2 Methods

2.1 DEFINITIONS

The following sections present the case definitions of injury, injury mechanism and morbidity used for the purposes of this report.

2.1.1 Injury

According to Robertson (1998), "An injury results when too much or too little energy (in the case of asphyxiation) is transferred to the human body, at rates or amounts that are above or below the tolerance of human tissues, resulting in damage". The World Health Organization (WHO) defines an injury similarly. An injury is "a bodily lesion at the organic level resulting from acute exposure to energy (this energy can be mechanical, thermal, electrical, chemical, or radiant) interacting with the body in amounts or rates that exceed the threshold of physiological tolerance" (Peden et al, 2001). Section 2.1.3 outlines the criteria used for putting into practice the definitions of injury used in this report.

In order to recognise the physical nature of an injury (e.g. a broken leg) and the external cause of the injury (e.g. a fall), two separate sets of codes were developed by WHO as part of its work on an International Classification of Disease (ICD) coding structure (WHO, 1977; WHO, 1992). One set, known as diagnostic codes or Ncodes, describes the physical nature of an injury and provides important information from a clinical standpoint. The other set, known as external cause codes or Ecodes, provides important information for prevention purposes, by identifying the type of energy that caused the physical injury. Section 2.1.3 describes the case selection process using these codes for this report.

2.1.2 Injury mechanism

Injuries are usually classified in terms of their external cause and intent. An injury mechanism (represented by an Ecode) is defined as the external object or circumstance that caused the injury, such as motor vehicle transport or drowning. The intent can be unintentional, intentional or undetermined. For example, the intent of an injury caused by a firearm could be unintentional, intentional (e.g. homicide, self-harm) or not able to be determined.

Injury mechanisms that are intentional are either self-inflicted or inflicted by another person or persons. All injuries that are intentionally self-inflicted are grouped under an injury mechanism called self-harm. For example, a poisoning that is self-inflicted is considered to be self-harm and is therefore separated from poisonings that have occurred unintentionally. However, for this report, if the individual was aged less than 10 years the ingestion of a poisonous substance(s) was not considered to be a self-harm event and was included in the other injuries category as a young child's understanding of the concept of

death and living is thought to be immature (Mishara, 1999). All injuries that are intentionally inflicted by another person or persons are grouped under an injury mechanism called interpersonal violence. Injury caused by the intentional use of a firearm on another person is considered to be interpersonal violence and is therefore separate from unintentional firearm injuries.

Thirteen injury mechanisms are described in this report. Twelve of the mechanisms each resulted in more than 2,000 hospitalisations of NSW residents during 1999–2000 to 2003–2004, and accounted for 85.1% of injury-related hospitalisations. The remaining injury mechanism, near-drowning, resulted in fewer than 2,000 hospitalisations over this period, but is regarded as a national priority area and is included in this report (Australian Water Safety Council, 2004).

The International Classification of Disease, version 9 clinical modification (ICD-9-CM) and the International Classification of Diseases, version 10 Australian modification (ICD-10-AM) Ecodes for the injury mechanisms included in this report are listed in Appendix 1. During the period of the report, various editions of ICD-10-AM were used to code hospital separations in NSW.

2.1.3 Injury hospitalisation

Hospitalisation data were obtained from the NSW Inpatient Statistics Collection (ISC), a census (since July 1, 1993) of all services for admitted patients to public and private hospitals, private day procedures, and public psychiatric hospitals. The ISC is a financial year collection from 1 July through to 30 June of the following year. The ISC is maintained by the NSW Department of Health. Data were obtained via the Health Outcomes and Information Statistical Toolkit (HOIST).

The ISC also contains data on hospitalisations of NSW residents that occurred in another state. However, these data were not available for 2003–2004. The number of interstate hospitalisations for this year was imputed based on hospitalisations for the previous three years. Details of the method used may be found in the 'The health of the people of NSW: Report of the Chief Health Officer' (Population Health Division, 2004).

Data for 1998–1999 and following years are for episodes of care in hospital, which end with the discharge, transfer or death of the patient, or when the service category for the admitted patient changed. Data for the years 1989–1990 to 1997–1998 are for periods of stay. Periods of stay end with the discharge, transfer, or death of the patient. The change from period of stay to episodes of care may cause a small rise in the apparent number of hospitalisations in the later years.

Since 1998–1999, ISC data have been coded using the ICD-10-AM (National Centre for Classification in Health, 2000). For the years 1989–1990 to 1997–1998, ISC data were coded using ICD-9-CM (National Coding Centre, 1996).

Hospitalisations that satisfied the following criteria were included in the report:

- The hospitalisation was for a patient who was a resident of NSW
- A principal diagnosis in the ICD-10-AM range S00-T98 (1998–1999 to 2003–2004) or in the ICD-9-CM range 800-999 (for 1989–1990 to 1997–1998)
- An external cause code in the ICD-10-AM range V01-Y39 or Y85-Y98 (1998–1999 to 2003–2004) or in the ICD-9-CM range E800-E869, E880-E929, E950-E999 (for 1989–1990 to 1997–1998).

In addition, hospital separations relating to transfers or statistical discharges were excluded. This was to partly eliminate 'multiple counts', which occur when an injured person has more than one hospitalisation for a given injury.

In Table 2, hospitalisations with a principal diagnosis in the ICD-10-AM range S00-T98 and with an external cause of 'complications of care' (ICD-10-AM: Y40-Y84, Y88; ICD-9-CM: E870-E879, E930-E948) are also included, along with those described above. These hospitalisations (i.e. including 'complications of care') are referred to as 'Injury, poisoning and certain other consequences of external causes' to distinguish these analyses from those presented in the rest of this report.

Data in this report include 16,974 NSW residents who died whilst hospitalised due to injury, poisoning and certain other consequences of external causes between 1989–1990 and 2003–2004.

2.1.4 Population data source

Age- and sex-specific population estimates as at 30 December of each year were obtained from the NSW Department of Health. These estimates are based on the Australian Bureau of Statistics (ABS) population estimates as at 30 June. More detail regarding ABS population estimates may be found in 'The Health of the People of NSW: Report of the Chief Health Officer' (Population Health Division, 2004).

2.1.5 Injury data coding issues

The data used in this report span a change in the coding scheme used to classify injury and disease. The ICD was initially formalised in 1893. Since 1948, it has been revised in its entirety approximately every 10 years by WHO. The two ICD revisions covered in this report are ICD-9-CM (NCC, 1996), which was in use in the ISC from 1989–1990 to 1997–1998, and ICD-10-AM (NCCH, 2000) used from 1998–1999 onward.

In ICD-10 alphanumeric codes were introduced (e.g. A37, R01) to represent an injury or disease, superseding the numeric codes (e.g. 125, 802) used in ICD-9. The external cause of injury codes have been included within the alphanumeric structure of ICD-10, as opposed to the separate scheme in ICD-9 (i.e., use of E800-E999).

At the time of separation from hospital, a consequence or 'nature of injury' code is assigned by a medical coder on the patient's medical record. In ICD-9, there was a specific Ncode for each injury (i.e., 800–999) and the codes were organised by the type of injury (e.g. fracture, dislocation). In ICD-10, a unique Ncode still exists, but the codes are organised by the location of the body part injured (e.g. head) instead of the type of injury.

For each injury Ncode and a few other disease Ncodes, an external cause of injury code (Ecode) must also be supplied to identify the cause or mechanism of the injury (e.g. drowning, fall, burn). Two major changes regarding Ecodes occurred between ICD-9 and ICD-10. In ICD-9, the person injured in a transport incident (e.g. motor vehicle) was secondary to the type of incident (e.g. collision with other motor vehicle). However, in ICD-10, the coding structure focuses firstly on the person injured and secondly on the type of incident. The second change in ICD-10 was the introduction of codes for the place where the injury occurred (e.g. home) and the activity at the time of the injury (e.g. playing sport).

2.2 ANALYSIS

Each of the following sections briefly describes the types of analysis conducted using the hospitalisation data. Three types of epidemiological analyses were conducted:

- number of hospitalisations
- age- and sex-specific rate of hospitalisations
- age-adjusted rates of hospitalisations.

Age-specific rates were calculated by dividing the number of hospitalisations for a particular age group (e.g. under five years) by the population of the age group. Rates are presented as the number of hospitalisations per 100,000 population, except in the case of self-harm where rates are presented as the number of hospitalisations per 100,000 population aged 10 years or older.

Age-adjustment is used to adjust for the effects of differences in the age-composition of populations across time or geographic region. In this report, age-adjustment was calculated using direct age-standardisation. An age-adjusted rate is a weighted sum of age-specific rates, where each weight is an age-specific population in the standard population. The estimated Australian residential population as at 30 June 2001 was used in this report as the standard population. Confidence intervals were calculated using the method of Dobson et al (1991).

The following analyses are provided in this report.

2.2.1 Top 10 causes of hospitalisation for NSW residents

All hospitalisations for 1999–2000 to 2003–2004 were grouped into disease and injury categories, using the principal diagnosis. The disease categories were based on the disease chapter headings in ICD-10.

The list of disease and injury categories used is at Appendix 2. The top 10 causes of hospitalisation tables were generated by ranking the frequencies of each disease and injury by age group. The following age groups were used to present frequencies for the top 10 leading causes of hospitalisation tables: under 1, 1–4, 5–9, 10–14, 15–24, 25–34, 35–44, 45–54, 55–64, and 65+ years.

Note that the numbers of injury hospitalisations in the top 10 causes of hospitalisation table (Table 2) will differ substantially from those given in the rest of the report, because this table includes all hospitalisations with a principal diagnosis of injury, poisoning and certain other consequences of external causes. However, in the rest of this report, those hospitalisations with a principal diagnosis of injury, poisoning and certain other consequences of external causes must also have an external cause code in the range in the ICD-10-AM range V01-Y39, Y85-Y87 or Y89-Y98 (1998–1999 to 2003–2004) or in the ICD-9-CM range E800-E869, E880-E929, E950-E999 (for 1989–1990 to 1997–1998) to be considered as an injury-related hospitalisation (see section 2.1.3).

2.2.2 Time trends

Age-adjusted rates for each injury mechanism were calculated annually from 1989–1990 to 2003–2004. A Poisson or negative binomial regression analysis (with population as an offset) was performed to examine the statistical significance of changes in the trend over the time period, and to calculate the annual percentage change in the rate of hospitalisations. This method takes into account changes in the age-structure of the population. Because of coding changes and changes in admission practices of hospitals, caution needs to be exercised in the interpretation of these trends.

2.2.3 Age- and sex-specific rates

Age and sex-specific rates for five-year age groups were calculated for each injury mechanism for 1999–2000 to 2003–2004 and presented by sex and age group.

2.2.4 Injury mechanism subcategory-specific frequencies and rates

The total number of hospitalisations for 1999–2000 to 2003–2004 for each injury mechanism was divided into subcategories specific to each injury mechanism. The list of injury mechanism subcategories by Ecode is at Appendix 3. The period 1999–2000 to 2003–2004 was chosen because hospital separations throughout this period were coded according to ICD-10-AM.

Frequencies for the injury mechanism subcategories were also ranked by age group and presented in a "Top 10" table format. The following age groups were used to present frequencies for the top 10 leading causes of injury hospitalisation tables: under 1, 1–4, 5–9, 10–14, 15–24, 25–34, 35–44, 45–54, 55–64, and 65+ years.

Frequencies and rates for all persons, males and females were also calculated for each injury mechanism. This information was presented in a table and the subcategories were ranked by the number of hospitalisations in each subcategory.