

Guide to the interpretation of injury data in Wales

Version 2 – August 2006



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There are many sources of data on injuries but none of them are perfect. For people unaware of the subtleties of each dataset it is easy to make simple comparison which come up with an inaccurate answer. The purpose of this brief guide is to outline the major issues with each dataset and how differences in groupings during analysis can affect the results. The data cover deaths, hospital admissions, accident and emergency attendances, road traffic accidents, fire injury, and workplace injury statistics. Some general guidance is also included on interpreting maps, deprivation measures, population denominators and suppression of low numbers to ensure confidentiality.

Deaths:

Deaths are registerable by law, and mortality statistics derived from death certificates are compiled by the Office of National Statistics. Comparison of time trends of deaths is complicated by many changes to the systems of collecting and classifying causes of death over the years. The main changes or problems are as follows:

- 1979 : International Classification of Diseases 9th revision introduced.
- 1981/2 : Industrial action by registration officers affected the quality of working with more deaths than usual being coded to 'unspecified' categories.
- 1984 : OPCS changed the interpretation of the World Health Organization's Rule 3, which decreased the numbers of deaths from causes such as pneumonia and increased the numbers from specific causes, including injury. This rule interpretation was revoked in 1993.
- 1993 : Three changes were made. Rule 3 was changed back to the pre 1984 situation; a new Coroner's form was introduced with less detail on injury and poisoning deaths; and automatic coding of deaths was introduced, based on a US system.
- 2001 : International Classification of Diseases 10th Revision was introduced. There was quite a change in injury codes between the 9th and 10th revisions with comparison between some specific causes not possible. For greater detail please refer to Health Statistics Quarterly 2003;19:10-21.

Delays in Registration:

Many injury deaths are referred to coroners resulting in inquests which may be delayed for some time. Consequently, the most recent year's data may be an underestimate.

Files of death data are purchased from the Office of National Statistics by NHS organisations based on years of registration or years of occurrence. There is an annual extract file and a monthly file called the Public Health Mortality File. In Wales these are held at Health Solutions Wales (HSW) and analysed by staff from HSW or the National Public Health Service for Wales (NPHSW).

Hospital in-patient data:

Admissions to hospital for the treatment of injuries are captured in the Patient Episode Database for Wales (PEDW) held at Health Solutions Wales. Records in PEDW are based on episodes of care under a particular consultant, called Finished Consultant Episodes. These need to be linked together to carry out analyses of the number of people admitted/discharged from hospital, how many had particular treatments, and whether they died in hospital. Variations in the level of coding of diagnoses and external cause coding (what caused the injury e.g. fall) over years and between hospitals can affect the results. There are considerable variations in the proportion of injuries admitted to different hospitals with the same ICD code, as the ICD system does not measure the severity of injury and admission to hospital is dependent on a variety of factors, including distance from home, ability to cope if living alone, bed availability, and surgeons' propensities to operate on certain injuries rather than treat them in an outpatient setting e.g. fracture management. Hip fractures are a notable exception with virtually all patients being admitted. Each record in PEDW has space for up to 14 diagnoses and 12 procedures. Over the years the most important diagnosis or procedure has not always been coded in the first position. Thus, analyses of a particular diagnosis or procedure based on the first position will often produce a different result than one based on 'any mention of'. Because of difference in coding practices between hospitals the use of the first position only can produce artificial geographical variations as most people are treated by their local hospital. PEDW data are held by Health Solutions Wales and anonymised records are made available to The National Public Health Service for Wales and the Health Information Research Unit, University of Wales, Swansea for analysis.

Accident and Emergency Department Data:

The All Wales Injury Surveillance System (AWISS) is funded by the Welsh Assembly Government to collect information on all injured people attending A & E departments across Wales in order to support research into the targeting and evaluation of injury prevention initiatives. AWISS does not yet cover all of Wales. The Minister with Responsibility for Older People announced in an Assembly debate on 4th May 2005 that the Welsh Assembly Government would take steps to ensure that all hospitals in Wales supplied data to AWISS.

The data are checked for duplicates and errors in Health Solutions Wales before being anonymised and made available to the AWISS analysts. Professor Ronan Lyons, Professor of Public Health at University of Wales Swansea, is the Director of AWISS and AWISS analysts work for NPHSW, HSW and UWS. Mr Rhys Pockett manages AWISS and can be contacted at: rhys.pockett@hsw.wales.nhs.uk

Work on this database has confirmed a strong effect of access or distance to hospital on attendance rates such that for children attendance rates for those living within a mile of hospital are double those 10 miles away. This holds for all injuries with the exception of fractures. The reason for this is that many minor injuries can be ignored, self treated, or treated by other health professionals such as general practitioners and physiotherapists. This means that comparing small area maps of many types of injury using A & E data can be quite misleading. Figure 1 shows how misleading this can be. The figure shows small area variation in the rate of burns attendance at Wrexham Maelor Hospital with higher rates being represented by darker areas. The closer one lives to the hospital the darker the shading. This is due to people living nearer having a greater propensity to attend with more minor injuries than those living further away. There is also an apparent low rate of injuries in the north eastern corner which is likely to be due to people living there attending the Countess of Chester Hospital which does not supply data to AWISS.

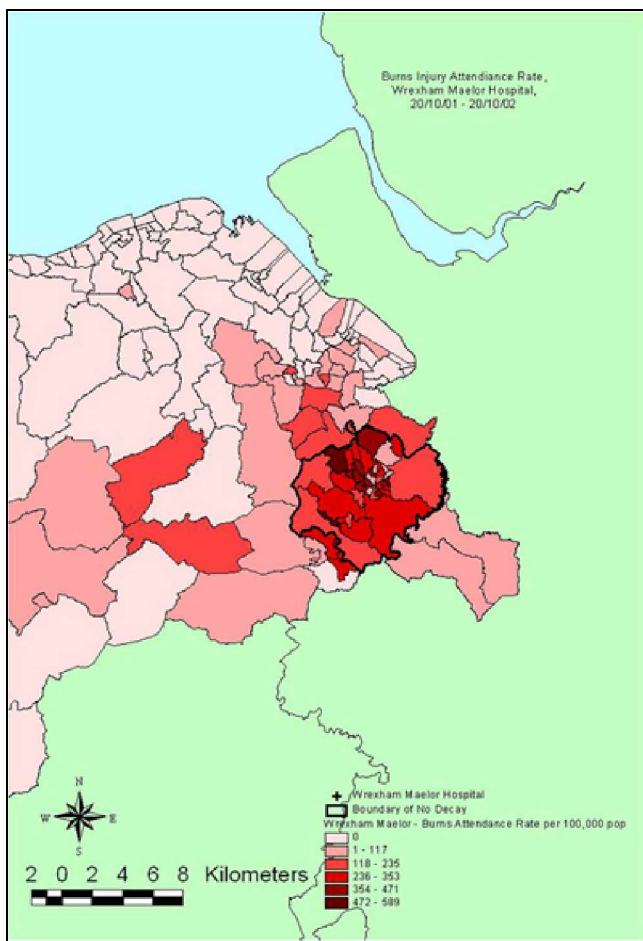


Figure 1. Burns Injury Attendance Rates, Wrexham Maelor Hospital.

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Before and after comparisons within a particular area are far less misleading. The data supplied to AWISS is based on that used to treat injured people in A & E departments

and has limited information on the location, causes, and mechanism of injury, factors which are more of interest to injury prevention practitioners.

Currently there are difficulties associated with 'unknown' values within the A&E data. Large numbers of 'unknowns' are presently held in the dataset, these 'unknowns' may contain data that should be from a known category, therefore exact numbers and subsequent rates are likely to be underestimated. We are working with A&E data entry clerks to reduce the number of 'unknown' codes and to increase the quality of the data, and it is likely that as coding quality increases and 'unknowns' reduce incidence numbers and rates will increase, therefore be careful when making inferences from A&E data without knowing the number classified as 'unknown'.

Road Traffic Accident Statistics:

The police should be called to all road traffic collisions in which at least one person is injured. A form called STATS 19 is completed by the police which details the nature and location of the collision and a crude classification of injury severity. The data are supplied to local authorities for checking and a subset sent to the Welsh Assembly Government and Department for Transport, and appears in several publications. The data are very useful for mapping the locations of collisions to plan road safety interventions. However, the data are not entirely complete or accurate. Comparing hospital data with the STATS 19 data shows that more people injured in road traffic collisions attend hospital than are recorded by the police. The STATS 19 classification of injuries between killed, serious, and slight is also problematic. The statistics on killed are very accurate, but the division between serious and slight is problematic. The apparent seriousness of injuries changes over time and one cannot expect police officers to be confidently able to judge the large grey area between 'serious' and 'slight'. There is evidence from studies that whilst the police both over- and underestimate serious injuries, underestimates form the larger group. As many official analyses use a combination of Killed and Serious Injuries (KSI), the fact that KSI is usually dominated by the number of serious injuries (usually by a factor of 10), changes in the interpretation of 'serious' between and within police forces over time can make it difficult to interpret such data.

Fire injury statistics:

Fire data in the United Kingdom has been collected as part of the British Crime Survey (to financial year 2002/03) and the Survey of English Housing (financial year 2004/05 onwards) and statistics are published annually by the Department for Communities and Local Government, formally the Office of the Deputy Prime Minister (ODPM).

Statistics show that 1.5% of households reported one or more domestic fires in the British Crime Survey in 2001/02 and 2002/03, and in the Survey of English Housing in 2004/05, though the true incidence could be higher as it has been observed that the fire and rescue services are not called to every domestic or commercial fire. The proportion of fires to which they are called depends on the extent of the fire, the occupiers' confidence in putting it out unassisted, and distance to the nearest fire station. It is estimated, from

comparison with data collected in the annual British Crime Survey that perhaps the services are called to around a quarter of fires, but with considerable regional variation. When called to a fire the investigating officers complete a form called FDR-1 which collects data on the nature and cause of the fire and limited data on any casualties. The FDR-1 statistics are sent to the Department for Communities and Local Government (previously the ODPM) and appear in several official publications. Fire Statistics, United Kingdom, 2004 (ODPM) reports that Fire and Rescue Services in Wales attended 10,161 fires, seeing 26 fatal and 830 non fatal casualties, of these 2,627 were dwelling fires, in which there were 18 fatal and 677 non fatal casualties.

A copy of the FDR1 Fire Incident Reporting form is available at:

<http://www.communities.gov.uk/index.asp?id=1125131>

(Accessed on 06/07/2006)

Publications of Fire Statistics, United Kingdom are available at:

<http://www.communities.gov.uk/index.asp?id=1124893>

(Accessed on 06/07/2006)

A report on Fires in the Home: Survey of English Housing, and the British Crime Survey is available at:

<http://www.communities.gov.uk/index.asp?id=1125069>

(Accessed on 06/07/2006)

Work place injury statistics:

By law, every fatal injury or injury requiring three or more days off work has to be reported to the Health and Safety Executive (HSE) in a system known as the Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations (RIDDOR). HSE gets to know about virtually all workplace deaths but there is considerable underreporting of non-fatal injuries. Comparison with the 2002/3 Labour Force Survey in Great Britain estimates that 43% of reportable injuries are reported by employers but less than 5% for self-employed people, discrepancies are further highlighted in 2004/05 when 150,559 non fatal injuries were reported to RIDDOR (587 per 100,000 population), yet the Labour Force Survey puts the reportable injuries figure as high as 363,000 (1,330 per 100,000 population).

Latest statistics on workplace injuries are available at: <http://www.hse.gov.uk/statistics/index.htm>

HSE statistics on injuries in Wales can be found at:

<http://www.hse.gov.uk/statistics/regions/index.htm>

(Accessed on 06/06/2006)

Injury Mapping

Injury mapping is a tool that is growing in popularity, and is a good means of representing injury data, however it should be used and interpreted carefully. The data

can be mapped as points or at different geographical levels. Point data maps are only used in circumstances where there are many injuries to ensure data confidentiality.

Geographical Areas: Injury mapping can display data at a multitude of geographical levels, these can include Electoral Divisions or Wards (EDivs in Wales and wards in England), Middle or Lower Super Output Areas (LSOAs, MSOAs), Unitary Authorities (UAs), and counties amongst others. Be careful when comparing geographical data to ensure that the areas are of the same type. It is also important to note that electoral ward or division boundaries seldom stayed the same for long and it is vital that mapped areas are not only of the same type but also the same version (i.e. Electoral wards or divisions in Wales have different boundaries in 1998 and 2001). Since the 2001 Census there has been a gradual movement away from maps based on EDivs/wards to ones based on Super Output Areas. The boundaries of Super Output Areas should stay the same for at least 10 years.

Mapped Values: Due to variation in populations between areas and the same area over time, it is rarely meaningful to map incidence numbers, the most commonly mapped value is an incidence rate, taking into account the number of events and the population size. It is also difficult to compare raw incidence rates between different areas as factors such as differences in age and sex structure, geography, and access to facilities may not have been taken into account. Sometimes standardised analyses are carried out to take account of differences in population structures, for example a European age and sex standardised rate will produce a rate for an area which is standardised to a particular European population structure which doesn't change over time. European standardised rates from different areas are comparable. Such analyses may deal with differences in population structures between areas but will not account for other factors, such as the influence of deprivation or the effect of distance on attendance. For many conditions people who live closer to health facilities tend to use them more often for less severe conditions than those living further away. For example Figure 1 shows attendance rates by small areas from burns injuries to Wrexham Maelor A&E Department. The darker the area the higher the attendance rate. Areas nearer the hospital are generally darker due to a greater proportion of people with minor burns attending. Maps can also mislead in other ways. Some large electoral divisions (wards) to the west of the hospital show similar rates to some of the smaller electoral divisions within the town, but the smaller areas tend to be less obvious to the eye, and a false impression is given as to which areas have the biggest problem with burns. Comparing urban and rural areas can also be misleading as the population profiles may also differ in other aspects, such as how wealthy or deprived are the areas or what proportion of the population works in different types of industry. Many types of injuries occur more common in deprived areas. Work-related injuries will be influenced by the distribution of different types of employment in different areas.

Value Ranges: Generally maps will have a range of up to 5 shades of the same colour, with the lighter shades indicating a positive/good outcome and the darker shades indicating a negative/bad outcome. White is not usually used other than to show missing data.

Although recommended, map colours will not always be the same between different maps. It is also important to ensure that the value ranges are the same in different maps, even when the colours are similar. It is not possible to accurately compare two maps (i.e. before and after) if the value ranges do not match. Maps devised for one purpose may be misleading if used for another. When interpreting a map it is essential to read the title, legend, and any notes available, as not doing so frequently leads to misinterpretation.

Deprivation

Deprivation is a factor which is associated with higher rates of many, but not all, injuries. An area based deprivation score is often applied to all people living within a certain area, usually electoral divisions or wards which are used to elect local politicians termed councillors. More recently UK Census Output Areas have been produced and maps may be produced at Lower or Middle Super Output Area levels. Deprivation scores are based on an index or score, such as the Carstairs Score. Four variables from census data are used in the Carstairs Score calculation: overcrowding, male unemployment, low social class, and no access to a vehicle. The Townsend Index of Material Deprivation is similar to the Carstairs Score but is made up from slightly different census variables. There are also separate indices of multiple deprivation for each of the countries of the UK calculated from a mixture of census and non census variables e.g. Index of Multiple Deprivation (England) and the Welsh Index of Multiple Deprivation (WIMD), and these are updated at different times. The 2005 WIMD has been constructed for use at Lower Super Output Area level.

Deprivation analysis is usually conducted using groups of areas. Often these are based on five categories, frequently termed: Most Affluent, Next Most Affluent, Median, Next Most Deprived, and Most Deprived. These groups are calculated by ordering the areas by their deprivation score and separating into five equal groups. Sometimes the groups are based on achieving equal numbers of population in each fifth and sometimes on achieving equal number of areas within each fifth. It is important to understand the basis of the grouping before trying to interpret the results. Most Welsh injuries analyses are conducted using all- Wales data as the comparator for small areas and local authorities. However, it is possible for analysis to be conducted using England and Wales, Great Britain, the UK or Europe as the basis of comparison. The actual numerical results for individual areas will differ when using different comparators.

Populations

With continual migration areas do not have a fixed population over time. It is important, when calculating or interpreting injury rates, to know which population figure to use or which has been used. In Wales there are two main sources of population data, the first is the UK Census, and the second is the National Health Service Administrative Register (NHSAR).

A UK Census is taken every ten years, the last of which was in 2001. The Census takes a 'snapshot' of the population structure of the United Kingdom, at that point in time. However, as the Census is only taken every ten years, and migration is a continuous process, the resulting profiles are generally only reliable for that one year. Mid-year population estimates are produced to take into account births, deaths, internal migration, and international migration. The main drawback of mid-year population estimates is that they are generally only calculated to local authority level and not to small areas (such as electoral divisions or output areas). There are plans to produce small area population estimates but it is not clear how accurate these may be.

All persons registered with the NHS in Wales should be included in the NHSAR. This health service database is continuously updated, taking into account births, deaths, new registrations from people moving into Wales, and those moving out to register elsewhere (e.g. England). As the NHSAR contains information on resident address it is possible to group these and calculate populations at small area levels. However, it should be noted that although the registration method is its biggest advantage for capturing population data it is also its biggest disadvantage. Not every person residing in Wales is registered with a Welsh GP Practice (although the number is thought to be small), and some are not registered with a GP Practice for some period of time. This often occurs when people registered elsewhere move into Wales and delay registering with a local practice (i.e. students or immigrants). This also works in the opposite direction as well, with people leaving the area for other areas of the UK, delaying or not registering in their new area of residence and delaying the removal from the old area. People may move out of the UK and not inform their GP and remain on the register. In the past deaths were not always removed from the register quickly. An anonymised extract of NHSAR data is provided annually to produce small area populations.

Some injury analyses in Wales use NHSAR or Census populations, depending on which seems to be the most appropriate at that point in time – those details are normally appended to the analyses.

It is often difficult to interpret what is happening in small areas with small populations over time. This can be caused by random fluctuations in small numbers of health events happening annually and causing large changes in subsequent rates (for example a small area could have 4 injuries in 2000, 6 in 2001, and 2 in 2003. The injury rate will have doubled or halved but in reality there has been little change).

Suppression and Data Confidentiality

Some injury events are rare and small numbers occur annually. The publication of data on small numbers of events combined with small areas and small populations could, however, theoretically lead to the identification of an individual if combined with other information, such as newspaper reports.

To ensure that no individual could ever be identified by the publication of anonymised health information, data containing small numbers of events are generally suppressed. Usually tables or maps with less than five events are suppressed. In some cases where larger populations are used or a number of years data are combined this rule can be relaxed without risking inadvertent disclosure of an individual's identity.