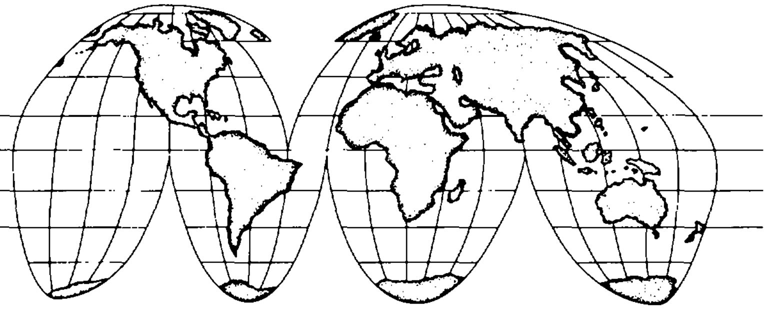
Coding Issues



E–Coding of Morbidity Data

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Background

The population of Scotland suffers a relatively high risk of injury in comparison with other parts of the United Kingdom for reasons which are unclear. Some claim that the inclement weather is to blame, others that the defiant personality of the Scots leads to risk–taking behaviour. A more plausible explanation is the extremely high level of poverty which casts a long shadow over Scottish society. This manifests itself not only in the economic deprivation of many individuals and families but in poor housing design and other environmental hazards to safety which are especially prevalent in the densely populated urban areas of the central belt.

Injury prevention in Scotland has received a major boost from a governmental policy statement contained in a document entitled "Scotland's Health—A challenge To Us All." This was issued at about the same time as its English counterpart "The Health of the Nation." These may be regarded as ideological descendants of the 1978 Alma Ata Declaration which led to the World Health Organisation's Health for All Strategy and its accompanying targets for health promotion. Both highlighted accidents as one of a handful of key areas requiring urgent attention by government departments.

Probably the most serious obstacle to the development of a comprehensive injury prevention strategy is the lack of appropriate data for injury surveillance—a sine qua non for planning and evaluating interventions. Of those data which do exist, mortality statistics are the most widely quoted, partly because the recording and classification of injury deaths generally adopts the format of the International Classification of Disease and is therefore often accompanied by some basic causal descriptors in the form of so–called E (External Cause) codes. This dependence on mortality data distorts the totality of the injury picture since deaths constitute less than one per cent of all injuries presenting to health services. In particular, there is a worrying deficiency of injury morbidity data which fulfil three important criteria of public health information: their routine availability, their population–based orientation and their inclusion of causal variables. Scotland, however, is almost unique in having an database which meets all three criteria. It is known as the Scottish Morbidity Record (SMR) system.

The SMR system is a routine hospital activity monitoring scheme dating back to 1961. It is operated by the Information and Statistics Division of the Common Services Agency of the Scottish Health Service. A computer–coded form (SMR 1) is completed on the discharge, death or transfer of every non–obstetric and non–psychiatric in–patient or day case from any Scottish hospital. The form records a range of administrative and clinical data, including ICD 9 diagnostic and E–codes, which are abstracted from the case record by trained clerical staff.

Relatively little use has been made of the SMR system for injury research or prevention. We therefore decided, on the gentle prompting of the organisers of this ICE, to explore the possibilities further. We set out to try to answer the following question: what is the potential of E–coded Scottish hospitalisation data for injury surveillance? Specifically, we wanted to know the completeness of E–coding of SMR data, and the epidemiological and preventive potential of the database.

Materials and Methods

All hospitalisation episodes arising from injury or poison diagnoses recorded on the SMR1 database were analysed using a linked file for the period 1984–91 for Scottish residents. The linkage enabled us to generate data on continuous inpatient stays (i.e., excluding transfers or re–admissions within 24 hours of the initial discharge) rather than episodes of hospitalisation.

We used two ICD 9 dimensions to tabulate the data: injury and poisoning diagnoses (ICD codes 800–999) and E–codes (ICD codes E800–E999). We then computed annual injury and external cause rates by relating the SMR1 data to age–specific population denominators derived from mid–year population estimates of the Registrar General for Scotland for the years 1984–91. We also cross–tabulated the injury diagnoses with E–codes to obtain bi–directional frequency distributions. Age standardisation was achieved by the direct method using the 1986 population as the standard.

The data were presented as diagrammatic and graphic displays using Harvard Graphics for Windows.

Results

A total of 713,398 hospitalisation episodes were analysed. Of these, 701,580 (98.3 percent) had an E–code recorded.

Table 1 shows the annual proportions of records of continuous inpatient stays (CIS) with an E–code recorded over the period 1984–91. These are consistently high, ranging from 96.9 percent to 100 percent.

We were able to generate an enormous number of tabulations, charts and graphs based on these E–coded injury hospitalisations. The following examples have been selected to illustrate the potential of the database for descriptive and monitoring purposes rather than as an exhaustive account of the wide range of its analytical possibilities.

Motor vehicle traffic accidents (MVTA) are one of the largest contributors to injury morbidity and are denoted by the codes E810–E819. Being a heterogeneous group of phenomena, data relating to MVTAs are of limited preventive value unless the role of the victim (as driver, passenger or other) is identified. The fourth digit extension to the code enables this to be analysed. Figure 1 is a pie chart showing the proportions of MVTA victims who were drivers, passengers, motor cyclists, pedal cyclists, pedestrians or others for the year 1991. The three largest categories were drivers (25 percent), pedestrians (24 percent) and passengers (13 percent).

Similarly, falls (E880–E888) represent a large but uninformative category. A fifth digit extension provides an opportunity to code place of occurrence of the fall. Figure 2 illustrates a recurring problem with the use of many of the E–codes—incompleteness of coding. While 25 percent of female fall victims hospitalised in 1991 are recorded as having experienced their injury in the home, in almost two–thirds of cases the place of occurrence was not specified. Whether this was due to deficiencies in the clinical recording of the circumstances of the falls or to a systematic failure to assign the appropriate codes cannot be determined from these data.

By relating the hospitalisation numerators to population denominators, age standardised annual injury hospitalisation rates can be derived. Figure 3 shows the temporal trend in discharge rates for falls for the whole of Scotland. Based on crosstabulations of falls against the resultant injuries, the graphs in Figure 4 provide a more revealing insight into the pattern of interaction between injury causes and outcomes over time. Falls are associated with head injuries more frequently in males than in females, who suffer more often from lower limb dislocations or fractures. In both sexes, however, fall–related head injuries are declining while lower limb injuries are increasing in frequency.

At times, the distinction between the cause and outcome of an injury appears to become blurred and it is therefore important for the investigator to include both dimensions while retaining an open mind about which is which. Figure 5 depicts the upward trend in suicide (E950–E959) as a cause of injury in females, the largest component "injury" being poisoning. In this case, the E–code (suicide) is more appropriately described as the outcome while the injury diagnosis (poisoning) is the cause. On the other hand, there is little ambiguity about assault (E960–E969) as the cause of a rising rate of male admissions and the various associated injuries (notably to the head) as the result (Figure 6), or traffic accidents (E810–E819) as the cause of a declining rate of hospitalisations and a range of injuries (mainly of the head and limbs) as their result (Figure 7).

All of the above examples have illustrated the analytical approach which takes the injury cause (as reflected by the E–code) as the starting point. This may seem logical when planning preventive measures. In some ways, however, the injury itself may be more important—if, for example, the resource implications for hospital specialties are being considered. To this end, the analysis can be reversed and the injury used as the starting point, and the contrast with the causally based approach can yield surprises. Figure 8, for example, suggests that the discharge rate for head injuries has barely changed despite an apparently declining causal contribution from MVTAs. Yet the previous illustration (Figure 7) seemed to indicate that both MVTAs and head injuries were declining in frequency. This latter conclusion would be erroneous since it fails to take account of the changing pattern of causes of head injuries, at least in males, which are increasingly associated with assaults and decreasingly with MVTAs. Thus an injury oriented analysis is as important—and should be complementary to—a causally oriented one.

Discussion

This rapid and relatively superficial overview of the potential of the SMR system for injury analysis scarcely does justice to the complexities and possibilities of the data. Our intention is to carry this work forward by extending and refining the types of analyses we have presented here, and to encourage our international colleagues to contrast their own injury morbidity experience with ours.

At the same time, we recognise that progress is likely to be hampered by the methodological constraints inherent in any hospitalisation based injury morbidity database as well as in the well–documented limitations of the ICD E–codes themselves. In particular, there are three worrying—and to date unanswered—questions to which we must find answers urgently.

First, how valid are the injury diagnoses—and the E–codes assigned to them—as recorded in routine hospitalisation morbidity systems?

Second, how useful in practice are hospitalisation morbidity systems for local injury surveillance and prevention?

Third, how confident are we that E–coded injury data are comparable both within and between countries?

Our provisional conclusions about the potential role of E–coded injury morbidity data in injury investigation, surveillance and prevention may be summarised as follows.

1. The systematic E–coding of routine hospitalisation data is eminently feasible: in Scotland, it approaches 100 percent. Further work is necessary to establish the local, national and international validity and comparability of both the principal injury diagnoses and their assigned E–codes.

2. E coded hospitalisation data offer valuable insights into the causes and epidemiological patterns (including secular trends) of injuries, although the practical utility for prevention of such analyses remains unclear.

3. The crosstabulation of injury types against their causes illuminates the nature of the injury hospitalisation phenomenon in ways which are more relevant to prevention than unidimensional analysis.

4. Routine hospitalisation data (such as those collected by the SMR system) can play an important role in the epidemiological investigation of injuries provided that the inherent theoretical and practical limitations of using hospitalisations—and E–codes—to measure injury morbidity are recognised.

5. Given the current paucity of causal information on injury morbidity world–wide, the routine use of E–coding of hospitalisation data should be placed high on the agenda of international initiatives such as this ICE and EURORISC (see Appendix).

Appendix

A brief word about EURORISC. The acronym stands for European Review of Research on Injury Surveillance and Control. The idea grew out of a growing realisation that re–inventing the wheel was a tremendously wasteful activity and that one could learn a great deal from colleagues working on injury surveillance in various parts of Europe. A grant application was therefore submitted to the Biomed programme of the European Commission in 1993. As yet, no outright rejection has been received but nor has any funding materialised.

The aim of EURORISC is to investigate the feasibility of establishing a transnational collaborative network of injury surveillance and control researchers in countries of the European Union.

Its three specific objectives are: to establish a central clearing house for information exchange, to initiate collaborative projects with particular emphasis on the evaluation of interventions and to accelerate progress towards the harmonisation of injury surveillance and control methods in Europe.

So far, eight potential participants have been identified in six countries (United Kingdom, Sweden, France, Netherlands, Italy and Greece). Since the future of the embryonic project is uncertain, and it may be logical to integrate it with existing global efforts such as those initiated by the World Health Organisation and the US National Center for Health Statistics.

References

1. Kohli HS, Knill–Jones RP. How accurate are SMR 1 (Scottish Morbidity Record 1) data? Health Bulletin (Edinburgh). 50, 14–23. 1992.

2. Ribbeck BM, Runge JW, Thomason MH, Baker JW. Injury surveillance: a method for recording E–codes for injured emergency department patients. Annals of Emergency Medicine, 21, 37–46. 1992.

3. Smith GS, Langlois JA, Buechner JS. Methodological issues in using hospital discharge data to determine the incidence of hospitalized injuries. American Journal of Epidemiology, 134, 1146–58. 1991.

4. Smith T. Accidents, poisoning and violence as a cause of hospital admissions in children. Health Bulletin (Edinburgh), 49, 237–44. 1991.

5. Tursz A, Crost M, Lelong N. Basic principles of epidemiology applied to accident research. In: Rogmans W, Schuurman M (eds), Proceedings of International Seminar on Accident Data, Baden, Austria. 1989.

Table 1 - % of Injury (ICD 800-999) CIS Discharges with an E Code Recorded

Year	No. of CIS discharges	With E code recorded
1984	76103	100.0%
1985	75875	100.0%
1986	74494	96.9%
1987	76077	98.7%
1988	78257	99.5%
1989	78011	98.5%
1990	81871	98.7%
1991	85911	99.7%

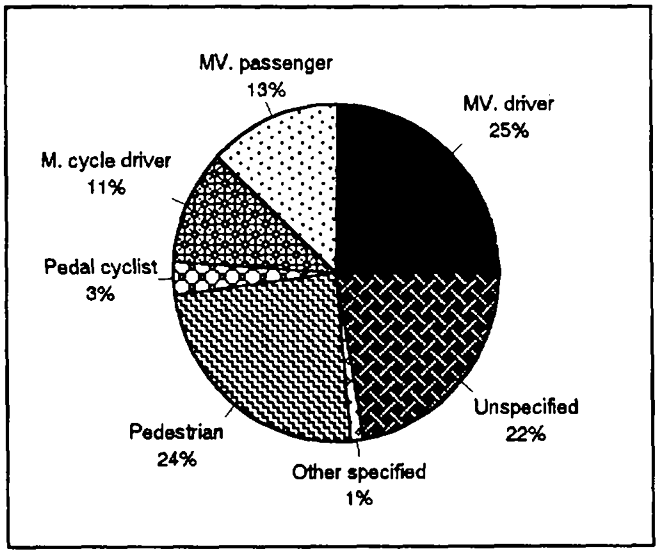

Figure 1. Fourth digit classification for MVTA (ICD E810-819), males discharged from Scottish hospitals, 1991

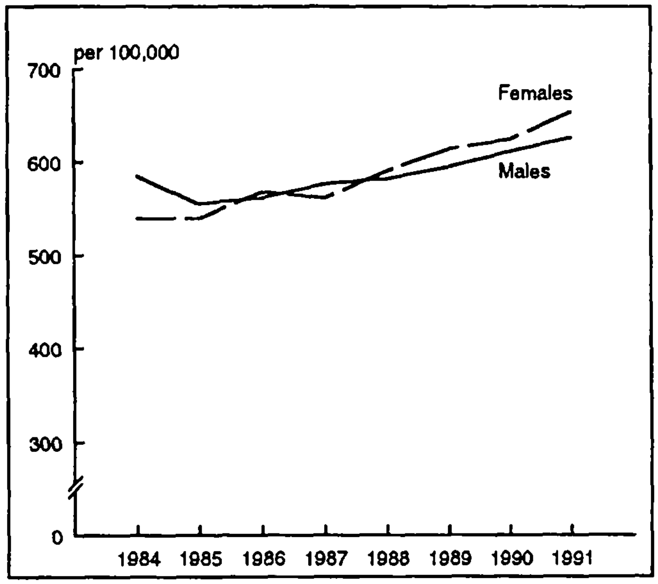

Figure 3. Age standardised CIS discharge rates for falls (ICD E880-888), Scotland 1984-91

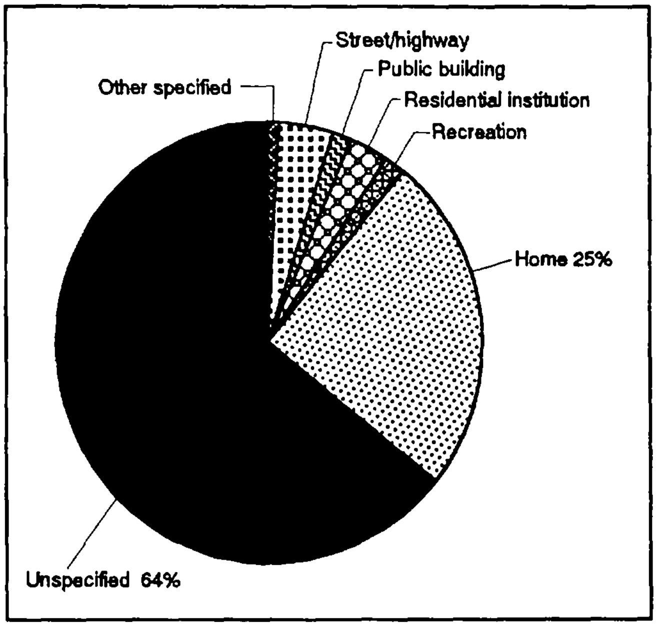

Figure 2. Fifth digit classification for Falls (ICD E880-888), females discharged from Scottish hospitals 1991

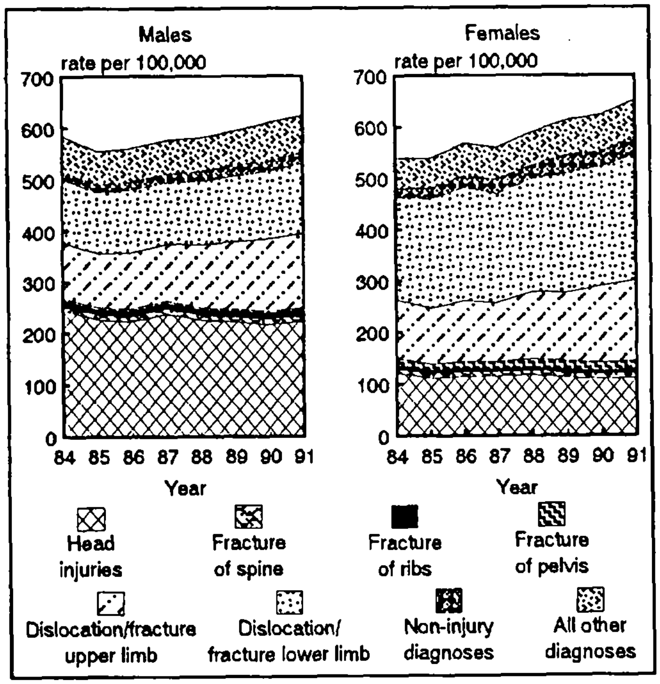

Figure 4. Age standardised CIS discharge rate for Falls (ICD E880-888), Scotland 1984-91

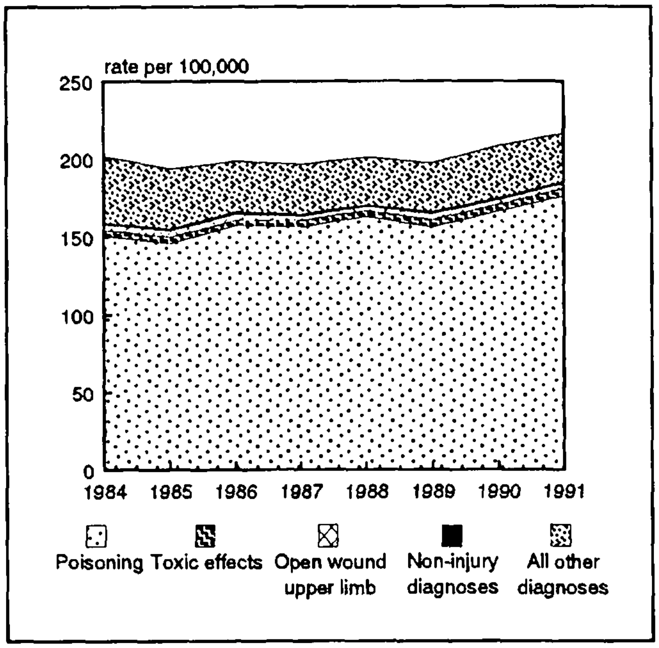

Figure 5. Age standardised CIS discharge rate for Suicide (ICD E950-959), females Scotland 1984-91

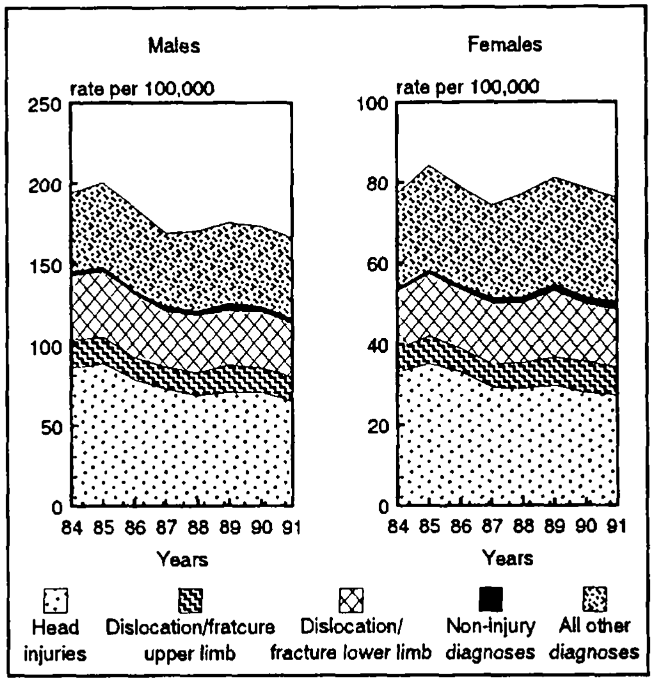

Figure 7. Age standardised CIS discharge rate for MVTA (ICD E810-819), Scotland 1984-91

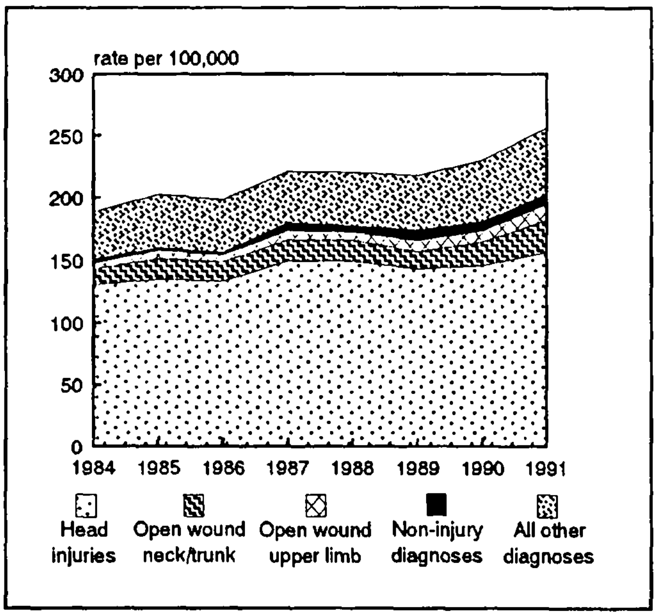

Figure 6. Age standardised CIS discharge rate for Assault (ICD E960-969), males Scotland 1984-91

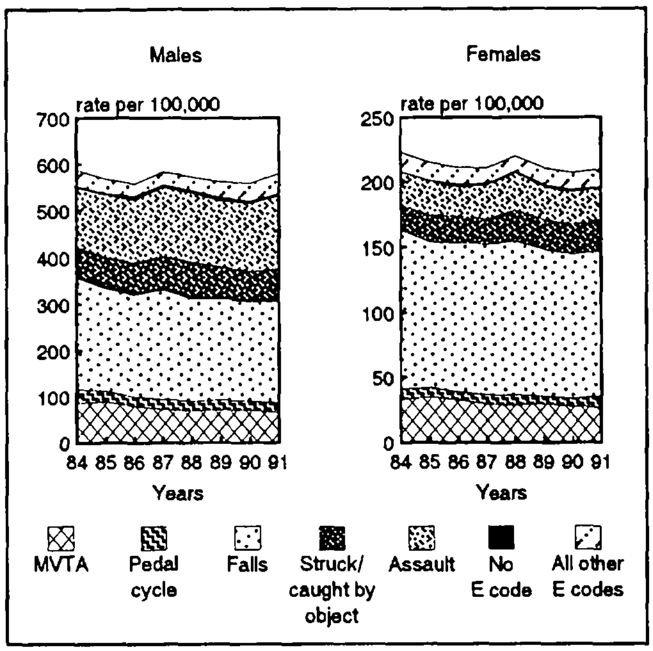

Figure 8. Age standardised CIS discharge rate for Head Injuries, Scotland 1984-91