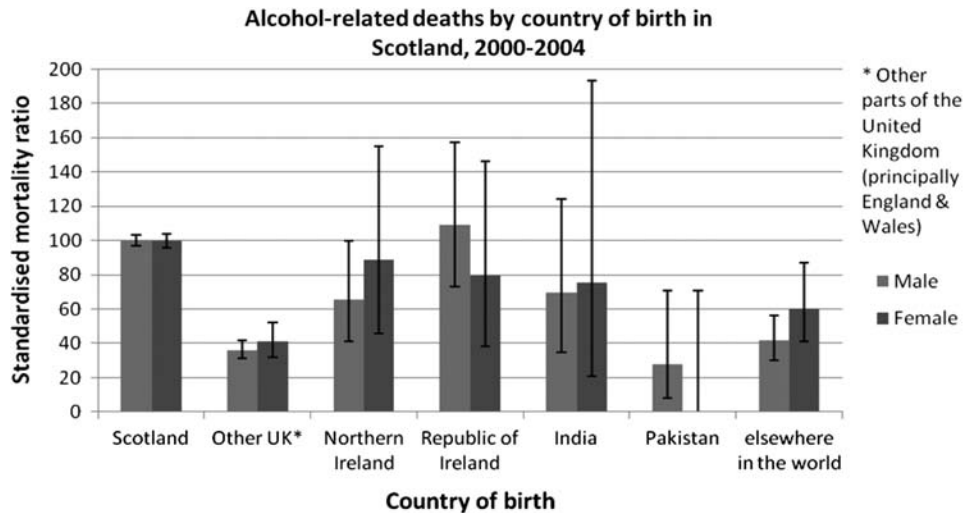


Fig. 1. Deaths due to causes directly related to alcohol: SMR and 95% confidence interval by sex and country of birth, Scotland 2000–2004.

Table 2. Deaths wholly attributable to alcohol: observed and expected deaths, SMR and 95% confidence interval by sex and country of birth, Scotland 2000–2004

Country of birth	Female			Male		
	Observed deaths	Expected deaths	SMR (95% CI)	Observed deaths	Expected deaths	SMR (95% CI)
Scotland	1,746	1,746	100.0	4,203	4,203	100.0
Northern Ireland	12	13.48	89.0 (46, 155)	21	32.01	65.6 (41, 100)
Other parts of UK	74	179.22	41.3 (32, 52)***	167	464.18	36.0 (31, 42)***
Republic of Ireland	10	12.57	79.5 (38, 146)	29	26.56	109.2 (73, 157)
India	4	5.30	75.4 (21, 193)	11	15.82	69.5 (35, 124)
Pakistan	0	5.17	0 (0, 71)*	4	14.41	27.8 (8, 71)**
Elsewhere	29	47.95	60.5 (41, 87)**	45	108.26	41.6 (30, 56)***

Note: SMRs were calculated using indirect age standardisation to the population born in Scotland, in 6 age groups (0–34 years, 35–44, 45–54, 55–64, 65–74, 75+). * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

alcohol-related conditions (as previously hypothesized in Hispanic populations in the USA, the so-called salmon bias) (Turra and Elo, 2008). However, this is unlikely to be important in the UK context, as it is well known that non-UK-born people show high rates for some causes of death (e.g. south Asians and cardiovascular diseases), and low rates for others (alcohol-related deaths as here).

While we need to be guarded in our interpretation of rates for people born in countries with relatively few events (e.g. Pakistan), low numbers of deaths for people born in some countries may also mean that some clinically important differences may not have been identified as being statistically significant. For example, the variation in the accuracy of cause of death described on death certificates by country of birth may also exist—e.g. social stigma may lead to under-reporting of alcoholic aetiology in death certificates (Bhala *et al.*, 2009a; NHS National Services Scotland, 2009a): such a stigma would certainly apply to Pakistan born, who are mostly Muslims. This theory fits well with the literature on alcohol consumption and ethnic background in a European context: for example, a study using the register data in Sweden showed that immigrants from Muslim countries tend to consume less alcohol compared with the European major population (Hjern and Allebeck, 2004). However, the data we present are in accord with other studies of alcohol

consumption and observations, indicating that taboos against alcohol are mostly holding (Bhala *et al.*, 2009a; Rehm *et al.*, 2009).

The value of country of birth as a proxy for ethnicity varies by population and condition, with a recent work in both Scotland and England giving data on cardiovascular mortality (Fischbacher *et al.*, 2007a) in line with the findings from a retrospective cohort study (Fischbacher *et al.*, 2007b). Nevertheless, the results here seem valid, e.g. the low mortality from Pakistani born, where most people are Muslims and observe the religious requirement of abstinence from alcohol. Data are lacking for recent migrants, such as Eastern Europeans (where alcohol already accounts for a high proportion of premature mortality) (Rehm *et al.*, 2007) and also the numbers are small for other groups, e.g. men born in India (Bhala *et al.*, 2009a; Fisher *et al.*, 2002). Country of birth cannot be used to identify offspring of immigrants—increased alcohol consumption may occur with acculturation (Pannu *et al.*, 2009).

Clearly, the findings need replication, potentially using record-linked methods with social and economic data (Fischbacher *et al.*, 2007b); however, the above limitations are unlikely to wholly, or even largely, explain the variations found here (Bhala *et al.*, 2009a; Fischbacher *et al.*, 2007a). The strengths of the study include the use of a large-scale national

data set used to explore this topic for the first time in this manner, the setting in a country with a major alcohol problem and analysis of data using four ways to define the burden.

Findings in relation to the literature

Alcohol-related conditions comprise a mixture of conditions (NHS National Services Scotland, 2009b), the commonest being alcoholic liver disease (here, 62% of alcohol-related deaths). Alcohol is the principal cause of liver disease in the UK, and around two-thirds of deaths from unspecified liver disease are attributable to it (Bhala *et al.*, 2009a) but other agents such as chronic viral hepatitis and non-alcoholic fatty liver disease may also contribute to variations, separately or synergistically (Bhala *et al.*, 2009b; Corrao *et al.*, 1998). Alcohol-related mortality is underestimated as direct estimates exclude other diseases where alcohol has some causal relationship, such as oral or oesophageal cancer, vascular disease, strokes and accidents (Rehm *et al.*, 2009); hence, arguably, the wider definition of alcohol-attributable mortality should be used. This increases the number of deaths in Scotland to almost 4000 per year, in a population of 5 million, although this is also likely to underestimate the social and economic harms related to alcohol (Association of Public Health Observatories, 2007).

Although we cannot adjust for socioeconomic data *per se*, people born in the rest of the UK are more likely to be economically active (70 vs. 64%), to be educated to degree level (41 vs. 22%), and in higher managerial positions (13 vs. 6%), than people born in Scotland (Scottish Health Survey, 2009; Office for National Statistics, 2010). Using self-reported data in this nationally representative survey, more than one in four men (30.2%) and more than one in six women (20.8%) reported drinking more than the recommended weekly limits. Small surveys carried out in the UK General Household Survey have suggested that people in Scotland drink less alcohol, on average, than those in England (Centre for Public Policy for Regions, 2010). However, the opposite is likely to be true, and alcohol consumption may have been seriously underestimated—in larger surveys, based on alcohol sales data for 2007, it has been estimated that Scots aged >16 drank, on average, almost 23 units of alcohol per week (compared with just >19 units in England and Wales) (NHS Health Scotland, 2010).

The variations by country of birth have not been studied in Scotland previously, but in England and Wales, men born in Ireland drink at high-risk levels and experience drinking problems more than non-Irish men (Harrison *et al.*, 1993). Increased admission rates for alcohol-related mortality in Scottish and Irish patients compared with the general population in an inner-city hospital in London were described >20 ago (Taylor *et al.*, 1986). Routine mortality statistics demonstrated a stark increase in liver cirrhosis mortality in Scotland compared with that in the rest of Europe, including England and Wales (Leon and McCambridge, 2006).

The great excess in Scottish mortality rates compared with other parts of the UK for alcohol-related deaths is alarming. Given the propensity of Scotland's population for alcohol-related mortality, what factors are driving the excess alcohol consumption? This cannot be related solely to adverse socioeconomic circumstances, as those born outside Scotland,

with the possible exception of people born in other parts of the UK (mainly English-born), are likely to be poorer than the Scottish-born population. Hence, there are potential lessons for cultural change in alcohol-related hazards to be learnt from those populations in Scotland with low alcohol-related mortality.

Potential implications for prevention

The priority for the prevention of a high level of alcohol-related deaths is to reduce consumption by targeting high-risk groups as well as the entire population (Scottish Government Alcohol Framework, 2009) and approaches to do this have been published (Anderson *et al.*, 2009). Given the increasing size of the problem (Leon *et al.*, 2003), NHS Health Scotland stated in its response to Scotland's consultation on alcohol: 'Changing Scotland's drinking cultures and relationship with alcohol is vital if Government's vision of a Scotland where moderate, responsible drinking is the norm is to be achieved. ... A debate which engages the public, as well professional audiences, on what a responsible drinking culture in Scotland will look like we believe will help build support for the change required in Scotland' (NHS Health Scotland Consultation response, 2010). The fact that, within Scotland, there are substantial populations that do not exhibit the excessive propensity to alcohol-related mortality is a potential pointer to, and foundation for, such policies both there and elsewhere. The lessons are likely to vary by population. For example, for the other UK population, socioeconomic status is likely to explain differences, whereas for the Pakistan-born population religious taboos are probably most important. The actual and potential influence of migrants upon the host population, and not just vice versa, merits consideration. Such variations need in-depth study, including further qualitative and epidemiological research, so that the lessons learned can benefit the entire population.

AUTHORS' CONTRIBUTIONS

N.B., C.F. and R.B. designed and conceived the study. Analyses were carried out by C.F., with interpretation by all authors. The manuscript was written and approved by N.B., C.F. and R.B.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Alcohol and Alcoholism* online.

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