An analysis of practice-level mortality data to inform a health needs assessment

Roger Webb and Aneez Esmail

SUMMARY

Background: *The utility of practice death registers has been indicated but, in the wake of the recent Harold Shipman case in the United Kingdom, the value of individual practice-level analysis has been questioned.*

Aim: *To assess the value of analysing practice-level mortality data to inform health needs assessment.*

Design of study: *Comparative analyses of mortality.*

Setting: *Two large practices, an inner-city study practice, and a reference practice in a medium-sized town.*

Method: *All premature deaths (aged one to 74 years) during 1994–1998 at the study practice (*n = *170), and reference practice (*n = *340), were identified. Cause-specific standardised mortality ratios (SMRs) were calculated using national reference data. The proportions of the total number of years of life lost (YLL) up to age 75 years associated with alcoholism, drug dependency, and severe mental illness were calculated and a comparison between practices was made, using standardised proportional mortality methods.*

Results: *Significantly raised SMRs for the study practice were lung cancer (SMR = 234), digestive system diseases (SMR = 362), and injuries and poisonings (SMR = 180). Having standardised for age, there were nearly four times as many YLLs in the study practice population associated with a history of alcoholism, and over three times as many associated with drug dependency, compared with the reference practice.*

Conclusion: *Mortality analyses can provide useful insights for informing needs assessment in an individual practice. Small number problems may occur with smaller practice populations, but collation of data at PCG/T level also has potential utility. The study reinforces the argument that practices need to set up and maintain complete and accurate death registers.*

Keywords: *mortality; cause of death; death records; needs assessment.*

R Webb, MA (Econ), research associate; and A Esmail, PhD, MFPHM, senior lecturer, University of Manchester School of Primary Care, The Robert Darbishire Practice, Rusholme Health Centre, Manchester.

Address for correspondence

Mr Roger Webb, Arthritis Research Campaign Epidemiology Unit, University of Manchester Medical School, Stopford Building, Oxford Road, Manchester M13 9PT. E-mail: roger.webb@man.ac.uk

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Introduction

PREVIOUSLY published work has indicated the value of setting up and maintaining general practice death registers.[1-4] The issue has recently gained prominence in the national media as a result of the Harold Shipman case, which has generated controversy concerning the value of collecting and analysing mortality data at individual practice level.[5-7] We set out to discover whether practice level analyses of deaths could provide useful insights to inform a health needs assessment of the practice population. The purpose of this paper is to describe the methods and findings of this descriptive epidemiological study and to discuss the potential utility of this approach for practices and service planners at Primary Care Group/Trust (PCG/T) level.

Preliminary analyses of mortality data at the study practice (Robert Darbishire Practice) in Manchester, indicated a high death rate among young adults associated with substance misuse and mental illness. Early premature mortality therefore became the main focus of our investigation.

It has been established that histories of substance dependence/chronic abuse are often not recorded on death certificates, leading to a significant undercounting of the numbers of deaths associated with these risk factors.[8-11] We therefore sought to estimate the true level of association between alcoholism/drug dependency/severe mental illness and early premature mortality in the practice population. We also aimed to identify the other causes of premature death that predominate locally.

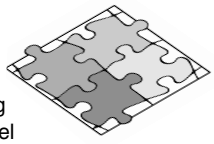
Method

Ascertainment of cases and risk factor data

All patients coded as 'deaths' (Read codes .9134 and .9234) occurring during the calendar years 1994 to 1998 were extracted from our clinical database (Torex Meditel™). We defined premature mortality as deaths occurring at age below 75 years, as this is close to life expectancy (77 years) for males and females.[12] Infant deaths were excluded and children aged less than one year were also excluded from all denominators. A total of 270 deaths were identified, 170 at age less than 75 years.

To measure the true degree of association between premature mortality and a significant history of alcoholism/drug dependency/severe mental illness, we reviewed the medical records of the premature deaths. The identification of these risk factors required some broadening of definitions owing to coding inconsistencies. For example, of the 46 deaths that were identified as having a significant history of alcoholism, the majority (35) were coded with the Read codes for either 'alcohol dependency' (E43.), 'alcoholism' (1462) or 'alcoholic cirrhosis of liver' (I722). The remaining 11 cases were identified on the basis of other relevant information

HOW THIS FITS IN



What do we know?

The value of collecting and analysing mortality data at general practice level has been indicated for some years. In the wake of the Harold Shipman case, recent authors have raised doubts about the value of such data, owing to problems of small numbers. Analyses of the causes of premature mortality in a large inner-city practice can provide useful insights regarding the health needs of the local population. Such information is useful for priority setting and service planning.

What does this paper add?

Small number problems remain; for example, in carrying out sex-specific analyses or with smaller practice populations. However, these problems can be overcome if the data are collated and analysed at PCG/T level. The application of census geography-based mortality data to primary care populations is prone to a high degree of error. Analysing data collected at individual patient level from each practice is therefore preferable.

recorded in the notes (for example, 'drinks in a.m., 2–12 cans'; 'referred to alcohol treatment unit', 'alcohol = 100 units/week'). Severe mental illness was defined as any type of psychotic illness (excluding senile dementia), major personality disorder (for example, 'explosive') or history of attempted suicide. For drug dependency only those coded as such (Read code E44.) were included.

A general practice in the medium-sized town of Northwich, Cheshire, was selected as a reference. This selection was based on two key factors. First, we sought a practice that was sufficiently large (so that a large number of premature deaths could be ascertained); secondly, we sought a practice that was markedly different from the study practice in terms of age structure, health status, risk factors, and mortality patterns. As the Robert Darbishire Practice (the study practice) is located in a diverse, deprived, and transient inner-city area, we selected a rerference practice in a generally more affluent and homogenous medium-sized town in Cheshire. Cases and risk factor data were ascertained in the same way (769 deaths in total, 340 at age less than 75 years).

Statistical analyses

We calculated the mortality rate per 1000 for those aged one to 74 years and the proportion of all deaths (over one year of age) that occurred in that age range, for the Robert Darbishire Practice, the reference practice, and England and Wales. For both practices, these rates and proportions were age-adjusted to the population structure of England and Wales using direct standardisation.

We obtained cause of death information from the Office of National Statistics (ONS). For reasons of cost we obtained these data for the Robert Darbishire Practice only and not the reference practice. Underlying cause of death was categorised using the ICD9 system.[13] We calculated cause-specific indirectly age-standardised mortality ratios (SMRs) (for deaths at age one to 74 years) for the Robert Darbishire Practice, using England and Wales mortality data as the reference.[14-18] This enabled us to take account of the Robert Darbishire Practice's unusual age distribution, which is greatly skewed by a preponderance of young adults.

We calculated the proportions of years of life lost (YLL) up to age 75 years associated with one or a combination of the three risk factors (alcoholism, drug dependency, and severe mental illness) in the Robert Darbishire Practice and reference practice populations. YLL is an especially useful measure for analysis of premature death as actual age of death is taken into account, thereby enabling us to assess the true degree of association between these factors and premature mortality.[19-21] Crude ratios of these proportions for Robert Darbishire Practice compared with the reference practice were calculated. To take account of the marked difference in age structures of the premature deaths between the two practices, indirectly age-standardised ratios (i.e. observed versus expected number of YLL for each risk factor) were calculated for the Robert Darbishire Practice, with expected numbers calculated using the reference practice age group-specific proportions. This is equivalent to a standardised proportional mortality ratio,[22] except that the unit of analysis is the YLL rather than the person.

Owing to problems caused by small numbers (there were only 61 female deaths at age less than 75 years at the Robert Darbishire Practice), no sex-specific analyses were performed. All 95% confidence intervals were calculated using the formulae given in Altman *et al.*[23]

Results

The unadjusted mortality rate (one to 74 years) at the Robert Darbishire Practice was 2.7 per 1000, compared with 3.5 per 1000 at the reference practice and 4.5 per 1000 for England and Wales, as shown in Table 1. However, the age-standardised rates for Robert Darbishire Practice were higher (5.7 per 1000) than for the reference practice (3.2 per 1000) and for the baseline national rate. The age-specific rates for the Robert Darbishire Practice were also higher within each age stratum, compared with those for the two reference populations. At the Robert Darbishire Practice, the unadjusted percentage of all deaths that occurred at ages one to 74 years was 63%, compared with 44% at the reference practice and 38% nationally. The age-standardised percentage for the Robert Darbishire Practice was much lower (46%) than the unadjusted one whereas, for the reference practice, age adjustment made only a negligible impact to this percentage (the unadjusted and age-standardised percentages were both 44%).

Table 2 shows the results of our analysis of the degree to which alcoholism, drug dependency, and severe mental illness were associated with premature mortality in the two practice populations. Comparison between the Robert Darbishire Practice proportions and those for the reference practice enabled us to assess the degree to which these risk factors predominate in an inner-city population compared with a more average practice. In the Robert Darbishire Practice population, 42% of all YLL were associated with alcoholism/drug dependency, compared with 11% for the reference practice. Fifty-three per cent were associated with alcoholism/drug dependency/severe mental illness, com-

Table 1. Proportion of all deaths that occurred in 1–74 years range, and mortality rate (1–74 years) per 1000, unadjusted and age-adjusted for Robert Darbishire Practice, the reference practice, and England and Wales.[a,b]

	Robert Darbishire Practice	Reference practice	England and Wales
Number of deaths in the 1 to 74 years range, compared with total	170/270	340/769	–
Unadjusted percentage of all deaths in the 1 to 74 years range	63.0 (57.2–68.7)	44.2 (40.7–47.7)	38.4
Age-adjusted percentage of all deaths in the 1 to 74 years range	45.6 (39.6–51.5)	43.5 (40.1–47.1)	–
Unadjusted mortality rate (1 to 74 years) per 1000	2.7 (2.3–3.1)	3.5 (3.1–3.9)	4.5
Age-adjusted mortality rate (1 to 74 years) per 1000	5.7 (4.8–6.6)	3.2 (2.9–3.5)	–

[a]Age adjustment carried out using age structure of England and Wales as the reference (direct method). [b]95% confidence intervals presented in parentheses.

Table 2. Age-standardised ratio (Robert Darbishire Practice versus reference practice) of the proportion of YLL (to age 75 years), accounted for by patients with alcoholism, drug dependency or severe mental illness (as recorded in medical notes).

Risk factor(s)	Robert Darbishire Practice (%) (YLL, *n* = 3432)	Reference practice (%) (YLL, *n* = 3955)	Crude ratio of proportions (Robert Darbishire Practice versus reference)	Indirectly age-standardised ratio (observed versus expected)[b]
Alcoholism (A)	30.1	7.3	4.1	3.9 (3.7–4.1)
Drug dependency (D)	21.1	3.6	5.9	3.3 (3.0–3.5)
Severe mental illness (SMI)	19.6	14.0	1.4	1.0 (0.9–1.1)
A/DD[a]	41.7	10.9	3.8	2.9 (2.8–3.1)
A/DD/SMI[a]	53.1	23.9	2.2	1.6 (1.5–1.7)

YLL = years of life lost. [a]Rows 'A/DD' and 'A/DD/SMI' include cases with either one or a combination of risk factors. [b]95% confidence intervals presented in parentheses.

pared with 24% for the reference practice. The age-standardised ratios indicate that there were nearly four times as many YLL in the Robert Darbishire Practice population associated with a history of alcoholism (ratio = 3.9, 95% CI = 3.7–4.1) and over three times as many associated with drug dependency (ratio = 3.3, 95% CI = 3.0–3.5), compared with the reference practice. For severe mental illness the age-standardised ratio was 1.0 (95% CI = 0.9–1.1).

Table 3 shows the cause-specific SMRs that enabled us to identify the causes of premature death raised in the Robert Darbishire Practice population compared with the national average. These results show that Robert Darbishire Practice has markedly and significantly raised SMRs for lung cancer, digestive system diseases (especially chronic liver disease and cirrhosis), and injuries and poisoning. The SMRs for circulatory diseases and respiratory diseases were similar to the national average and that for cancer (all types except lung) was lower (but non-significant).

Discussion

The results presented in Table 1 demonstrate the necessity of carrying out age adjustment when comparing mortality data between practices. The fact that the Robert Darbishire Practice has a higher premature mortality rate than both the national and practice reference populations only became apparent following age adjustment. Age adjustment also indicates that the markedly high percentage of all deaths occurring in the 1 to 74 years age range at the Robert Darbishire Practice can, to a large degree, be attributed to its highly skewed age structure.

There was a very strong association between the risk factors of alcoholism/drug dependency and premature mortality within the Robert Darbishire Practice population. This was demonstrated clearly in terms of total YLL, by comparing the Robert Darbishire Practice with a reference practice, having taken account of the markedly different age structures of the premature deaths through indirect standardisation. The excess of deaths associated with severe mental illness in the Robert Darbishire Practice population disappeared when we standardised for age, which was an unexpected finding. Possible reasons for this may have been coding inconsistencies between the two practices, or that our definition of severe mental illness was too broad.

By calculating cause-specific SMRs we were able to identify the causes of premature mortality that were most raised in our population. These causes are directly related to alcoholism (i.e. digestive system diseases, especially chronic liver disease and cirrhosis), smoking (i.e. lung cancer), and substance dependence (i.e. injuries and poisonings). By contrast, the major causes of premature mortality in the national population (all types of cancer and circulatory diseases) did not have significantly raised SMRs. However, these SMRs are based on small numbers of observations and, on the basis of the width of the 95% CIs, we should interpret them with caution.

Our practice is far larger than average (the list size is approximately 13 000), and has higher premature mortality rates than average. Even so, our analysis lacked sufficient power to enable sex-specific analyses. Problems caused by small numbers may therefore generally preclude meaningful analyses at individual practice level, but this problem could be overcome by collation and analysis at PCG/T level, or by analysing trends over time.

The calculation of cause-specific SMRs, using numerator and denominator data obtained directly from practice systems is preferable to methods that attempt to apply electoral ward-based SMRs (which are often presented in local Public Health Departments' annual reports) to practice or PCG/T

Table 3. Cause-specific SMRs for the Robert Darbishire Practice: all persons (1 to 74 years), 1994–1998[a] (reference: England and Wales).

Underlying cause of death (ICD-9 categories)	Number of deaths (Robert Darbishire Practice)	Percentage of deaths (Robert Darbishire Practice)	Percentage of total YLL (Robert Darbishire Practice)	95% CI		
				SMR	LCL	UCL
Malignant neoplasm (140–208)	49	28.8	18.7	114	84	150
Lung cancer (162)	23	13.5	7.1	*234*	148	351
All cancers (except 162)	26	15.3	11.7	78	51	115
Circulatory diseases (390–459)	44	25.9	16.0	104	75	139
Ischaemic heart disease (410–414)	24	14.1	8.7	87	55	131
Cerebrovascular disease (430–438)	11	6.5	5.5	145	72	260
Respiratory diseases (460–519)	12	7.1	6.2	104	54	181
Digestive system diseases (520–579)	19	11.2	10.2	*362*	218	565
Chronic liver disease and cirrhosis (571)	11	6.5	6.6	*503*	251	900
Injury and poisoning (800–999)	30	17.6	37.5	*180*	121	257
Accidents (800–949)	17	10.0	21.9	*187*	109	299
Suicide (950–959, 980–989, excluding 988.8)	10	5.9	10.5	153	74	282
All causes (001-999)	170	–	–	*124*	106	144

[a]Statistically significant SMRs (i.e. where the 95% CI does not cross 100), are in italic.

populations. Bias occurs because practice populations can be quite unrepresentative of the geographical area in which they are situated and practice and PCG/T catchment areas are usually not coterminous with ward boundaries. The data from several wards can be appropriately weighted to take these discrepancies into account, but such methods are prone to a high degree of ecological error. Our method is more accurate and would be an especially powerful tool if carried out at PCG/T level.

This study reinforces the argument that practices need to set up and maintain complete and accurate death registers.[1-4] While carrying out our analyses we reviewed current systems for recording deaths within the practice. We found that cause of death information, as currently recorded, was inadequate for carrying out epidemiological analyses (i.e. it was not consistently recorded and was only around 30% complete). It was for this reason that we purchased the data from ONS. To address these inadequacies we have written a protocol for the prospective collection of cause of death data. Through this we hope to achieve better levels of communication with local hospitals and coroners, to enable the accurate and efficient acquisition of this crucially important information.[3]

We have demonstrated that a descriptive epidemiological analysis of premature mortality within a practice population can provide insights into local health needs. The information is especially useful for service planning, priority setting and monitoring trends in health inequalities. While the value of analysing mortality data at individual practice level is still open to debate as a result of problems caused by small numbers,[5] there can be little doubt as to its potential usefulness at PCG/T level. Our study reinforces the argument that there is a need for the creation and maintenance of accurate and complete death registers for all general practices.

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