

## FEATURED PROGRAMME

# Development and use of a population based injury surveillance system: the All Wales Injury Surveillance System (AWISS)

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This report details the development and use of a population based emergency room surveillance system in the UK. Despite some difficulties in accessing high quality data the system has stimulated a considerable number of research and intervention projects. While surveillance systems with high quality data collection and coding parameters remain the gold standard, imperfect systems, particularly if population based, can play a substantial part in stimulating injury prevention initiatives.

prevention. Nor can they assist in the targeting and evaluation of local prevention initiatives. This requires local injury data. The purpose of this paper is to describe the development and use of a low cost population based emergency room surveillance system in Wales.

### DEVELOPMENT OF AWISS

Following the 1992 recommendation of the Welsh Health Planning Forum that an injury surveillance system be established, a pilot system was developed in the West Glamorgan area of south Wales. Computerised data on all attendees at two accident and emergency (A&E) departments, and manually collected data on all children (0–14) years attending a third non-computerised department, were obtained. These were amalgamated with population based data from the 1991 census to provide an analysis at electoral ward level (areas of about 5000 population) in West Glamorgan county.<sup>9</sup> This area was well suited to population based injury surveillance as it is compact and the population served by the three local hospitals is discrete; less than 1% of injured people attend hospitals outside the area. Information from the system was used to initiate several local injury prevention projects based on lending safety products to low income families.

After the success of the pilot study it was decided to extend the project to include all of Wales. The All Wales Injury Surveillance System (AWISS) funded by the Welsh Office started in 1996 with a remit to collect data on injuries resulting in fractures, burns and scalds, head injuries, and unintentional poisonings to children under 5 from all A&E departments and to calculate population based event rates. Of the 17 A&E departments in Wales in 1996 not all were computerised. Data on 42 951 episodes were collected from the nine computerised departments during this year and between 1997 and 1999, the number of hospitals participating fluctuated as a result of computerisation changes.

In 1999, the funding body, the National Assembly for Wales, reviewed all of the national databases and recommended that an injury surveillance system, such as AWISS, was a considerable asset and should be permanently

Injury is the leading cause of death in people aged 1–35 years in the UK and globally.<sup>1,2</sup> Governments have realised that information on the pattern and distribution of injuries is essential for designing and evaluating injury prevention strategies and consequently many have supported the development of injury surveillance systems.<sup>3–5</sup>

### INJURY SURVEILLANCE

Injury surveillance systems are diverse and can operate at local, national, or international levels. They can be based on a variety of data sources including deaths, hospital inpatients, emergency room attendees, surveys and police, fire or ambulance records. However, most use emergency room attendances. These can be divided into those that are local (one or two hospitals), such as the CHIRPP system in Glasgow, Scotland and the VISS system in Victoria, Australia; national, such as the LIS system in the Netherlands, and HASS/LASS in the UK<sup>6</sup>; or comprehensive, such as the Danish NPR.<sup>7</sup>

Many local and national systems are based in a single hospital or a random sample of such hospitals. These systems usually do not cover a defined geographical population and cannot therefore provide accurate injury incidence rates, although extrapolations to national or regional estimates are sometimes possible. Such systems are usually designed to capture detailed data on location, activity, mechanism, and product involvement that can help to guide prevention strategies.<sup>8</sup>

However, many injury prevention practitioners work at local levels, for example, populations of 100 000–150 000 are typical for local authorities in Wales. These practitioners complain that extrapolations from national data are not sufficient to influence policy makers to invest in injury

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**Abbreviations:** A&E, accident and emergency; AWISS, All Wales Injury Surveillance System; CAPIC, Collaboration in Accident Prevention and Injury Control; GP, general practitioner; NHS, National Health Service

**Box 1: AWISS data fields**

- Address.
- Postcode.
- Sex.
- Date of birth.
- A&E number (unique number for each individual attendance at hospital).
- NHS number (unique number for each person).
- Referral source (self, general practitioner (GP), other).
- GP code (codes for individual GP or practices).
- Time of incident.
- Date of incident.
- Time of arrival.
- Date of arrival.
- Initial complaint (text field, which often contains information on symptoms, activity, location, and mechanism of injury).
- First/repeat attendance.
- Mode of arrival (private transport, ambulance, helicopter).
- Triage category (five point national priority score).
- Patient group (accident, assault, self inflicted).
- Incident type (home, public place, etc).
- Incident location (text field which can contain information on address, name of premises etc, but often also contains information on activity and mechanism of injury).
- Primary diagnosis.
- Secondary diagnosis.
- Tertiary diagnosis.
- Diagnostic anatomical site 1.
- Diagnostic anatomical site 2.
- Diagnostic anatomical site 3.
- Side of body.
- Treatments (varies by unit).
- Investigations (varies by unit).
- Disposal (discharged, admitted).
- Follow up (A&E, outpatient, GP, none).

established and funded on an on-going basis.<sup>10</sup> The review listed 18 recommendations, the most important of which are listed below:

1. NHS [National Health Service] Wales shall retain, through AWISS, a corporately held information service containing data on accidents in Wales.

2. Data held by AWISS should be used as a means of setting and monitoring a better health gain target for injuries. This target should be based on morbidity rather than mortality.

3. Information contained in AWISS should be further used to facilitate national and local initiatives in areas such as child safety, home safety, crime and disorder reduction partnership and the reduction of accidents, where appropriate.

4. The information collected by AWISS should be shared and discussed with other agencies on a regular basis to help highlight problem areas and to develop interagency action plans to reduce the number of accidents and to progress towards the achievement of health gain targets.

During the review of AWISS the amount of data collected was reviewed and it was decided to increase the extent of surveillance to cover all types of injury and to increase the number of data items collected. Box 1 lists the data fields collected.

AWISS capitalises on data collected by A&E departments for treatment purposes, which is a major factor in assessing the quality of the data. However, there is considerable variability in computer systems and in the amount of data collected by different hospitals. Despite this variability, it is possible to aggregate data to a level where there is good comparability between hospitals. All the hospitals have a “location of incident” field that categorises injuries as having occurred at home, work, educational establishments, during sports, road traffic, public place, and other. This is not sufficient to give a precise location except in the case of home injuries

where postcodes are used. Additional information on location is collected by several hospitals on an on-going basis and occasionally further information is collected in time limited projects.

In several hospitals free text data on preceding activity and locations are collected. We have found that a structured analysis of free text data can substantially reduce the proportion of records with missing or non-instructive categories in these fields. All hospitals have an “intent” code, which includes categories for unintentional injury, assault, and self inflicted injuries. There is general support from emergency department clinicians for the collection of additional data on activity and location but the implementation of a completely standardised system is limited by variability in complete systems, the cost of changing software programmes, and the capacity of staff to collect such data in busy departments.

Rather than attempt to enforce a completely standardised dataset without additional resources we have chosen to take a pragmatic view and encourage departments to standardise as much as possible. Variability and lack of coverage in some areas of Wales (some residents attend A&E departments in England) influences the ability to compare areas and to carry out different analyses. At an all Wales level, analyses are relatively crude, but in certain areas much more detailed analyses are possible—for example, down to electoral divisions with a median population of 3000.

## USES OF AWISS

Data from AWISS have been used for a variety of purposes from measuring the magnitude of the injury problem to identifying areas or groups with particularly high rates of injury and developing and implementing injury prevention initiatives. Some examples are:

### 1. Identifying areas with high injury rates

By linking attendance data with population denominator data from the census and the health service population register it is possible to map injury rates across small geographical areas to support community schemes for additional funding and to set up local injury prevention projects such as the Child Safe Penarth initiative.<sup>11</sup> We have also studied the link between fracture rates in affluent and deprived areas, and compared fracture rates in districts across Europe.<sup>12–14</sup>

### 2. Identifying types of premises with high injury rates

By linking the address fields on the AWISS database with a list of nursing and residential homes for older people we have been able compare fracture rates in people living in such homes with the general community in a pilot study<sup>15</sup> and to develop a randomised control trial to test the effectiveness of supplemental intermittent vitamin D in preventing fractures in nursing home residents.

AWISS data have been used to measure the magnitude of injury risk to children in playgrounds in the Cardiff area and to measure the effectiveness of a policy of changing the surface materials.<sup>16 17</sup>

Enhanced surveillance of violent assaults in one of the participating departments has been used to identify pubs and clubs that appear to have a high number of incidents and to develop interventions.<sup>18–20</sup>

Data from AWISS are also being used to assess the relationship between the built environment and injury in a study funded jointly by the UK Medical Research Council and Engineering and Physical Sciences Research Council.

### 3. Identification of the magnitude and risk factors for sports injuries

Our data suggesting a fall in bleeding head injuries but not other injuries among rugby players have resulted in two studies to identify whether the increasing use of soft head protectors (scrum cap) could explain this phenomenon. We are also

**Table 1** Shoulder injuries by type and severity (under 35 year olds only). Serious injuries are all fractures, sprains, and dislocations. Source: AWISS, January 1999 to June 2000

Incident type	All shoulder injuries		Serious shoulder injuries	
	No	%	No	%
Home	1293	15.8	764	14.5
Work	375	4.6	200	3.8
RTA	512	6.3	274	5.2
Playground	62	0.8	40	0.8
Hospital	26	0.3	20	0.4
Licensed premises	41	0.5	22	0.4
All sport	1611	19.7	1066	20.3
School	481	5.9	295	5.6
Other	3772	46.2	2577	49.0
Total	8173	100.0	5258	100.0
All sport	1611	100.0	1066	100.0
Rugby	599	37.2	423	39.7
Soccer	177	11.0	108	10.1
Cycling	107	6.6	56	5.3
Skating	25	1.6	18	1.7
Others	703	43.6	461	43.2

RTA, road traffic accident.

planning studies into the use of shoulder and body padding to determine whether these have had any effect on the incidence of shoulder dislocation as rugby accounts for over one third of all serious shoulder injuries in sports in Wales (table 1).

#### 4. Evaluation of a speed reduction partnership

There is ample evidence that fixed site speed cameras are effective in reducing traffic related mortality and morbidity in the vicinity of the cameras.<sup>21</sup> In the UK, installation of cameras has been limited due to the cost of this technology. The south Wales police area is one of eight pilot sites in the UK where a huge expansion in speed camera use is planned. Over a four year period the number of speed camera fines issued will increase from 5000 per annum to 120 000 per annum in an area with a population of 1.2 million. Data from AWISS and other sources will be used to evaluate factors influencing the effectiveness of mobile speed cameras.

#### 5. International collaboration

Members from the AWISS team are participating in several injury prevention projects funded by the European Commission, including the development and testing of minimum datasets for injury surveillance and a study to estimate the medical costs of injury across Europe.

#### 6. Development of a national injury prevention network

Wales is a relatively small country (population three million) and consequently has a small injury prevention fraternity that is often geographically isolated and tend to work singly or in small groups. Following the use of AWISS in highlighting injury issues in Wales, the National Assembly has awarded a grant to develop a Wales injury prevention network.

The Collaboration in Accident Prevention and Injury Control (CAPIC) will form the basis of the network. CAPIC is a virtual body composed of groups from all sectors interested in injury prevention across Wales formed in 1996 but due to not having any funds has had limited impact. This 18 month stream of funding will allow CAPIC to develop as the Wales injury prevention network and will deliver the following products:

- An injury prevention web site.
- Two national conferences, the first on injury prevention in deprived communities.

- Enhanced training in injury prevention.
- A national strategy on injury prevention.

Because of the difficulties of travelling we believe that the web site will be a considerable asset to injury prevention. The web site, at [www.capic.org.uk](http://www.capic.org.uk), which is under development, will contain factual data on injuries in Wales, a directory, and contact numbers for injury prevention personnel, links to training resources and other useful sites, and a directory of on-going and completed research in Wales.

The chance to write a proposed national strategy for injury prevention for submission to the National Assembly offers a huge opportunity to secure political commitment for an evidence based approach to injury prevention.

#### DISCUSSION

There has been considerable debate about the merits of emergency unit data for surveillance systems in the literature.<sup>22-23</sup> However, these discussions did not consider in detail how different systems could be used for interventions at different levels. We believe that the debate about whether to focus surveillance on deaths, on hospital admissions, emergency room attendances, or surveys is a sterile debate. The only issue for the committed injury prevention professional is whether data from any of these sources can help in identifying a problem or solution, in targeting an intervention, or testing a new intervention. No single system is perfect or suitable for all purposes. For example, a dedicated surveillance system based on a random sample from the emergency department may be the best method of identifying national estimates of injuries from a wide variety of causes. It may be used to suggest and test the effectiveness of preventive interventions at the national level, but because it is not population based will be unable to test interventions at local levels. There are many situations in which interventions can only be tested at local levels and in these circumstances population based emergency department systems will have the edge as the number of injury events in small defined areas will often be sufficient to test the intervention in a cost effective manner.

There is also a tendency in academic circles to deride systems that are not perfect. We have yet to see a perfect system. All systems have difficulties with completeness, timeliness of data, etc. The only question to be asked is whether the data are good enough to support the purpose for which they are being used. As has been said before, the perfect should not be the enemy of the merely good. A recent article in *Injury Prevention* on the development of injury surveillance in the Caribbean described the difficulties inherent in setting up such systems and the unsuitability of rigorous guidelines developed for use in a not well resourced setting.<sup>24</sup>

There are several plans for the further development of AWISS. We are currently attempting to link the system to the ambulance system by recording unique ambulance call out numbers in several emergency departments. This will allow better quality data on activity and location to be linked with clinical data. It is also proposed to link the emergency department data with inpatient records that would facilitate outcome based studies. It should be possible to use AWISS as a sampling frame for more detailed studies such as an audit into the process of emergency care.

However, issues relating to data confidentiality have limited access to some identifiable data and thus the uses that can be made of such data. We have previously described the legal limitations on transferring small area data from our surveillance system to public bodies charged with preventing injuries, but not knowing where these injuries are happening.<sup>25</sup>

In recent years interpretations of the UK 1998 Data Protection Act have changed and some hold a view that it is essential to obtain explicit consent for the use of patient data outside of that required for treatment purposes. This

### Key points

- Development of surveillance systems is incremental and takes time.
- No perfect surveillance systems exist.
- Population based surveillance can stimulate injury prevention initiatives.
- Surveillance can target areas and groups for research into effective prevention methods.
- Recent interpretations of data confidentiality could seriously hamper injury surveillance and prevention.

interpretation has stopped data flows from some hospitals to many surveillance systems, including AWISS. AWISS does require some potentially identifiable data items to carry out the range of activities listed above. The address is necessary to identify premise types, for example nursing homes, and to attach small area codes where the postcode is missing or inaccurate. Once these functions have been performed, the identifiers are stripped from the main database, encrypted, and stored separately. We also request the unique NHS number, which can be used to link emergency room and inpatient datasets. The NHS number can be used to identify people if a person has access to the key but no member of the AWISS team has access to these keys. We are currently examining different ways of continuing to obtain these data. Options under consideration include:

1. Collecting data in a two stage process, with a temporary unique number being used to add codes to the hospital databases. Only aggregated anonymised data are then transferred to AWISS.
2. Trialing a period of seeking implied (opt out) or explicit consent for transfer of data to AWISS.
3. Changing the flow of data from hospitals to the university (current situation) to that used for inpatient identifiable data, which is from hospitals to Health Solutions Wales (a NHS information body), carrying out all linkages at this stage, and transferring anonymised data to AWISS.
4. Applying to the Patient Information Advisory Committee, which has been set up under sections 60 and 61 of the Health and Social Care Act 2001, to consider allowing the use of potentially identifiable data for public health and research purposes where obtaining consent is not practicable.<sup>26</sup>
5. A mixture of the above approaches.

### CONCLUSION

This paper describes the development and use of an injury surveillance system. There have been many ups and downs in its development. The system is far from perfect but continues to develop. However, it has been the focus for a wide variety of injury prevention initiatives. We will continue to use and develop AWISS to stimulate and evaluate injury prevention initiatives. This account should prove useful for others trying to develop similar systems elsewhere.

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### REFERENCES

- 1 **ONS Mortality Statistics**. *General review of the Registrar General on death in England and Wales, 1997*. London: Stationery Office, 1999.
- 2 **Krug E**, ed. *Injury: a leading cause of the global burden of disease*. Geneva: World Health Organization, 1999.
- 3 **Welsh Health Planning Forum**. *Protocol for investment in health gain for injuries*. Cardiff: Welsh Office Publicity Unit, 1992.
- 4 **Department of Health**. *The health of the nation: a strategy for health in England*. London: HMSO, 1992.
- 5 **Crime and Disorder Act 1998**. London: HMSO, 1998.
- 6 **Stone DH**, Morrison A, Ohn T. Developing injury surveillance in accident and emergency departments. *Arch Dis Child* 1998;**76**:108–10.
- 7 **Bay-Nielsen H**, Frimodt-Moller B, Ulykker I. [Description of registers containing information on accidents or injuries.] Denmark: Sundhedsstyrelsen, 1993.
- 8 **Stone DH**. Research on injury prevention: time for an international agenda. *J Epidemiol Community Health* 1996;**50**:127–30.
- 9 **Lyons RA**, Lo SV, Heaven M, et al. Injury surveillance in children—usefulness of a centralised database of accident and emergency attendances. *Inj Prev* 1995;**1**:173–6.
- 10 **All Wales Injury Surveillance System (AWISS)**. *Final report*. Cardiff: National Assembly for Wales, 2000.
- 11 **Kemp A**, Gibbs N, Vafidis G, et al. Safe Child Penarth: experience with a Safe Community strategy for preventing injuries to children. *Inj Prev* 1998;**4**:63–8.
- 12 **Lyons RA**, Delahunty AM, Kraus D, et al. Children's fractures: a population based study. *Inj Prev* 1999;**5**:129–32.
- 13 **Lyons RA**, Delahunty AM, Heaven M, et al. Incidence of childhood fractures in affluent and deprived areas. *BMJ* 2000;**320**:149.
- 14 **Lyons RA**, Sellstrom E, Delahunty AM, et al. Incidence and cause of fractures in European districts. *Arch Dis Child* 2000;**82**:452–5.
- 15 **Johansen A**, Lyons RA, Jones S, et al. Fracture incidence among elderly people in institutional care: linking injury surveillance with a postcode-based register of residential and nursing homes. *International Journal for Consumer and Product Safety* 1999;**6**:215–21.
- 16 **Mott A**, Rolfe K, James R, et al. Safety of surfaces and equipment for children in playgrounds. *Lancet* 1997;**348**:1874–6.
- 17 **Sibert JR**, Mott A, Rolfe K, et al. Preventing injuries in public playgrounds through partnership between health services and local authority: community intervention study. *BMJ* 1999;**318**:1595.
- 18 **Goodwin V**, Shepherd JP. The development of an assault patient questionnaire to allow accident and emergency departments to contribute to Crime and Disorder Act local crime audits. *J Accid Emerg Med* 2000;**17**:196–8.
- 19 **Sivarajasingam V**, Shepherd J. Effect of closed circuit television on urban violence. *J Accid Emerg Med* 1999;**16**:255–7.
- 20 **Shepherd J**. Emergency room research on links between alcohol and violent injury. *Addiction* 1998;**93**:1261–2.
- 21 **Highways Agency**. *West London speed camera project: analysis of accident data 36 months before and 36 months after implementation*. London: Highways Agency, 1997.
- 22 **Stone DH**, Morrison A, Smith GS. Emergency department surveillance systems: the best use of limited resources? *Inj Prev* 1999;**5**:166–7.
- 23 **MacKenzie SG**, Pless IB. CHIRPP: Canada's principal injury surveillance program. *Inj Prev* 1999;**5**:208–13.
- 24 **Ezenkwele UA**, Holder Y. Applicability of CDC guidelines towards the development of an injury surveillance system in the Caribbean. *Inj Prev* 2001;**7**:245–8.
- 25 **Lyons RA**, Sibert J, McCabe M. Injury surveillance programmes, ethics, and the Data Protection Act. Sharing data to prevent injuries. *BMJ* 1999;**319**:372–5.
- 26 <http://www.doh.gov.uk/nhsexipu/confiden/act/s60bg.htm>