



# MONASH University

## Accident Research Centre

### THE EPIDEMIOLOGY OF SPORT AND ACTIVE RECREATION INJURY IN THE LATROBE VALLEY

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March 1999

Report No. 151



MONASH UNIVERSITY ACCIDENT RESEARCH CENTRE  
REPORT DOCUMENTATION PAGE

Report No.	Date	ISBN	Pages
151	March 1999	0 7326 14503	116

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**Title and sub-title:**

The epidemiology of sports and active recreation injury in the Latrobe Valley

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**Type of Report & Period Covered:**

Injury Epidemiology: 1994-1995

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**Sponsoring Organisation(s):**

This project was funded by the Victorian Health Promotion Foundation, Commonwealth Department of Health and Aged Care and the Australian Sports Commission (Australian Injury Prevention Taskforce).

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**Abstract:**

This epidemiological study of sports and active recreation injuries in the Latrobe Valley region aimed to determine the complete sports and active recreation injury experience, including participation, within a well-defined regional population.

Australian Bureau of Statistics census data were obtained to determine the size of the Latrobe Valley population. Data on all recorded hospital discharges, emergency department presentations and general practice consultations for sport and active recreation injury were obtained for a 12-month period from November 7, 1994 to November 6, 1995. In addition, a randomised household telephone survey of participation in sport and active recreation and associated injuries was undertaken.

The ratio of general practice and emergency department presentations to hospital discharges for sports injury was 1 (hospital admission) : 10 (emergency department presentations) : 12 (general practice consultations). From the household survey of 1,084 residents, it was determined that 648 (60%) participated in sports and active recreation activities in the previous two weeks. Thirty-four (5%) of the sports participants sustained a sports injury in the previous two weeks in one of 20 activities. Nine cases (or 27% of all injured people) required treatment for their injury.

The rank order of rates of population participation per 10,000 persons over 4 years of age were: walking 2,315/10,000; swimming 746; bicycling 710; basketball 712; Australian football 477. The rank order of medically treated injury frequency by sport, however, was Australian football, basketball, bicycling, netball, cricket and soccer. Based on self reported data from the community survey the sport and active recreation activities with the highest rates of injury per 1,000 participants were: cricket (242/1,000), horse riding (122/1,000), soccer (107/1,000), netball (51/1,000) and Australian football (37/1,000). These data included inconsequential injuries. Almost one-half (47%) of self-reported injuries in the community survey were inconsequential in that they did not require treatment or affect participation in sports and active recreation or activities of daily living.

These results confirm that sport and active recreation injuries are a public health problem and that a significant proportion require treatment from the health care sector. In the main, sport and active recreation injuries are mild to moderately severe.

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**Key Words:**

Sport and active recreation injury, Latrobe Valley, community survey

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## ACKNOWLEDGMENTS

The Victorian Health Promotion Foundation, the Commonwealth Department of Health and Aged Care and the Australian Sports Commission (through the Australian Sports Injury Prevention Taskforce) jointly funded this study. Dr Caroline Finch was supported by a PHRDC (of the NH&MRC) Research Fellowship over the period of this project, while employed at Monash University Accident Research Centre (MUARC) and, currently, in the School of Health Sciences at Deakin University.

Professor Joan Ozanne-Smith is thanked for her valuable comments on the draft report. The following MUARC staff are acknowledged for their contribution to the project: Karen Ashby for analysing VISS hospital emergency department data and writing the relevant section in the report; Christina Leong for setting-up the database for the telephone survey and assisting with the interviews; Jason Boulter for coordinating the survey of schools and sporting bodies; Alicia McGrath, Barbara Fox and Anita Imberger for their contribution as telephone interviewers; and Ruth Zupo for formatting and preparing the report for publication.

Cathryn Little also assisted with the preparation of this report and was supported by a School for Health Sciences (Deakin University ) Summer Scholarship.



# EXECUTIVE SUMMARY

The specific aims of the Latrobe Valley sport and active recreation injury study were to:

- describe the epidemiology of sport and active recreation injuries, including risk assessment, within a geographically defined population;
- supplement existing Latrobe Valley health sector data describing sport and active recreation injuries with data on injuries of lesser severity or receiving specialist treatment to provide a full description of sport and active recreation injuries in this community;
- trial a survey methodology for collecting information about sport and active recreation injuries and associated participation levels in sport and active recreation in one community, that could be transferred to other community settings;
- collect sport and active recreation participation data amongst Latrobe Valley residents; and
- analyse injury and participation data to determine injury risk ranked by sport and active recreation activity.

The Latrobe Valley region of Victoria was chosen as the geographical base for this survey because it is the only area in Australia for which all medically-treated and catastrophic injury data (i.e. deaths, hospital admissions, hospital emergency department presentations, general practice consultations) are available for a known population for a given period of time.

The methodology used to describe the broad sport and active recreation injury profile in the defined geographic region had four major components:

## **1. Analysis of existing databases**

- hospital admissions data (Victorian Inpatient Minimum Database – VIMD)
- hospital emergency department presentations (Victorian Injury Surveillance System – VISS)
- general practice presentations (Extended Latrobe Valley Injury Surveillance – ELVIS)

## **2. A community-based survey of sports participation and associated injuries**

- randomised household telephone survey
- calculation of injury rates for specific sports within the sample

## **3. Calculation of overall sport and active recreation injury rates for the Latrobe Valley**

- extrapolation of survey results to the whole population
- development of a sports and active recreation injury pyramid for medically-treated injury

## **4. A survey of local sports and active recreation clubs and schools to gather data on participation, associated injuries and time-at-risk**

- postal survey of local sports and active recreation clubs and organisations

- postal survey to all schools within the geographic region

The analysis of sport and active recreation injury data from the three available databases (VIMD, VISS and ELVIS) found that there were 112 hospital admissions, 1,177 hospital emergency department presentations and 1,003 general practitioner presentations in the twelve-month period November 7 1994 to November 6 1995 in the defined Latrobe Valley region. When emergency department and general practitioners' data were compared, the same six sport and active recreation activities ranked highly in terms of injury frequency. Australian football accounted for the highest number of injury cases presenting to emergency departments and general practitioners (29% and 22% respectively). Basketball, bicycling, netball, cricket and soccer also contributed significant and similar proportions of injury in both treatment settings.

Because it is known that hospital and general practitioner injury data are not comprehensive, additional information on sport and active recreation injury data were collected from a community telephone survey conducted quarterly over a twelve-month period. This survey also collected data on participation so that injury rates could be compared across activities. A randomised telephone survey of 402 households in the Latrobe Valley was undertaken. Information was collected about participation in sport and recreation activities in the two weeks prior to the survey in 1,084 household residents aged over 4 years. Overall, 652 household members (60% of all household members covered by the survey) participated in some form of sport and active recreation in the two weeks prior to the survey.

The sport and active recreation activity with the highest level of participation per head of population (active and inactive) in the Latrobe Valley was walking (2315 participants/10,000 persons). Other popular individual activities were swimming and bike riding (746 participants/10,000 persons and 710 participants/10,000 persons, respectively). Team sports such as basketball (712 participants/10,000 persons) and Australian football (477 participants/10,000 residents) were also popular.

The survey also collected information about any injuries that occurred during participation in sport and active recreation activities. Of the 652 residents who participated in some form of sport and active recreation, 34 or 5% sustained an injury during the 2 weeks prior to the survey. To compare injury risk across sports, only the active population (participants) was included in the denominator for the calculation of injury rates. Cricket was the sport with the highest rate of injuries per 1,000 participants (242 injuries/1,000 participants) followed by horse-riding (122 injuries/1,000 participants), soccer (107 injuries/1,000 participants) and netball (51 injuries /1,000 participants).

Of the 34 injuries reported (5% of all participants), 27% received some form of treatment, but only 6% of all injury cases received treatment from a doctor. Thirty-six percent of the injured participants had their performance/participation affected and 35% had a disruption to their daily routine as a result of their injury. Conversely, of the 34 injuries reported, 47% were inconsequential in that they did not require treatment, and/or did not disrupt participation in sport and active recreation or activities of daily living. Some injuries affected all aspects (i.e. they required treatment, affected performance or participation in sports and recreation and interfered with the performance of activities of daily living) but others affected only one or two of these aspects. For example, seven of the eleven people with injuries that affected their performance or participation in sport did not receive treatment for those injuries. Soccer recorded the highest rate of injuries requiring

treatment (51 treated injuries per 1000 participants) followed by cricket (41 treated injuries per 1000 participants) and netball (24 treated injuries per 1000 participants).

The injury data from the hospital and general practitioner databases were then collated with the injury data from the household survey to construct a sport and active recreation injury pyramid for the Latrobe Valley. Per 1,000 head of population in the Latrobe Valley, over a 12 month period, it is estimated that two people will be admitted to hospital for treatment of a sports injury, 17 will present at an emergency department and 19 people will receive treatment from a GP. Using the additional data from the telephone survey it was estimated that for every sports injury case admitted to hospital there are 22 cases that receive medical attention in another setting (hospital emergency department or from a GP), forty-one cases that receive treatment for their injury from other than a medical practitioner and 145 non-treated injuries.

In addition, a mail-out survey of sport and active recreation clubs and schools in the Latrobe Valley was conducted to ascertain injury, participation and exposure (time at risk) data in these settings. Unfortunately, this aspect of the project yielded very poor data, largely due to poor response rates and incomplete data. Obviously, more assistance and support to schools and clubs were required to enable them to complete the survey form.

This study has confirmed that injuries associated with participation in sport and active recreation activities are a significant public health issue. A community telephone survey of sports participation and associated injuries is a useful way to collect data on injury risk and to compare risk across activities. This kind of survey provides better data about sports injuries than mail surveys of schools or sporting clubs.

On the basis of this study, it is concluded that a population-based telephone survey is a useful methodology for collecting data about community level sports injuries and participation in sport and active recreation, necessary to calculate injury rates. There appears to be little value in trying to identify sports injuries and exposure data through mail surveys of schools and sporting clubs, due to poor response rates and a lack of relevant or detailed information.

Comparison of the survey results with data from available health sector sources, indicates that the available injury databases describe less than 30% of all sports injury cases. Health sector data (sports injury cases) and participation-adjusted figures give different rankings of the risk of injury in sport and active recreation activities indicating the importance of specific exposure data in the estimation of risk. However, health sector data are essential for quantifying and describing injuries that are severe enough to require medical treatment to identify the high risk sports for these injuries.

In summary, this project has shown that injuries during sport and physical activity are not rare events. They have a significant public health impact with consequences for injury treatment, quality of life and future participation in activity. The extent to which these findings can be extrapolated to other populations is not known but should be investigated in future studies.

Nevertheless, these findings suggest that prevention activities should be aimed at the following sports and active recreation activities and groups:

- Bicyclists, because of high frequency of medically treated injury and the severity of their injuries.

- Australian football and basketball because of high frequency of medically-treated injury.
- Other team ball sports (cricket, soccer and netball) because of comparatively high rates of injuries per 1,000 participants.
- Horse riders because of the comparatively high rate of injuries per 1,000 participants and frequency of hospital admissions.
- Children aged 4-15 years because of the comparative severity of their injuries.
- Adults 15-39 years because of the comparative frequency of injuries in this age group.

# 1. INTRODUCTION

In 1995, a Monash University Accident Research Centre report for the National Sports Research Centre and VicHealth explored the feasibility of improved data collection methodologies for sports injuries in Australia (Finch et al., 1995). A major recommendation from this report was to “conduct community surveys of sports and recreational injury for defined populations, where health sector data at all levels of severity are potentially available”.

There were two major reasons for this recommendation. First, a community survey of injuries associated with sport and active recreation participation had not previously been undertaken in Australia. Second, the opportunity to collect related injury and exposure (time-at-risk) data is inherent in a population survey. It was argued in the report by Finch, et al., 1995) that a major focus of a population-based survey should be to obtain community levels of participation across the range of sport and active recreation activities. Injury data, combined with participation data, would allow the risk of injury to be determined for particular sport and active recreation activities and comparison between sports. In turn, this information would provide substantial guidance to the development and targeting of sport and active recreation injury prevention programs within the study community and elsewhere.

One community that was considered to be particularly suitable for this kind of sports and active recreation injury study was the Latrobe Valley region in Victoria. The Latrobe Valley is the only geographical area in Australia for which all medically treated injury data on a defined population for a given period of time are available (Watson & Ozanne-Smith, 1997). The twelve-month Latrobe Valley General Practitioner (GP) injury data collection project (the Extended Latrobe Valley Injury Surveillance or ELVIS project) provided a unique opportunity to obtain data on all sport and active recreation injury presentations to GPs in this region (Day et al., 1997). During the same period, data on hospital admissions (Victorian Inpatient Minimum Database - VIMD), hospital emergency department presentations (Victorian Injury Surveillance System - VISS) and coronial cases (Coroners' Facilitation System – CFS) were also available. Thus, for a 12-month period (7 Nov 1994 to 6 Nov 1995) the full range of medically treated and catastrophic injury data were available for a defined population in the Latrobe Valley (Watson & Ozanne-Smith, 1997).

While the CFS (deaths), VIMD (hospital admissions), VISS (hospital emergency department presentations) databases and the ELVIS special collection (GP presentations) are valuable sources of general injury data, they are somewhat limited for describing the magnitude of the sport and active recreation injury problem (Finch et al., 1995).

First, the VIMD underestimates hospital admissions for sport and recreation injuries because the injury classification system used to record data, the International Classification of Disease, ninth revision (ICD 9 CM), has only two major sports-specific codes: ‘falls in sport’ and ‘struck by person or object in sport’. Second, these databases only cover sport and active recreation injuries that result in death, or for which medical treatment was sought from hospitals and general practitioners. It is generally acknowledged that a significant proportion of all sport and active recreation injuries, particularly overuse and other soft tissue injuries, will not present for treatment at hospitals or general practitioners (Finch, et al., 1995). Indeed, many sport and active recreation injuries are attended to by other practitioners such as sports medicine practitioners, physiotherapists, chiropractors, masseurs and sports first aiders. Third, a large proportion of sport and active recreation injuries are not severe enough to require medical treatment and/or are self-treated.

Therefore, conclusions based on injuries treated in hospital and general practice settings will underestimate the magnitude of the sport and active recreation injury problem. For these reasons, data from these sources should be supplemented with injury data from a community survey and other available sources to gain a more accurate estimation of the injury incidence in the complete range of sport and active recreation activities in the study community.

Also, limited inferences can be drawn about the relative risks of injury in various sport and active recreation activities when data are based solely on counting cases of injury in a total population. To compare the relative risk of injury in different sport and active recreation activities in a community, injury frequency data should be adjusted for participation (to estimate the risk per participant) and, preferably, for exposure or time-at-risk (estimating risk per time unit) (de Loes, 1997). These adjustments are important because, for example, one sport and active recreation may rank highly in terms of injury incidence (the rate of new cases of injury recorded in a defined time period) because of the large number of participants in that activity in a given community, rather than because there is a comparatively high risk of injury associated with that particular activity.

While injury frequency is an important indicator of the need for intervention, rate data collected for exposure is also useful for comparison purposes and for targeting interventions and monitoring their effectiveness. Injury incidence data adjusted for participation and, preferably, time-at-risk provides the most accurate epidemiological picture of the sport and active recreation injury problem in a community and the relative risk of particular sports and active recreation activities.

The 'ideal' community sports and active recreation injury study would collect comprehensive injury data at all levels of severity from all available sources as well as data on community levels of participation and player hours across the range of sport and active recreation activities in the defined community. This study is a 'first attempt' at providing such a detailed picture of sports and active recreation injury in a defined geographical region - the Latrobe Valley region of Victoria.

At some point, however, agreed definitions will be required on the level at which injuries are too trivial to be included in injury statistics.

## 2. LITERATURE REVIEW

This section provides an overview of Australian and international studies, that have explored the risk of injury across a range of sport and active recreation activities in particular populations (communities).

It is generally proposed that the frequency of injuries resulting from participation in a particular activity is largely determined by the number of participants and the level of risk of injury associated with the activity (Watkins & Peabody, 1996). Twelve of the seventeen international and Australian community-based sport and active recreation injury surveys identified in the literature search generated an injury incidence in a defined population that included active and inactive members, but collected no participation and exposure (time-at-risk) data (Tables 1&2).

This type of survey is the least complicated, provides current information and allows comparison with the results of other researchers (de Loes 1997). However, community-based sports injury surveys generally reflect the relative popularity of the sport or recreation activities in the particular community, especially in communities where a few sports dominate (de Loes, 1997). For example, given that soccer is the world's most popular sport, community-based surveys will inevitably show a high percentage of soccer injuries (de Loes, 1997). This bias is evident in Tables 1 and 2 where soccer and the other codes of football that dominate men's sport in particular countries (for example, Australian football in Australia) rank highly in terms of injury frequency. If football codes (or other sports) generate a sizeable proportion of the sports injury problem in a particular country, based on estimates of risk per total population, then preventive action in the particular sport could be justified on the sheer weight of numbers of injuries in the sport (ignoring the issue of relative risk).

Injury incidence rates which use the total population (active and inactive) as the denominator can be misleading. For example, in the Netherlands soccer is the most popular team sport and is responsible for the absolute highest number of sports injuries (Inklaar et al, 1996). However, when the relative number of active participants in sport were used as the denominator for estimating sports injury incidence rates in a cohort of school children in the Netherlands, then basketball, handball, korfbal, volleyball and hockey were shown to be higher risk sports for injury than soccer (the most popular sport) on a risk per participant basis (Backx et al. 1991). There were only four studies in the literature that concurrently measured participation levels among their respective sample groups over a given time span (Table 3) but comparisons between these studies are complicated because they used different measures of participation for the denominator (per 100 participants; per 1,000 athletes/participants a year; and per 1,000 occasions of participation).

Only the study of injury of youth sports by de Loes (1995) measured the relative risk of sports calculating injury rates using a measure of exposure (time-at-risk) for the denominator (incidence rate per 10,000 hours of exposure to training and competition). When exposure (time-at-risk) data are used, soccer is ranked third in terms of injury incidence behind ice hockey and handball and wrestling emerges as a high risk sport for injury (Loes 1995, table 3). By contrast, injury rates unadjusted for exposure (time-at-risk) showed soccer as the highest ranked sport for injury (accounting for 28% of sports injuries), hockey ranked seventh, handball ranked sixth and wrestling ranked thirteenth.

As shown by the literature, collection of exposure data is rare in sport and recreation injury epidemiological studies. Exposure data allow the estimation of comparative risk of injury

across the various sports played in a particular community and, together with frequency and severity of injury data, provide the most accurate information for decision-making on intervention and targeting of sport and active recreation injury prevention programs. Comprehensive sports injury data may also guide prospective participants in their choice of sport and active recreation activity. Major barriers to the collection of exposure data (on the number of sports participants and frequency and duration of training and competition) are the complexity of the task and the increased time needed for such studies, both of which have cost implications.

**Table 1: Ranking of sports on frequency of injuries: Australian community-based studies**

SPORT	Finch et al. (1998)		Baquie & Brukner (1997)
	<15 yrs	≥15 yrs	
Aerobics			8
Australian football	2	1	1
Basketball	4	6	3*
Cricket	8	5	
Cycling	1	2	
Dancing		10	6
Hockey		8	
Long Distance Running			2
Martial Arts		9	
Netball	9	7	3*
Rollerblading	3		
Row/Canoe			7
Rugby	10	4	
Skateboarding	7		
Soccer	5	3	8
Swim			7
Track Running			5
Trampolining	6		
Triathlon			7

*Note: \*In this study basketball and netball injuries were grouped together*

**Table 2: Ranking of sports on frequency of injuries: international community-based studies**

STUDY	Tenvergert et al. 1992	Sandelin et al. 1987	Spencer-Jones + Taggart, 1994	Pickard et al. 1988	Rowell & Rees-Jones 1988	Watson 1984	Watkins & Peabody 1996	Pelletier et al. 1991	Chan et al. 1993	Ellison & MacKenzie 1993	
Country and data collection period	The Netherlands 1982-88	Finland Census Data 1980	UK 10 day period Oct '92	UK Aug '85 to Apr '86	UK Oct 1986 to Oct 1987	Ireland Sept-June (year not given)	UK Jan '89 to Dec '91	Canada Oct 6-13 1986	Hong Kong May '84 to Dec '90	Canada 1991	
SPORT					HOS	SIC	M	F			
Soccer	1	2	1	1	1	2	6	1	4	1	3
Rugby				2	2	5	3	2			
Grid Iron									2		5
Touch Football									1		
Gaelic Football							1				
Netball			2	8				4			
Basketball			2				5	5	5	2	1
Racquet Sports		4		7	4	3		3	5	6	
Hockey			4	5			4		5	3	
Volleyball	3		2						7	3	9
Badminton								6	7	5	
Base/Soft Ball			6						6		4
Cricket					7	10		7			
Indoor Soccer							8				
Ind. Ball games		1									
Ice Hockey											2
Other team sport					3	4					
Martial Arts	4		5	4	8	5			8		
Gymnastics	2		8		10	7	3	2		7	7
Cycling							4		6	4	
Swim				10			10	4	2		
Short dist. Run										6	
Jog/Run		3		6		1			6		
Long dist. Run										4	
Athletics							2	2	1		
Dancing			7						3	5	
Aerobics											
Row/Canoe											
Snow Skiing				3					6		4
Ice Skating											6
Street Hockey											8
Diving								3	4		
Camogie							9				
Hurling							6				
Other					6	9	7				
Roller blading			10								
Golf				9							
Outdoor Pursuits					5	6					
Weight Training			3								
Motor Racing			9		9	8					

**Table 3: Ranking of sports according to comparative injury risk: international studies.**

STUDY	de Loes (1995) Incidence per 10 000 hours of exposure to the sport (Switzerland) 1987-1989	de Loes & Goldie (1988) Incidence per 1000 participant per yr  (Sweden) 1984 (12 months)		Backx et al. (1991) Incidence rate per 1000 athletes/yr.  (The Netherlands) 1982-83 (12 months)	Nicholl, Coleman & Williams (1995). Incidence rate per 1000 occasions of participation (UK) 1989-1990 28 day recall	Powell et al. (1998) Incidence rate per 100 participants (USA) Apr 28-Sept 18 1994
Country and data collection period						
Sport		Female	Male			
Soccer	3		1	1	6	2
Rugby	6			1		
Basketball	10			8		
Martial Arts		6		7		
Gymnastics					7	
Tennis					6	
Squash				5	3	
Hockey	7	7	7	4		
Volleyball						
Weightlifting					5	1
Badminton				9		
Base/Softball		4	3		8	
Jog/Run						
Aerobics	1		2			3
Ice Hockey	8	3	6			
Snow Skiing				10		
Athletics					4	
Cricket					9	
Wt Training			5			
Mtr Racing						
Gardening						2
Walking						2
Outdoor Cycling		2				3
Horse riding	2	5	4	2		
Handball				3		
Korfbal	4					
Wrestling	5					
Hiking	9					
Alpinism						

Because of the limited number of studies that include participation data in the calculation of injury rates, it is difficult to determine the extent to which the high level of participation in football dictates the apparent high risk of injury. Soccer and rugby, the predominant football codes in Europe and the United Kingdom are consistently reported as having among the highest injury rates, irrespective of whether or not the injury rate has been adjusted for participation.

The apparent high risk of injury associated with football codes may be associated with both the popularity of the sport and certain characteristics of the sport. Australian football and rugby have been reported as having some of the highest sports injury rates in Australia (Finch et al., 1998). Baquie and Brukner (1997) suggest that the high incidence of Australian football injuries reflects both the popularity of the sport in Melbourne (the study community) and the contact nature of the sport. Watkins and Peabody (1996) state that football and other sports such as hockey and basketball involve a greater relative loading on the lower limbs than on the upper limbs. This aspect, together with the rapid changes of speed and direction that characterise the sport, puts participants at a high risk of injury. Irrespective of the nature of the sport, Watkins and Peabody (1996) emphasise that the sports with highest numbers of participants that are practised to a greater extent will have the highest injury frequencies. Sandelin et al. (1987) state that an overall high level of sports exposure must undoubtedly play a significant role in determining the risk of injury. This may be the case for handball which features as one of the highest risk sports for injury in international studies, when injury incidence rates are adjusted for exposure. However, it does not feature as a high risk sport when ranked according to injury frequency in community-based studies. Several authors attribute the high risk of injury in handball in European studies to the fact that it is predominantly played by young males (de Loes & Goldie, 1988; Backx et al., 1991; de Loes, 1995).

Comparison and interpretation of results from different studies on the epidemiology of sports injuries is often difficult because of differences in research design and other characteristics including: definition of injury; diagnosis of injury; method of recording injuries; method of determining the size of population at risk and/or exposure time; and sampling procedure. The studies included in this review used different definitions of sports injuries, regardless of the method of data collection employed (ie. injury surveillance system or population survey). For example, in the community based study by Backx et al. (1991) a sports injury was defined as “any physical damage caused by an accident during physical education or in any sports injury or in any physical education or in any sports activities outside school, both “organised and non-organised.” Similarly, Sandelin et al. (1987) defined a sports injury as “any acute incidence regardless of severity or treatment occurring during non-organised and organised sports.” However, another population study by Nicholl et al. (1995) used a more restricted definition ie. “instance of trauma requiring competent medical care or resulting in at least one day of restricted activity.” Studies that gather data from emergency departments or sports medicine clinics also use different definitions making it difficult to compare findings across studies.

The potential for generalisation may also be biased by too many confounders due to differences in the populations being compared eg. the age distribution, cultural characteristics, climate and season (de Loes, 1997). In some of the studies in this review (Nicholl et al., 1995; Powell et al., 1998; Pickard & Tullett, 1988; Spencer-Jones & Taggart, 1994) sports injury data (and sports participation data) were collected for less than a full year which may bias findings. For example, Pickard and Tullett (1988) collected data over the winter months and identified that skiing was one of the highest risk sports for injury. If the data had been collected over the entire year, skiing may have featured less significantly. Studies based on data collection for less than a full 12-month period exclude injuries obtained in seasonal sports including netball, cricket and triathlon, which could account for the low injury incidence rates observed in these activities.

The studies examined in this report also differ in terms of sampling procedure. Those that employed injury surveillance (within emergency departments, sports injury clinics or schools) monitored injury prevalence over a period of eight months to four years.

Population-based studies that featured surveys of interviews asked the participation to recall their injury status and participation levels for the preceding 28-30 days.

Both time periods are appropriate for the method of data collection employed. For example, data from emergency departments and sports injury clinics collected over an extended period are valuable in that they have the capacity to identify injury incidence (or prevalence) over an entire year or longer and so include information on the full range of seasonal sports. Population surveys that employ subject recall of 30 days or less limit the likelihood of recall bias which can compromise the validity of results.

Overall, data collected at sports injury clinics and emergency departments are more reliable because the injuries are reported continuously and are generally recorded only a short period after they occur, usually a few hours. In comparison, population surveys employing 28-30 day recall periods may be subject to either under- or over- reporting bias, and the subject's 'guesstimate' exposure to sport and physical activity within the past month may be inaccurate.

In summary, at this stage in the development of sports injury epidemiology, high risk sports for injury cannot be reliably identified. An injury report without a denominator can only describe frequency. In terms of injury frequency, all codes of football appear to generate the highest number of injuries, along with basketball, racquet sports and hockey (Tables 1 & 2). When the findings from the limited number of studies with participation and/or exposure data factored in are considered (Table 3), football maintains its relatively high ranking but handball and ice hockey assume prominence. Because football codes feature prominently in all types of epidemiological studies of sports injuries it is difficult to establish the relative contribution of high participation and the injury hazards inherent in the sport to injury frequency and risk.

To improve the comparability of sports injury studies, there is need for consensus on definitional and methodological issues and increased attention to gathering data on exposure (Finch, 1997).

### 3. AIMS

The Latrobe Valley sport and active recreation injury study was conducted to determine the sport and active recreation experience, including participation levels and associated injuries, within a well-defined regional population. The specific aims of this study were therefore to:

- describe the epidemiology of sport and active recreation injuries, including risk assessment, within a geographically defined population.
- supplement existing Latrobe Valley health sector data describing sport and active recreation injuries with data for injuries of lesser severity or receiving specialist treatment to provide a full description of sport and active recreation injuries in this community.
- trial a survey methodology for collecting information about sport and active recreation injuries and associated participation levels in sport and active recreation, that could be transferred to other community settings.
- collect sport and active recreation participation data amongst Latrobe Valley residents.
- analyse injury and participation data to determine injury risk ranked by sport and active recreation.

Specific research questions to be asked for the Latrobe Valley population were:

- What is the overall rate of sport and active recreation participation per 10,000 resident population (i.e. for all activities combined)?
- What is the rate of participation, per 10,000 resident population, in individual activities (e.g. football, cycling, aerobics, etc.)?
- What is the rate of injury per 1,000 sport and active recreation participants?



## 4. METHODS

The methodology used to describe the broad sport and active recreation injury profile in the defined geographic region had four major components:

### 1. Analysis of existing databases

- hospital admissions data (Victorian Inpatient Minimum Database – VIMD)
- hospital emergency department presentations (Victorian Injury Surveillance System - VISS)
- general practice presentations (Extended Latrobe Valley Injury Surveillance – ELVIS)

### 2. A community survey of sports participation and associated injuries

- randomised household telephone survey
- calculation of injury rates for specific sports within the sample

### 3. Calculation of overall injury rates for the Latrobe Valley

- extrapolation of survey results to the whole population
- development of a medically-treated sports injury pyramid

### 4. A survey of local sports and active recreation clubs and schools to gather data on participation, associated injuries and time-at-risk

- postal survey of local sporting clubs and organisations
- postal survey to all schools within the geographic region

In the context of this report, the term "sport and active recreation" is used to represent the broad context of sports and active recreation participation as defined by the Australian Sports Injury Prevention Taskforce (ASIPT 1997):

- formal professional sport
- formal non-professional sport
- informal sporting activity
- school sport
- general recreation activity
- fitness activities
- adventure sports and activities

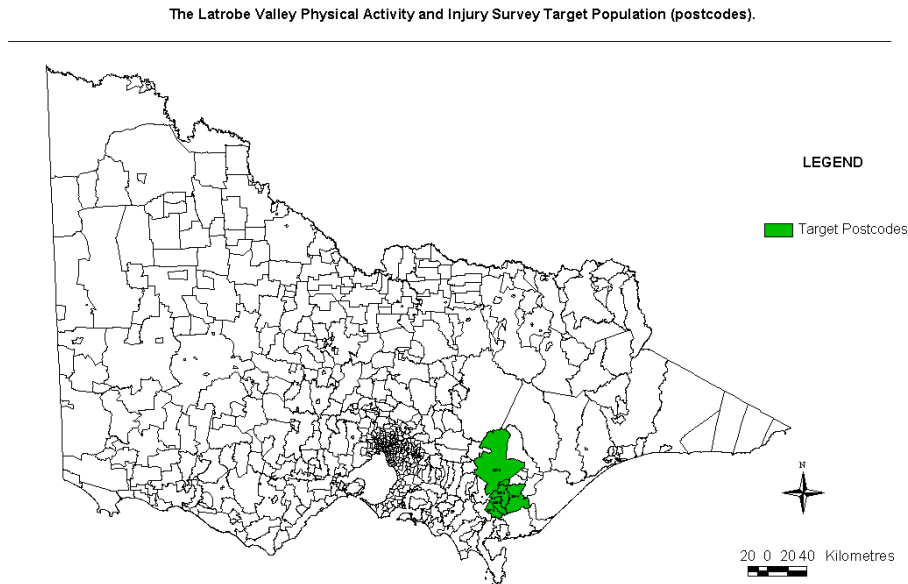
This definition excludes gardening, home duties and home maintenance activities.

This project describes a community survey of sport and active recreation injuries. This approach was chosen so that specific injury risk estimates could be calculated. Such risk estimates have not been previously reported in Australia.

## 4.1 THE GEOGRAPHIC REGION

A defined geographic target area, the Latrobe Valley, was chosen for this study. This community includes both urban and rural areas. Figure 1 shows the location of the Latrobe Valley within Victoria.

**Figure 1: The Latrobe Valley target area**



The target area was restricted to postcodes that fell wholly within the catchment area of the Latrobe Regional Hospital. The rationale behind this choice was to allow comparison of the community survey results with injury data routinely collected in this area.

Table 4 lists the postcodes that identify the target region and population. All people who were usually resident in one of these postcodes were considered to be eligible for this study. Because the focus was on sport and active recreation injuries, the target population was further defined as residents aged over 4 years.

**Table 4: Postcodes used to define the target area**

Postcode	Town
3825	Moe
3840/1	Morwell
3842	Churchill
3844	Traralgon
3869	Yinnar
3870	Boolarra

*Note: 3841 is the postcode for the Morwell Mail Centre which was the postcode given by some people presenting to the Latrobe Regional Hospital and general practitioners.*

## 4.2 ANALYSIS OF EXISTING DATABASES

The Extended Latrobe Valley Injury Surveillance (ELVIS) project was conducted in the Latrobe Valley from 7 November 1994 to 6 November 1995 (Day et al., 1997). The ELVIS project collated the most comprehensive collection of General Practice (GP) injury data in Australia, to date, including sport and active recreation injury data. During this same period, routine injury data were also being collected at the Latrobe Regional Hospital through the Victorian Inpatient Minimum Dataset (VIMD) and the Victorian Injury Surveillance System (VISS). These data collections provide information about all injury hospital admissions and injury emergency department presentations, respectively.

Data from all three sources for the period 7/11/94 to 6/11/95 (the time frame for the ELVIS data collection) available at the Monash University Accident Research Centre. A descriptive statistical analysis of the sport and active recreation injury data from each of these databases was undertaken to describe common injuries. Data from these collections are presented as case frequencies and proportions.

Summary details of each of these database and the procedures used to select cases are given below.

### 4.2.1 Hospital admissions

The Victorian Inpatient Minimum Dataset (VIMD) is a collection of data on admissions to Victorian hospitals. The database is primarily used for health policy and planning purposes.

Within the VIMD “injury data” subset, injuries are identified as admissions coded with an external cause of injury E-code (ICD-9-CM classification). Inpatient admissions to public hospitals for sports and active recreation injury can be identified by the E-codes assigned to the discharge diagnoses.

All sport and active recreation injury cases admitted to the Latrobe Regional Hospital (Moe and Traralgon campuses) in the period from 7/11/94 to 6/11/95 who were aged over 4 years and resided in the six postcodes of interest (Table 4) were selected from the VIMD database. For the purposes of this report, the following cases were excluded from the analyses: private hospital admissions; re-admissions within 30 days; medical injuries and late/adverse effects. There was one private hospital in the area (Maryvale Hospital), however, it was not possible to identify individual private hospitals in the VIMD because the Department of Human Services encrypt private hospital codes.

The following staged procedure was used to extract the sport and active recreation cases on the basis of admissions to the Latrobe Regional Hospital:

1. *Selection of cases within the target geographical community.* All public hospital injury admissions to the Latrobe Regional Hospital (Moe and Traralgon campuses) of residents in the postcode areas of interest (Table 1) for the study period were extracted using a combination of hospital and postcode variables. The selection was confined to the Latrobe Regional Hospital in line with the selection of ED and GP cases.
2. *Selection of sport and active recreation injury cases.* Sport and active recreation injury cases were selected by the only two ICD 9 E-codes that specifically identify any type of sports injury:
  - E886.0 Fall on the same level from collision, pushing or shoving by or with other

person in sports

- E917.0 Striking against or struck accidentally by objects or persons in sports.

Codes for bicycling and animal being ridden (ie. horse riding) were also utilised to extract active recreation cases. This process yielded 112 cases of sport and active recreation injury. The VIMD underestimates sports injury admissions by an unknown factor because not all sports injuries are captured by these two E-codes. Since E-codes are the only means of identifying injuries in this database, and sport and active recreation injuries in particular, this level of under-ascertainment cannot readily be estimated.

#### **4.2.2 Emergency department presentations**

The Victorian Injury Surveillance System (VISS) was first established in 1988 to collect and analyse injury presentations data from hospital emergency departments and to disseminate information for the purposes of injury prevention. The presentations data include hospital admissions and non-admissions. This manual data collection system operated until 1996 when it was replaced by the Victorian Emergency Minimum Database (VEMD).

The VISS began as a paediatric injury data collection but expanded to include data on adult injury presentations to the emergency departments of participating hospitals from January 1991, commencing with the Western Hospital (Footscray campus). Another four hospital campuses contributed adult injury data to the database during the period 1990-96: Latrobe Regional Hospital (Moe and Traralgon campuses), Preston and Northcote Community Hospital, and Royal Melbourne Hospital. The full data collection period for Latrobe Regional Hospital (Moe and Traralgon campuses) for patients of all ages was 1/7/91-30/6/96.

The VISS database is a rich source of detailed information of utility to injury research and intervention. Data were collected by a standard instrument for injury surveillance which has been used throughout Australia by emergency departments collecting injury data. This collects demographic data and information relating to the injury event such as the mechanism of injury and associated factors. The patient or carer and doctor filled in the form on a voluntary basis. The completion rate of data collection forms for the VISS hospitals ranges from 85% (frequently more than 90%) for presentations to 100% for admissions. The capture rate of injury cases for the Latrobe Regional Hospital was 100% of all cases subsequently admitted to hospital and 85% of all other cases.

By definition, all injury emergency department presentations (aged over 4 years) in the study period at the two campuses of the Latrobe Regional Hospital (Traralgon and Moe) whose residential postcodes corresponded with those defined as the target area (see Table 4) were eligible to be included in this study.

The VISS data are not coded using the ICD 9 E-code classification system. Instead, the data are analysed using the Injury Surveillance Intelligence System (ISIS) to generate frequency distributions to compare the nature and extent of injury presentations. Sports injury cases were selected on the basis of ISIS context/activity codes 102, 103 and 301-303 representing 'Sports' (organised competition or practice, informal and not specified). In addition, active recreation cases were identified by factor codes and included horseback riding, roller-skating, trampolining, swimming, skateboarding, snow skiing and bicycling.

During the period 7.11.94 to 6.11.95, VISS recorded 994 sport/active recreation injury presentations to the combined campuses of the Latrobe Regional Hospital (Traralgon and Moe). In addition there were 183 presentations for bicycling injuries. In total, the sport

and active recreation injury cases represented 15% of the 6,683 injury cases recorded in the Latrobe Valley region over the study period.

### **4.2.3 General Practice presentations**

In the Extended Latrobe Valley Injury Surveillance (ELVIS) project, injury data were collected through a research network of general practitioners, established by the Central West Gippsland Division of General Practice. A data collection process, based on that already established by the Victorian Injury Surveillance System (VISS), was refined and modified for use in the context of general practice (Day et al., 1997). The method of data collection involved the manual recording of injury presentations to general practice on a form, sections of which were completed by the patient and general practitioner. Sixty-four of the 66 GPs in the Division participated through 18 general practices. Injury data were collected over a 12-month period from 7/11/94 to 6/11/95. The injury case capture rate was 77%. Data quality was good and there was a high completion of each of the data variables ranging from 94% to 100% (Day et al., 1997).

The selection of cases used the same method as described above for the VISS hospital emergency department presentations. Selection by ISIS context and activity codes in the six postcodes of interest yielded 1,003 cases of sports injury.

As stated above, data about other medically-treated (i.e., emergency department presentations and injury hospitalisations) injury cases in this region were concurrently collected by the VISS and VIMD. The Latrobe Valley GP injury data, when combined with these other data, provide a complete picture of all medically-treated sport and active recreation injuries for a 12-month period in a defined region.

### **4.2.4 A sport and active recreation injury pyramid**

Injury researchers often find it convenient to describe the profile of injuries within a community by an injury pyramid. This approach has also been found useful for describing sport/active recreation injuries (Finch et al., 1995).

The numbers of sport/active recreation injury cases from each of the three major database used in this report (the VIMD, VISS and ELVIS) were used to generate a sport and active recreation injury pyramid. These case numbers were factored up to account for the capture rates of the individual databases according to the following assumptions:

- the number of sports and active recreation injury cases reported by the VIMD represents 100% of all actual injuries admitted to hospital (despite the inclusion of 100% of cases identified by available E-codes, hospital admissions for sport and active recreation injury will be underestimated because of the limitations of the coding system)
- the number of sports and active recreation injury cases reported by the VISS represents 100% of all actual cases subsequently admitted to hospital and 85% of all other relevant emergency department presentations
- the number of sports and active recreation injury cases reported by the ELVIS database represents 77% of all actual GP consultations.

The ratios of the numbers of emergency department and general practice presentations were calculated, relative to the numbers of hospital admissions.

### 4.3 COMMUNITY TELEPHONE SURVEY

One of the major challenges in epidemiological research into sport and active recreation injuries is the definition and collection of meaningful exposure data. Population figures for the postcodes of interest were obtained from Australian Bureau of Statistics (ABS) census data for the Latrobe Valley. These were used to calculate sport and active recreation injury rates per 10,000 population active and inactive. Whilst these provide useful rate data for comparison with other injury causes, they are not useful for comparing injury rates between sports because not all people participate in sport and active recreation activities. It is therefore more meaningful to confine the population at risk to those exposed to sport and active recreation activities. The results of the community survey were used to provide multipliers to the population figures for estimating the numbers of people who participate in sport and active recreation activities.

A randomised telephone survey was conducted in the study population using a similar methodology to that used in the Safety Survey conducted by the Australian Bureau of Statistics (ABS) for the Department of Human Services (ABS, 1992). The aim of the community telephone survey was to provide injury and participation data for the same period of time so that meaningful injury rates could be expressed as numbers per 10,000 head of population and per 1,000 sports participants.

#### 4.3.1 Design of the community telephone survey

Results of a pilot question on sports participation were included opportunistically in a survey to evaluate the effectiveness of the Latrobe Valley Better Health Injury Prevention Program (Day et al., 1997). The results showed that 52% of households had at least one member who had played sport in the 2 weeks prior to the survey. One quarter of all households had more than one member who had participated in sport. On the basis of these figures it was decided that a sample of 100 households each quarter (to obtain information on household members, aged over 4 years) would provide sufficient and representative data and was within the project's budget. The number of households in the Latrobe Valley was obtained from ABS census data and it was estimated that the survey sampled approximately 1.7% of households in the Latrobe Valley Hospital catchment area.

The community survey was staggered over 12 months to accommodate seasonal variations in sport and active recreation participation.

The telephone survey study area was restricted to households in the region covered by the six major postcodes that fell wholly in the catchment area of the Latrobe Regional Hospital – 3825 (Moe), 3840/41 (Morwell), 3842 (Churchill), 3844 (Traralgon), 3869 (Yinnar) and Boolarra (3870) (Table 1).

Although the precise number of households in the target area was unknown at the time of the survey, population estimates from the 1991 census were available for each of the six postcode areas for persons aged > 4 years. It was assumed that the number of households in each postcode area was proportional to the population estimate for that postcode. For example, according to the 1991 population census, 26% of the total population in the target area resided in postcode 3840. It was therefore assumed that 26% of the households in the target area were also within that postcode region.

The quota of households to be surveyed in each individual postcode area was broadly calculated on the basis of the proportion of the population (households) residing in that area compared to the whole target area. There was some subsequent over-sampling to cover

outlying districts with the result that the number of households eventually sampled in each survey was 104 and not 100 (as initially planned).

Table 5 below shows the sample quotas used for the survey. For example, the allocated quota for Moe and district (postcode 3825), which covered 30% of the population in the survey target area, was 32 households (including over-sampling).

Telephone directories could not be used to randomly select households because the postcode areas of interest were included in two telephone books that covered the whole of the Gippsland region. Information on telephone exchanges within the six postcode areas of interest was therefore obtained from Telstra. This included the geographic location of the telephone exchanges within each postcode area and the prefixes and range of telephone numbers covered by each exchange. Telstra was not able to supply information on the telephone numbers of private residences separated out from unallocated numbers and numbers used for businesses, public premises, faxes etc.

**Table 5: Sample quotas for the telephone survey according to postcode**

<b>POSTCODE</b>	<b>Population 1991 census (&gt;4 yrs old)</b>	<b>% total population (&gt; 4 yrs old)</b>	<b>Survey quota (original) n=100</b>	<b>Survey quota (adjusted) n=104</b>
3840/1 Morwell & District	17,174	26%	26	27 *
3825 Moe & District	20,461	30%	30	32 *
3870- Boolarra	1 035			2
3869-Yinnar	3 163			5
3842-Churchill	2 657			4
Sub-total	6 855	10%	10	11 *
3844 Traralgon & District	23,169	34%	34	34
<b>TOTAL</b>	<b>67,659</b>	<b>100%</b>	<b>100</b>	<b>104</b>

\* Note: Morwell, Moe & District and Boolarra were eventually over-sampled to cover outlying districts.

The best possible 'fit' of Telstra telephone exchanges was made to the six postcode areas. The survey quotas for each postcode area were used to allocate the number of telephone interviews to each exchange within the postcode area. It was assumed that the number of households covered by each telephone exchange was in direct proportion to the number of lines allocated to each exchange. For example, there were 9 exchanges covering Moe & District (postcode 3825) which had originally been allocated a quota of 30 survey interviews on the basis that 30% of the survey target population (households) lived in this postcode area. Each of these exchanges was allocated a quota of interviews in proportion to the number of lines allocated by Telstra to the exchange. Because of the number of small exchanges in the postcode area, the quota of interviews was lifted to 32 so that there would be at least one household surveyed from each exchange. The interview quotas (per exchange) are given in Appendix 1.

Telephone numbers within the number range on the specific telephone exchange were randomly generated by computer. Five times as many numbers as required for the interview quotas were generated to allow for refusals, non-responders (no contact made) and ineligible (insufficient English spoken by person answering phone, business or public

facility). Telephone calls were made to successive randomly generated numbers until the required interview quota was obtained. A consequence of this method was that pending appointments (which had been arranged with respondents) and attempted, unanswered numbers were not pursued once the interview quota for the specific exchange was filled. Interviewers were instructed to make two "call backs" to unanswered numbers before abandoning the number and to make call-backs prior to using new numbers at the beginning of a session.

The telephone survey was conducted quarterly over a twelve-month period to capture seasonal participation in the full range of sports: December 1995; March 1996; July 1996; and September 1996. The same methodology was used to select the samples for each survey. The lists of random telephone numbers were generated for each survey separately. Duplicate numbers in lists were removed.

Over the 12-month survey period, a total of 417 telephone survey questionnaires were completed (Morwell, 106; Moe, 129; Boolarra & Yinnar, 45; and Traralgon, 147). The response rate among contacted households (completed interviews out of completed plus refusals) was 67.9% (Table 6).

Not included in the denominator for calculation of the response rate were:

- households where no contact was made (that is, where the telephone was out of order, connected but no answer was obtained, engaged or attached to a fax or answering machine);
- ineligible households (that is, the contact in the household did not speak sufficient English to be interviewed, the household was out of the study area or the phone number was attached to a business/public facility); and
- households where appointments were made for follow-up contact but were not kept (because interview quotas had been filled or no interviewer was working at the appointed time).

#### **4.3.2 The survey questionnaire**

The survey, which sought specific information on all household members aged 4 years and older, was administered to the respondent of the telephone call, provided he/she was over the age of 18 years. If the person answering the telephone was a minor, he/she was asked to bring an adult to the telephone. The period of recall was for the two weeks prior to the survey for both injury and participation data.

The information sought from the survey was as follows:

##### *Demographic data*

- number of people aged 4 years or older in household
- age of household members
- sex of household members

##### *Participation data:*

- sports and recreation participation for each household member
- range of sports and recreation activities participated in

Data was collected on level of play, hours played, hours of training, context of participation (e.g. formal competition, social, school-based), location of participation and routine use of protective equipment. This will be reported in a later publication.

*Injury data:*

- recent injury history, including nature of injury
- sports and activity being undertaken at the time of the injury
- treatment by (type of health care professional)
- time off sport, school/work, etc
- severity
- use of protective equipment

A copy of the survey questionnaire is given in Appendix 2.

**Table 6: Outcome of the survey telephone calls in each area (surveys 1-4 combined) including response rate**

Outcome	Morwell	Moe	Boolarra & Yinnar	Traralgon	All areas
Answered calls to eligible households (private households that met survey inclusion criteria, except unused recall appointments)					
Interviews	106	129	45	137	417
Unwilling to be interviewed	65	63	16	53	197
Sub-total	171	192	61	190	614
Response rate (%)	(62.0)	(67.2)	(73.8)	(72.0)	(67.9)
Unanswered calls/Exclusions/Unused recall appointments					
- Unanswered (no response/ engaged/answering machine/ fax/not connected/out of order)					
- Exclusions (NES/ out of study area /business/public facility)					
- Unused recall appointments					
No answer/engaged	287	255	79	191	812
Answering machine	23	24	9	54	110
Fax/not connected/ Out of order	265	156	37	323	781
No English spoken (NES)	1	3	0	0	4
Wrong no./out of study postcode area	1	0	1	0	2
Business/public facility	97	66	5	74	242
Appointments made for recall but not used	23	30	9	26	88
Sub total	697	534	140	668	2,039
TOTAL diallings	868	726	201	858	2,653
Call backs	34	31	4	65	134
TOTAL phone no.'s used	902	757	205	923	2,787
Mean number of calls that had to be made for each successful phone completed interview	8.5	5.9	4.6	6.7	6.7

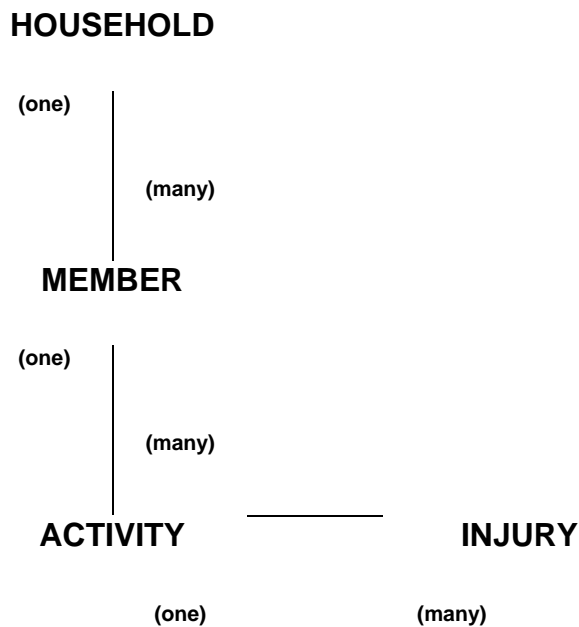
### 4.3.3 The computer telephone survey

The first two telephone surveys were paper-based. For the third and fourth surveys, a computer-aided telephone interview (CATI) system was set-up so that the responses were entered directly onto a personal computer at the time of interview. The data-entry system was set-up using *Microsoft Access* software. Data was cleaned and then converted to an *SPSS* file.

Figure 2 describes the structure of the relational database that was established for this survey. One household could have more than one household member. Each member could participate in more than one activity. Each activity could be associated with more than one injury. All entities are related in some way, and linked by a unique identifier in the database.

Two separate databases were formed for this preliminary analysis. The first database focused primarily on member and activity details. The second database was injury-based. Both databases contained household and demographic details.

**Figure 2: Structure of the relational database**



### 4.3.4 Calculation of population sport and active recreation participation rates

Formal advice on the correct analysis of the survey data was obtained from the Australian Bureau of Statistics' Statistical Consultancy Service in Melbourne.

Because the sampling was done on the basis of households, but estimates of individuals participation in sport and active recreation were required, a weighting factor was applied to all data before analysis. Weights were determined for all ages/sexes combined, for each sex (ages combined) and for each age group (sexes combined).

For each stratum (i), this weighting factor took the form:

$$\frac{\text{estimated population in stratum } i \text{ (according to the census)}}{\text{no. of people in stratum } i \text{ in sample survey}} \times \frac{\text{estimated no. of households (census)}}{\text{no. of households in sample survey}}$$

The estimated number of households and estimated population in the catchment area was obtained from the ABS census data for the region. The final sports participation rates were expressed per 10,000 population. For some sports and active recreation activities, the reported number of participants in the survey sample was less than 20 people. To ensure adequate validity of the participation estimates, participation rates have only been calculated for sports activities for which there were more than 20 people in the sample.

#### **4.3.5 Calculation of injury rates**

Injury rates for each sport activity were calculated per 10,000 population. However, since not every person participates in sport, injury rates were also calculated per 1,000 participants in each sport. These injury rates per sport were only calculated for activities with more than 20 participants in the survey.

#### **4.3.6 Revisions to the sports injury pyramid**

Data from the survey were used to supplement the data from the medically-treated injury databases to extend the sports injury pyramid (discussed in Section 4.2.4) to cover non-treated injuries. The ratios of treated to non-treated injuries from the survey were used as multipliers to obtain the relevant tiers of the pyramid.

### **4.4 SURVEYS OF SPORT AND RECREATIONAL CLUBS AND SCHOOLS**

In addition to the community survey, mail surveys of Latrobe Valley schools and sport and active recreation clubs were conducted to collect additional information about sport and active recreation participation levels. This was by a postal survey with a follow-up phone call to the major sporting clubs and schools within the region.

These mail surveys aimed to collect participation and injury data and other information relevant to potential sports injury prevention interventions:

- participation (registered players: age level, grade and sex)
- player/participant injury insurance coverage
- hours spent in competition and training (or participation only, for non-competitive activities)
- number and level of accredited sports' trainers and coaches
- player injury data
- injury prevention initiatives at school, club and association level.

#### **4.4.1 Survey of sport and active recreation clubs**

The aim of this mail survey was to obtain data on participation and injuries in sport and active recreation at the club level in the Latrobe Valley region over the previous twelve months (1/10/95 - 30/9/96). Clubs were also asked to supply information on safety measures taken by the club and safety equipment used by team members. A copy of this survey is in Appendix 3.

A list of sport and active recreation clubs and associations that serviced the six postcode areas of interest in the Latrobe Valley region was obtained from Sport and Recreation Victoria (Westernport and Central Gippsland Region). An officer of Sport and Recreation regional office undertook to make an initial telephone call to alert the clubs to the survey and to check contact details based on their records. However, subsequent unopened mail returns and telephone enquiries to non-responding clubs revealed that a substantial number of clubs on the list were not able to be contacted.

The mail survey was sent out to Latrobe Valley sports and active recreation clubs in early November 1996.

#### **4.4.2 Survey of schools**

The aim of this mail survey was to obtain data on school sports participation and injury in schools that serviced the six postcode areas of interest in the Latrobe Valley. Sports coordinators (through school principals) were asked to supply sports participation data that covered inter-school sports, in-school sports (organised competition); and athletics, cross country, swimming and other organised physical activity over the 12-month period October 1 1995 to September 30 1996. They were also asked to supply data on school sports injuries that occurred during this period and information on school sports safety measures.

Permission was obtained from the Victorian Ministry of Education to conduct the survey in state government schools. The private schools (Catholic and independent) were approached through their principals. Follow-up telephone contact was made in December 1996 in an attempt to boost the response rate that was probably adversely affected by the closeness of the survey to the end-of-school year.

## **5. ANALYSIS OF HOSPITAL AND GENERAL PRACTITIONER SPORT AND ACTIVE RECREATION INJURY DATA: LATROBE VALLEY REGION**

This chapter describes sport and active recreation injury in Latrobe Valley residents that presented for medical treatment in the period 7/11/94 to 6/11/95. This period was chosen because it coincided with the 12-month General Practice injury surveillance project (ELVIS) implemented in the Latrobe Valley. The data presented describe hospital admissions, emergency department and general practice presentations for sport and active recreation injuries. There were no deaths of Latrobe Valley residents associated with sport and active recreation activities on the Coroners' Facilitation System (CFS) in the same period. The available data were then used to develop a sports injury pyramid for the Latrobe Valley.

### **5.1 HOSPITAL ADMISSIONS**

Hospital admissions databases (for example, the Victorian Inpatient Minimum Database – VIMD) are good sources of general injury data. However, their limitations for adequately describing sports injuries are well documented (Finch et al., 1995). Their major limitation is the coding system used to classify cases (the International Classification of Diseases External Cause of Injury codes – ICD9 E-codes). The sport and active recreation E-codes provide insufficient coverage of all sport and active recreation injury cases, because the categories are not all-inclusive. Furthermore, the sports associated with the injuries are not identified.

The list of E-codes that can be used to select sports injury cases for the VIMD databases are shown in Table 7. Exposure studies have indicated that over 87% of all bicycle use is for sport and active recreation (Finch et al., 1995), so cases assigned to this E-code are included. Similarly, the majority of animal being ridden (almost entirely horse riding-related) injuries occur during sport and active recreation (Ozanne-Smith, personal communication) so the cases assigned this E-code were also included in the dataset.

#### **5.1.1 Frequency and pattern of injury admissions: all cases (n=112)**

Over the 12-month period, there were 112 hospital admissions for sport and active recreation injury in the Latrobe Valley. This represents 2% of the total number of hospital admissions for sport and active recreation injury ( $n=5,660$ ) during the same period in Victoria.

The major cause (mechanism) of sport and active recreation hospital admissions was 'being struck or crushed during sport' which accounted for 39% of all sport and active recreation injury admissions (Table 7). While it is likely that many of these injuries occurred during collision or contact sports, the ICD-9 classification system does not identify the individual sports involved. Other significant causes of sport and active recreation injury were bicycling (19%), overexertion and strenuous movements (19%), and falls on the same level during sport (11.6%) (Table 7).

**Table 7: Cause of sport and active recreation injury: VIMD hospital admissions, Latrobe Valley residents (n=112)**

<b>E-code group</b>	<b>E-codes</b>	<b>Frequency of admissions with this E-code</b>	<b>Proportion of all sport and active recreation admissions with this E-code %</b>
Animal riding	(810.5, 811.5, ..., 825.5) (826.2, 827.2, ..., 829.2)	11	9.8
Pedal cycling	(800.3, 801.3, ..., 807.3) (810.6, 811.6, ..., 825.6) (826.1, 827.1, ..., 829.1)	22	19.6
Water skiing	(830.4, 831.4, ..., 838.4) (910.0)	0	-
Swimming	(830.5, 831.5, ..., 838.5)	0	-
Diving	(883.0, 910.1, 910.2)	1	0.1
Fall on same level (sport)	886.0	13	11.6
Struck/Crush (sport)	917.0	44	39.3
Overexertion/strenuous movements*	927.0	21	19.6
<b>TOTAL</b>	<b>-</b>	<b>112</b>	<b>100.0</b>

*Note: these may include cases from other sport activities*

Table 8 shows the age and gender breakdown of hospital admissions by cause (mechanism) of injury. 'Being struck or crushed during sport' was the major cause of the sport and active recreation injury in adults, but not in children. This difference is partly explained by the fact that children often participate in modified (non-contact) sports where the risk of being struck is reduced. Conversely, adult males often participate in contact sports, such as the football codes, where the risk of struck/crush injury is higher.

Bicycling was associated with the highest proportion of sport and active recreation injuries in children, accounting for 47% of all injuries to children. This finding probably reflects the popularity of bicycling among children, as a means of transport and a recreational activity. 'Falls in sport' were a more prominent cause of injury in children than in adults. This may be explained by children's less developed sports skills and their increased risk of sustaining fractures during the phases of their active bone growth and development. By contrast, 'overexertion and strenuous movements' were more likely to be associated with adult injury and may be related to overuse and the high physical demands of some adult sports. Horse riding was a significant cause of injury in young females, but not in young males, reflecting the higher participation of young girls in this activity.

**Table 8: Age and gender of sport and active recreation injury: VIMD hospital admissions, Latrobe Valley residents (n=112)**

E-code groups	Male		Female		Total	
	5-14 years (n=27) %	15+ years (n=51) %	5-14 years (n=14) %	15+ years (n=20) %	5-14 years (n=41) %	15+ years (n=71) %
Animal riding	-	5.9	14.3	30.0	4.9	12.7
Pedal cycling	48.1	3.9	42.9	5.0	46.3	4.2
Diving	-	2.0	-	-	-	1.4
Fall on same level (sport)	18.5	5.9	21.5	10.0	19.5	7.0
Struck/crush (sport)	33.4	60.8	14.3	10.0	26.9	46.5
Overexertion/strenuous movements	-	21.5	7.1	45.0	2.4	28.2
<b>TOTAL</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Approximately one-half (49%) of all hospitalised sports and active recreation injury cases occurred in a place for sport and recreation (Table 9). A high proportion of injury caused by falls in sport (54%), struck/crush in sport (77%) and over-exertion and strenuous movements, and the single diving injury, occurred in this setting. Public buildings were the location of more than one-third (39%) of injury cases resulting from falls in sport. Streets and highways were the most frequent location of pedal cycling injury (59%) and a significant proportion of animal riding injury (18%).

**Table 9: Location of sport and active recreation injury: VIMD hospital admissions, Latrobe Valley residents (n=112)**

Place of injury	Animal riding (n=11) %	Pedal cycling (n=22) %	Diving (n=1) %	Fall on same level (sport) (n=13) %	Struck/Crush (sport) (n=44) %	Overexertion/strenuous movements (n=21) %	All cases (n=112) %
Home	9.1	4.5	-	7.7	11.3	14.2	9.8
Farm	9.1	-	-	-	-	4.8	1.8
Place for sport and recreation	-	-	100.0	53.8	77.3	61.9	49.1
Street & highway	18.2	59.1	-	-	-	4.8	14.3
Public building	-	4.5	-	38.5	6.8	-	8.0
Residential institution	-	4.6	-	-	2.3	-	1.8
Other specified place	36.3	4.6	-	-	-	4.8	5.4
Unspecified/missing	27.3	22.7	-	-	2.3	9.5	9.8
<b>TOTAL</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

One measure of the severity of injury in hospitalised sport and active recreation cases is the length of stay in hospital (Table 10). Eighty-five percent of all sport and active recreation hospital admissions were for less than two days indicating that most of the injuries sustained were at the less serious end of the injury severity scale. However, a significant proportion of animal riders (18%) and pedal cyclists (18%) required a hospital stay of between 2 and 30

days, indicating the comparatively serious nature of injuries in these groups. A small proportion of injured cyclists (5%) were in hospital for 31 days or more.

**Table 10: Length of stay in hospital for the sport and active recreation injury: VIMD hospital admissions, Latrobe Valley residents (n=112)**

Place of injury	Animal riding (n=11) %	Pedal cycling (n=22) %	Diving (n=1) %	Fall on same level (sport) (n=13) %	Struck/ Crush (sport) (n=44) %	Overexertion/ strenuous movements (n=21) %	All cases (n=112) %
< 2days	81.8	77.3	100.0	92.3	90.9	76.2	84.9
2-7 days	9.1	9.1	-	0.7	6.8	23.8	10.6
8-30 days	9.1	9.1	-	-	2.3	-	3.5
31+ days	-	4.5	-	-	-	-	1.0
<b>TOTAL</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

### 5.1.2 Nature of injuries and body site injured: child hospital admissions (n=41)

Thirty-seven percent of hospital admissions for sport and recreation injury were children aged 4-15 years. Table 11 shows the nature of their injuries. More than one-half (54%) of sport and active recreation injuries in children were fractures. They accounted for a large proportion of child admissions for 'falls on the same level in sports' injury (88%), pedal cycling injury (42%), struck/crushed injury (36%) and the single over-exertion and strenuous movement case. Intracranial injuries (15% of child sport and active recreation injuries) and open wounds (12%) were also relatively common injuries in children. Over one-third (36%) of struck/crush admissions were for intracranial injuries. Open wounds were common among child admissions for pedal cycling injuries (21%).

**Table 11: Nature of injuries in child sport and active recreation: VIMD hospital admissions, Latrobe Valley residents (n=41)**

Nature of injury	Animal riding (n=2) %	Pedal cycling (n=19) %	Fall on same level (sport) (n=8) %	Struck/ Crush (sport) (n=11) %	Overexertion/ strenuous movements (n=1) %	All cases (n=41) %
Fractures	100	42.1	87.5	36.4	100.0	53.7
Dislocations	-	-	12.5	-	-	2.4
Sprains/strains	-	-	-	-	-	-
Intracranial (not skull fracture)	-	10.5	-	36.4	-	14.6
Internal (chest, pelvis, abdomen)	-	5.3	-	-	-	2.4
Open wound	-	21.0	-	9.1	-	12.2
Bruises, haematomas, crushing	-	5.3	-	9.1	-	4.9
Burns	-	10.5	-	-	-	4.9
Other injuries	-	5.3	-	9.1	-	4.9
<b>TOTAL</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

The body sites injured in hospitalised children are summarised in Table 12. Both animal riding injuries were fractures to the upper extremities. Pedal cycling injuries were predominantly to the upper and lower extremities (mostly fractures) and to the head and face. Injuries from falls in sport were all fractures (88%) or dislocations (12%) to the upper and lower extremities. Head and face injuries predominated in the struck/crush in sport injury group, accounting for 64% of their injuries. Thirty-six percent of the struck/crushed group sustained fractures to the face, upper and lower extremities. The single case in the overexertion/strenuous movement group was a fracture to the upper extremity.

**Table 12: Body site injured in child sport and active recreation: VIMD hospital admissions, Latrobe Valley residents (n=41)**

Body region injured	Animal riding (n=12) %	Pedal cycling (n=19) %	Fall on same level (sport) (n=8) %	Struck/ Crush (sport) (n=11) %	Overexertion/ strenuous movements (n=1) %	All cases (n=41) %
Head	-	15.8	-	36.4	100.0	17.1
Face, excluding eye	-	21.0	-	27.3	-	17.1
Neck	-	-	-	-	-	-
Chest	-	-	-	-	-	-
Abdomen/pelvis	-	5.3	-	-	-	2.4
Spine/back	-	-	-	-	-	-
Upper extremity	100.0	21.0	75	18.2	100.0	36.6
Lower extremity	-	31.6	25	9.1	-	21.9
Other/unspecified	-	5.3	-	9.1	-	4.9
<b>TOTAL</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

### 5.1.3 Nature of injuries and body site injured: adult hospital admissions (n=71)

Table 13 describes the nature of adult sport and active recreation injury hospital admissions. The most common sport and active recreation injury in adults was a fracture (39%). Fractures accounted for approximately one-third to one-half of injuries in all causal groups, except animal riding and diving. Intracranial injuries were prominent in the struck/crush and animal riding groups, and accounted for the single case of diving injury. Dislocations featured as a prominent injury in the falls in sport and over-exertion/strenuous movements group.

**Table 13: Nature of injury in adult sport and active recreation: VIMD hospital admissions, Latrobe Valley residents (n=71)**

Nature of injury	Animal riding (n=9) %	Pedal cycling (n=3) %	Diving (n=1) %	Fall on same level (sport) (n=5) %	Struck/ Crush (sport) (n=33) %	Overexertion/ strenuous movements (n=20) %	All cases (n=71) %
Fractures	11.1	33.3	-	40.0	54.6	30.0	39.4
Dislocations	11.1	-	-	40.0	3.0	30.0	14.1
Sprains/Strains	-	-	-	-	-	35.0	9.9
Intracranial (not skull fracture)	22.2	-	100.0	-	33.3	-	19.7
Internal (chest abdomen/pelvis)	11.1	-	-	20.0	3.0	-	4.2
Open wound	11.1	-	-	-	3.0	-	2.8
Bruises, haematomas, crushing	11.1	-	-	-	3.0	-	2.8
Burns	-	-	-	-	-	-	-
Other injuries	22.2	66.6	-	-	-	5.0	7.1
<b>TOTAL</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Table 14 describes the body sites injuries in adult sport and active recreation hospital admissions. Animal riding injuries were mostly fractures and dislocations to the upper extremities (33% of adult injuries) and head injuries (33%). Eighty percent of falls in sport comprised fractures and dislocations to the upper and lower extremities. Struck/crush injuries in sport mainly involved fractures to the upper and lower extremities (36%) and head injuries, including concussion (33%). Over-exertion injuries were evenly divided between sprains and strains to the lower extremity (30%), fractures to the upper and lower extremities (30%) and dislocation to the upper and lower extremities (30%).

**Table 14: Body sites injured in adult sport and active recreation: VIMD hospital admissions, Latrobe Valley residents (n=71)**

Body region injured	Animal riding (n=9) %	Pedal cycling (n=3) %	Diving (n=1) %	Fall on same level (sport) (n=5) %	Struck/ Crush (sport) (n=33) %	Overexertion/ strenuous movements (n=20) %	All cases (n=71) %
Head	33.3	-	100.0	-	33.3	-	21.1
Face, excluding eye	-	-	-	-	12.1	-	5.6
Neck	-	-	-	-	3.0	-	1.4
Chest	-	-	-	-	3.0	-	1.4
Abdomen/pelvis	22.2	-	-	20.0	6.1	-	7.1
Spine/back	-	-	-	-	-	5.0	1.4
Upper extremity	33.3	33.3	-	60.0	27.3	30.0	31.0
Lower extremity	-	-	-	20.0	15.2	60.0	25.4
Other/unspecified	11.1	66.6	-	-	-	5.0	5.6
<b>TOTAL</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

## **5.2 EMERGENCY DEPARTMENT PRESENTATIONS**

The Victorian Injury Surveillance System (VISS) recorded 994 sport and active recreation injury presentations (admissions and non-admissions) to the emergency departments (EDs) of the combined campuses of the Latrobe Regional Hospital (Traralgon and Moe) in the 12 month period 7/11/94 to 6/11/95. In addition, there were 185 bicycling presentations. Together these cases (n=1,179) represented 18% of the 6,683 ED presentations for all injury causes recorded in this region over the same period. The bicycling presentations are analysed separately in section 5.2.4.

### **5.2.1 Frequency and pattern of injury: all ages (n=994)**

Seventy-one percent of the sport and active recreation ED presentations were males. The predominant age groups for injury were 10-14 years (28% of all sport and active recreation injury ED presentations), 15-19 years (21%) and 20-24 years (17%).

Almost one-third of injury presentations (32%) occurred on Saturdays. The peak period for presentations was March to the end of May (accounting for one-third of presentations).

Sixty-five percent of sport and active recreation injury occurred at areas for organised sport, a further 11% occurred at school, 9% at residential locations, 7% at parks and 6% in area of transport. Eighty-two percent of cases were undertaking organised sporting competition or practice when the injury occurred, the rest were involved in informal play or active recreation.

The sports and active recreation activities with the highest frequencies of hospital emergency department presentations are shown in Table 15. Australian football and basketball accounted for 45% of all sport and active recreation hospital emergency department presentations. The number of presentations for Australian football injuries was 1.7 times higher than any other sport. The five highest-ranked sport and active recreation activities, in terms of emergency department injury presentations, were all team-based ball sports.

**Table 15: Sport and active recreation activities associated with VISS emergency department presentations: Latrobe Valley residents (n=994)**

	Frequency	Proportion of all cases %	Admission rate %
Australian football	283	28.5	5
Basketball	163	16.4	4
Netball	81	8.2	2
Cricket	75	7.6	4
Soccer	64	6.4	14
Horseback riding	56	5.6	14
Roller skating/blading	52	5.2	8
Trampolining	39	3.9	15
Rugby	31	3.1	16
Swimming	23	2.3	9
Baseball	18	1.8	17
Tennis	18	1.8	11
Field Hockey	16	1.6	0
Skateboarding	11	1.1	0
Squash	11	1.1	0
Martial arts	7	0.7	0
Physical education	7	0.7	14
Ball sports NS	6	0.6	17
Badminton	4	0.4	0
Gymnastics	4	0.4	25
Snow skiing	4	0.4	25
Track and field	3	0.3	33
Other	18	1.8	4
<b>TOTAL</b>	<b>994</b>	<b>100.0</b>	<b>7 (average)</b>

The most common injury events leading to ED presentations were: over-exertion (61% of all adult presentations), falls, slips and trips (23%), and collisions with another player (9%).

The major causes (mechanisms) of injury were: the player hitting against a stationary object, including falls to the ground (43%); being struck by a moving object (35%); strains or over-exertions (12%); and collisions with another player (7%). Six cases of injury were possibly intentionally inflicted.

Up to 3 separate injuries could be recorded for each case. Injuries were mostly to the upper limbs (39% of all injuries). The most frequently occurring injuries were ankle sprains/strains (9% of all injuries), knee sprains/strains (4%); fractures of the radius/ulna (4%); face scalp lacerations (4%); and finger fractures (3%).

The hospital admission rate is defined as the proportion of all emergency presentations that result in admission to hospital for further treatment. The admission rate for adult sport and active recreation injury ED presentations was 7%. More than one-half (53%) of injury presentations required significant treatments including review or referral, most often to a general practitioner (26%), a review in the emergency department (18%) or another referral (9%). Another 35% of cases required only minor treatment and 6% required no treatment. The admission rates for all sport and active recreation activities in which injuries occurred are shown in Table 15. The four sports with the highest frequencies of injury presentations (Australian football, basketball, netball and cricket) had below average hospital admission

rates. By contrast, eleven sports had injury admissions rates that were at least twice the average admission rate.

### 5.2.2 Child hospital emergency department presentations (n=358)

Sixty percent of child ED presentations for sport and active recreation injuries were males. More than three-quarters of child presentations were aged 10-14 years.

Twenty-eight percent of injury ED presentations occurred on Saturdays. A large proportion of cases (42%) presented in the period March through to the end of June.

Forty-eight percent of child active sport and recreation injury occurred at areas for organised sport, a further 21% occurred at school, 19% at residential locations, 11% in area of transport and 6% at parks. Fifty-seven percent of ED presentations were undertaking organised sporting competition or practice when the injury occurred, another 22% were playing, the remainder were involved in informal sport or active recreation.

The sports and active recreation activities most associated with injury are shown in Table 16. Basketball and Australian football together accounted for 39% of sport and active recreation injury presentations. Roller skating and rollerblading, trampolining and netball also contributed significant proportions of injury cases.

Table 16 shows that the average admission rate for child sport and active recreation injury cases presenting to hospital EDs was 10% (3% higher than the admission rate for adults). The admission rates for soccer (29%), gymnastics (25%), baseball (22%) and rugby (20%) were twice the average or more. Another 50% of child ED presentations required significant treatments, including, review or referral, most often to a general practitioner (25%), a review in the emergency department (16%) or another referral (7%). A further 34% of child presentations required only minor treatment and 6% required no treatment.

**Table 16: Sport and active recreation activities associated with VISS child emergency department presentations: Latrobe Valley residents (n=358)**

	Frequency	Proportion of all cases %	Admission rate %
Basketball	73	20.4	7
Australian football	66	18.4	5
Roller skating/blading	42	11.7	10
Trampolining	38	10.6	16
Netball	29	8.1	7
Soccer	17	4.8	29
Horseback riding	15	4.2	13
Cricket	13	3.6	15
Swimming	10	2.8	0
Skateboarding	10	2.8	0
Baseball	9	2.5	22
Rugby	5	1.4	20
Tennis	5	1.4	0
Field Hockey	5	1.4	0
Ball sports NS	5	1.4	20
Gymnastics	4	1.4	25
Other	12	3.4	6
<b>TOTAL</b>	<b>358</b>	<b>100.0</b>	<b>10 (average)</b>

The most common events leading to injury were over-exertion (48% of all sport and active recreation child ED presentations), falls, slips and trips (37%), and collision with another player (6%).

The most common causes (mechanisms) of injury were the player hitting against a stationary object, including falls to the ground (56%), being struck by a moving object (31%), strains and over-exertions (6%) and collisions with other players (4%).

Up to 3 separate injuries may be recorded for each case. Almost one-half of injuries were to the upper limbs including fractures of the radius/ulna (9% of all injuries), sprain/strain of the finger (4%), sprain/strain of the wrist (3%) and finger fractures (3%). Other common injuries included ankle sprains/strains (6% of injuries), knee sprains/strains (3%), face and scalp lacerations (3%) and lacerations to the jaw and /or lip (3%).

### **5.2.3 Adult hospital emergency department presentations (n=636)**

Seventy-eight percent of adult ED presentations for sport and active recreation injury were male. The most common age groups for injury were 15-19 years (33%), 20-24 years (27%) and 25-29 years (16%).

More than one-third of injury presentations (34%) occurred on Saturdays. Forty-six percent occurred in the period March through to the end of June.

Seventy-eight percent of injury occurred at areas for organised sport, 7% at parks, 4% at residential locations and 3% in areas of transport. Eighty-three percent of injury cases were undertaking organised sporting competition or practice when the injury occurred, the remaining cases were involved in informal play or active recreation.

The sports and active recreation activities associated with injuries are shown in Table 17. Australian rules was associated with approximately one-third (34%) of all adult injury ED presentations. Basketball (14%), cricket (10%), netball (7%), soccer (7%) and horse-back riding (7%) also contributed sizeable proportions of ED presentations.

**Table 17: Sport and active recreation activities associated with adult VISS emergency department presentation, Latrobe Valley residents (n=636)**

	Frequency	Proportion of all cases %	Admission rate %
Australian football	217	34.1	6
Basketball	90	14.2	1
Netball	52	8.2	0
Cricket	62	9.8	2
Soccer	47	7.4	9
Horseback riding	41	6.5	15
Roller skating/blading	10	1.6	0
Rugby	26	4.1	15
Swimming	12	1.9	0
Baseball	9	1.4	11
Tennis	13	2.0	15
Field Hockey	11	1.7	0
Squash	11	1.7	0
Martial arts	6	0.9	0
Physical education	5	0.8	20
Badminton	3	0.5	0
Snow skiing	3	0.5	33
Other	18	2.8	6
<b>TOTAL</b>	<b>636</b>	<b>100.0</b>	<b>5 (average)</b>

The average admission rate for adult sport and active recreation ED presentations was 5% (Table 17). Snow skiing (33%), physical educations (20%), horse riding (15%), rugby (15%) and tennis (15%) had much higher than average admission rates (Table 17). More than one-half of the ED presentations required significant treatments, including, review or referral, most often to a general practitioner (26%), a review in the emergency department (19%) and another referral (8%). A further 35% of presentations required only minor treatment and 5% required no treatment.

The most common events leading to injury were over-exertion (68% of adult presentations), falls, slips or trips (15%), collision with another player (10%) and ejection from a moving object (5%). The most common causes (mechanisms) of injury were the player being struck by a moving object (37%), hitting against a stationary object – including falls to the ground (36%), strains or over-exertions (15%) or collisions with other players (9%). Four cases of injury were possibly intentionally inflicted.

Injuries were predominantly to the lower limbs (36% of injuries), particularly ankle sprains/strains (19%) and knee sprains/strains (5%). Other injuries included face and scalp lacerations (5%), shoulder sprain/strain (3%), finger fractures (2%), finger dislocations (2%) and lacerations to the jaw and lip (2%).

#### **5.2.4 Injuries to bicyclists (n=185)**

In addition to the sport and active recreation injuries described in Section 5.2.1 to 5.2.3, bicycling injuries were extracted from the VISS database separately. There were 126 child and 59 adult bicycling injury cases among Latrobe Valley residents over the 12-month study period. Bicycling, therefore, ranked second behind Australian football in terms of ED presentation for sport and active recreation injury.

### *Child cyclists (n=126)*

Seventy-seven percent of child bicycling ED presentations were male and 56% of all injured child bicyclists were aged 10-14 years. Presentations were more common in the summer months (accounting for 39% of bicycling presentations). The most frequent location of injury were: public roadways (52% of total), home – own or other (19%), footpaths (11%), parks (7%) and schools (4%).

ED presentations for child bicycling injury were caused by loss of control of bicycle (70%), collision (11%), over-exertion (6%) and caught or snagged by an object (3%).

The hospital admission rate for child presentations was 14%. A further one-third of cases were referred to a general practitioner, 29% required only minor treatment, 11% were reviewed in the emergency department and 6% required no treatment. It was noted that 48% of cases were wearing bike helmets but there was no information on whether the helmet was correctly worn or the extent to which it was protective.

The upper extremities and head/face were the most frequently injured body sites, accounting for 38% and 32% of all injuries, respectively. The most frequently occurring injuries were face and scalp lacerations (9%), knee lacerations (7%) radius/ulna fractures (5%) and concussion (3%).

### *Adult cyclists (n=57)*

Eighty-eight percent of adult bicycling ED presentations were male. Sixty-three percent of injured adult bicyclists were aged 15-25 years. Thirty-nine percent of injuries occurred in the months of January and February. The most common location of injury were public roadways (60% of all adult cases), home – own and other (16%), parks (9%), footpaths (7%) and parking areas (4%).

The major causes (mechanisms) of bicycling ED presentations were loss or control of bicycle (57%), collision (23%), malfunction of bicycle (9%), caught or snagged by an object (5%) and over-exertion (5%).

The admission rate for adult bicycle injury presentations was 2%. Sixty percent of adult bicycling injury cases required significant treatments including referral to a general practitioner (26% of all adult bicycling cases), review in the emergency department (19%), and other referral (14%). Of the remainder, 33% required only minor treatment and 5% required no treatment. In one-half of cases the use of safety equipment, mostly bike helmets, was noted.

The most common types of injuries sustained were face and scalp lacerations (9% of all adult bicycling injuries), face and scalp abrasions (5%), clavicle fractures (4%) and hand lacerations (4%).

## **5.3 GENERAL PRACTICE PRESENTATIONS**

The Extended Latrobe Valley Injury Surveillance (ELVIS) project collected detailed injury data for a defined geographic region from a high proportion of GPs for a full 12-month period (7/11/94 to 6/11/95). The ELVIS project collected data on 77% of all injury cases. There were 5,995 injuries for all causes recorded in the 12-month period (Day et al., 1997).

Both ISIS codes and E-codes were used to classify injury data in the ELVIS project. For comparison purposes only, sport and active recreation injury cases were selected using the

two methods of coding. First, injury data were extracted using ICD9 E-codes (as were used to select hospital admissions data). This method of case selection yielded 1,146 cases. Details of the injury data extracted by E-codes are shown in Table 18.

**Table 18: Causes of ELVIS General Practitioner presentations for sport and active recreation injury: Latrobe Valley residents (n=1,146)**

E-code group	E-codes	Number of GP injury presentations with this E-code
Animal riding	(810.5, 811.5, ..., 825.5) (826.2, 827.2, ..., 829.2)	20
Pedal cycling	(800.3, 801.3, ..., 807.3) (810.6, 811.6, ..., 825.6) (826.1, 827.1, ..., 829.1)	133
Water skiing	(830.4, 831.4, ..., 838.4) (910.0)	2
Swimming	(830.5, 831.5, ..., 838.5)	0
Diving	(883.0, 910.1, 910.2)	9
Fall on same level (sport)	886.0	44
Struck/Crush (sport)	917.0	380
Overexertion/strenuous movements	927.0	558
<b>TOTAL</b>	-	<b>1 146</b>

However, as stated earlier, E-code data are limited because they cannot identify specific sporting activities. For this reason, sport and active recreation injuries were also selected using the ISIS *context/activity* and *factor code* variables in the ELVIS system. This method identified 1,003 cases of sport and active recreation injury attending general practitioners. Because more information can be gained from ISIS coding, the smaller dataset of sport and active recreation injury cases (selected on ISIS codes) was subjected to detailed analysis.

The age and gender profile of the sport and active recreation injury cases presenting to GPs is shown in Table 19. The majority of presentations were male (67%). Forty-six percent of the cases were aged under 15 years.

Table 20 shows that Australian football was the most common sport and active recreation activity associated with injuries presenting to GPs, contributing 22% of all presentations. Basketball was also associated with a sizeable proportion of injuries requiring GP consultation, as were bicycling, netball, soccer and cricket.

**Table 19: Age and gender distribution of ELVIS sport and General Practitioner sport and active recreation injury presentations (n=1,003)**

Age Group	Gender				Total	
	Male		Female		n	%
	n	%	n	%		
< 15 yrs	305	45.3	155	46.9	460	45.9
15+ yrs	368	54.3	175	53.1	543	54.1
<b>TOTAL</b>	<b>673</b>	<b>100.0</b>	<b>330</b>	<b>100.0</b>	<b>1 003</b>	<b>100.0</b>

**Table 20: Sport and active recreation activities associated with ELVIS General Practitioner presentations: Latrobe Valley residents (n=1,003)**

Sporting Activities	N	%
Football	221	22.0
Basketball	176	17.5
Bicycle	126	12.6
Netball	67	6.7
Soccer	59	5.9
Cricket	55	5.5
Baseball	32	3.2
Physical education	28	2.8
Horseback riding	26	2.6
Tennis	23	2.3
Rollerskating/blading	22	2.2
Trampoline	21	2.1
Rugby	19	1.9
Other specified	15	1.5
Swimming/diving	14	1.4
Martial arts	14	1.4
Ball sports NS	11	1.1
Volleyball	10	1.0
Squash	9	0.9
Golf	7	0.7
Weightlifting	7	0.7
Other	41	4.0
<b>TOTAL</b>	<b>1 003</b>	<b>100.0</b>

The most common types of injury reported to GPs were sprains/strains (39%), bruising (23%), fractures (11%) and inflammation (8%) (Table 21). Sprain/strains were mostly to the lower extremity, while bruising was commonly to the head and face. Fractures were most frequently to the upper extremity. The trunk sustained the majority of injuries resulting in inflammation. Overall, the lower and upper extremities were the most frequently injured body sites (39% and 38% respectively), followed by the head and face (12%) and trunk (10%) (Table 22).

The high frequency of fractures treated in General Practice is noteworthy since it is often assumed that injuries of this severity generally present to hospital emergency departments.

**Table 21: Nature of injuries presenting to ELVIS General Practitioners: Latrobe Valley residents (n=1,003)**

	<b>Frequency n</b>	<b>Proportion %</b>
Sprain/strain	389	38.8
Bruising	231	23.0
Fracture	114	11.4
Inflammation	80	8.0
Laceration	70	7.0
Abrasion	46	4.6
Dislocation	15	1.5
No injury	11	1.1
Bite	9	0.9
Concussion	8	0.8
Other wound	6	0.6
Crushing injury	6	0.6
Puncture	5	0.5
Haemorrhage	5	0.5
Foreign body	5	0.5
Penetrating wound	1	0.1
Burn, partial thickness	1	0.1
Dental injury	1	0.1
<b>TOTAL</b>	<b>1 003</b>	<b>100.0</b>

**Table 22: Body regions injured in cases presenting to ELVIS General Practitioners: Latrobe Valley residents (n=1,003)**

	<b>Frequency n</b>	<b>Proportion %</b>
Lower Extremity	394	39.3
Upper Extremity	385	38.4
Head & Face	118	11.7
Trunk	84	8.4
Other	22	2.2
<b>TOTAL</b>	<b>1 003</b>	<b>100.0</b>

Table 23 describes the event, circumstance or condition associated with the occurrence of the injury, poisoning or violence. The most common circumstances leading to an injury were ‘being in a dangerous position’ (37%), over-exertion (31%), falls (13%) and loss of control (6%). ‘Being in a dangerous position’ and over-exertion injuries were more frequently reported in people aged 15 and over, while falls and ‘loss of control’ were more common among those age less than 15 years.

**Table 23: Circumstances leading to injury, ELVIS General Practitioner presentations: Latrobe Valley residents (n=1 003)**

	Age Groups				Total	
	5-14 yrs		15+ yrs		n	%
	n	%	n	%		
Dangerous position	166	36.1	201	37.1	367	36.6
Over-exerted	108	23.5	201	37.1	310	30.9
Fall: other	73	15.9	51	9.4	125	12.5
Lost control	39	8.5	20	3.7	59	5.9
Collision	25	5.4	19	3.5	44	4.4
Slipped	17	3.7	17	3.1	34	3.4
Tripped	17	3.7	16	3.0	33	3.3
Other specified	9	2.0	9	1.7	18	1.8
Aggression, fight	1	0.2	4	0.7	5	0.5
Caught in, snagged by	3	0.7	2	0.3	5	0.5
Practical joke	2	0.4	1	0.2	3	0.3
Missing cases	1	0.3	1	0.2	-	-
<b>TOTAL</b>	<b>461</b>	<b>100.0</b>	<b>542</b>	<b>100.0</b>	<b>1 003</b>	<b>100.0</b>

Table 24 illustrates the mechanisms of injury presenting to GPs. The most frequently reported causes (mechanisms) of injury was victim hitting an object (39%, predominantly hard surfaces eg. concrete and bitumen), object hitting a victim (28%, mostly a ball or another player's foot, elbow or knee) and strain/over-exertion (26%). 'Victim hitting an object' accounted for 47% of the injuries sustained in the 5-14 years age group and for 31% of injuries in the 15 years and above age group. Strain/over-exertion and object hitting a victim were also common mechanisms of injury, particularly in those aged 15 years or above (accounting for 33% and 28% of injuries in this age group, respectively).

**Table 24: Mechanism of injury, ELVIS General Practitioner presentations: Latrobe Valley residents (n=1,003)**

Mechanism	Age Groups				Total	
	5-14 yrs		15+ yrs		N	%
	n	%	n	%		
Victim hit object	217	47.2	168	31.1	386	38.5
Object hit victim	131	28.5	149	27.5	280	27.9
Strain/overexertion	79	17.2	178	32.9	258	25.7
Collision	14	3.0	24	4.4	38	3.8
Grazed/lacerated	7	1.5	9	1.7	16	1.6
Caught in or between	7	1.5	6	1.1	13	1.3
Chemical	4	0.9	3	0.6	7	0.7
Bitten	1	0.2	2	0.4	3	0.3
Other mechanical	0	0	1	0.1	1	0.1
Radiation	0	0	1	0.1	1	0.1
Missing cases	1	0.2	1	0.1		
<b>TOTAL</b>	<b>461</b>	<b>100.0</b>	<b>542</b>	<b>100.0</b>	<b>1 003</b>	<b>100.0</b>

'Places for organised sport' was the setting where almost half (46%) of the injuries presenting to GPs occurred (Table 25). Educational settings (for example, schools), transport areas and the home were also common locations for injury (22%, 12% and 7% respectively), especially in the younger age groups (under 15 year-olds).

**Table 25: Places where the sport and active recreation injury occurred, ELVIS  
General Practitioner presentations: Latrobe Valley residents (n=1 003)**

Mechanism	Age Groups				Total	
	5-14 yrs		15+ yrs		n	%
	n	%	n	%		
Organised sport	125	27.2	361	66.7	486	48.5
Educational	168	36.5	52	9.6	220	21.9
Transport areas	79	17.2	40	7.4	119	11.9
Home	47	10.2	23	4.3	70	7.0
Outdoor land: Recreation	6	1.3	19	3.5	25	2.5
Commerce areas	8	1.7	3	0.6	11	1.1
Farm	1	0.2	4	0.7	5	0.5
Public playgrounds	4	0.9	0	0.0	4	0.4
Production areas	0	0.0	2	0.4	2	0.2
Outdoor water: Recreation	6	1.3	4	0.7	10	1.0
Unknown	16	3.5	33	6.1	49	4.8
Missing cases	1	0.0	1	0.0	2	0.2
<b>TOTAL</b>	<b>461</b>	<b>100.0</b>	<b>542</b>	<b>100.0</b>	<b>1 003</b>	<b>100.0</b>

The type of treatment required by the patients presenting to GPs is summarised in Table 26. Of all presentations, 42% of patients were treated without further referral, 21% were reviewed and investigated, 12% were reviewed but did not require an investigation and 18% required no treatment.

**Table 26: Type of treatment applied by General Practitioners**

	Age Groups				Total	
	5-14 yrs		15+ yrs		n	%
	n	%	n	%		
Treated: no referral	202	43.8	217	40.0	419	41.8
Review investigation	96	20.8	110	20.2	206	20.5
No treatment	86	18.7	89	16.4	176	17.5
Review no investigation	56	12.2	62	11.5	119	11.9
Specialist	12	2.6	25	4.6	37	3.7
Other referral	3	0.7	28	5.2	31	3.1
Unknown	4	0.9	9	1.7	13	1.3
Emergency department	1	0.2	1	0.2	2	0.2
Missing data	1	0.2	1	0.2		
<b>TOTAL</b>	<b>461</b>	<b>100.0</b>	<b>542</b>	<b>100.0</b>	<b>1 003</b>	<b>100.0</b>

## 5.4 SUMMARY AND INJURY PYRAMID

Table 27 compares the sport and active recreation activities that were most associated with emergency department and general practitioner presentations in the Latrobe Valley. The same set of sport and recreation activities ranked highly in both settings. Australian football accounted for the highest number of injury cases presenting to both EDs and GPs (29% and 22% respectively). Basketball, bicycling, netball, cricket and soccer were associated with significant (and similar) proportions of injury cases in both settings.

**Table 27: Comparison of the sport and active recreation activities most commonly associated with VISS emergency department and ELVIS General Practitioner presentations for injury in Latrobe Valley residents.**

<b>EMERGENCY DEPT (n=994)</b>		<b>GP VISITS (n=1 003)</b>	
<b>ACTIVITY</b>	<b>%</b>	<b>ACTIVITY</b>	<b>%</b>
Australian football	29	Australian football	22
Bicycling	19	Basketball	18
Basketball	16	Bicycling	13
Netball	8	Netball	7
Cricket	8	Soccer	6
Soccer	6	Cricket	6
Horse riding	4	Baseball	3
Rugby	3	School Physical Education	3
Tennis	1	Horse riding	3
Swimming	1	Tennis	2

One measure of the severity of the injuries treated in the various medical settings, is their status at discharge or disposal. These data are shown in Table 28 for the VIMD hospital admissions, VEMD hospital ED presentations and ELVIS GP consultations described in this chapter.

**Table 28: Discharge/disposal status of the medically treated sports injury cases: Latrobe Valley residents**

<b>Data Source</b>	<b>Sent to an emergency department</b>	<b>Admitted to hospital</b>	<b>Dead on arrival or death</b>	<b>Other (included discharge to home)</b>	<b>Total</b>
ELVIS	2	0	0	999	1001
VISS	N/A	69	0	925	994
VIMD	0	0	0	112	112
<b>TOTAL</b>	<b>2</b>	<b>69</b>	<b>0</b>	<b>2 036</b>	<b>2 107</b>

Two cases presenting to GPs were referred to an emergency department. No GP presentations were directly admitted to hospital. Sixty-nine of the emergency department presentations were subsequently admitted to hospital.

Using the injury data in Table 28 and the 1995 ABS census data to derive population denominators for the Latrobe Valley study region, a sports injury pyramid for medically treated injury was constructed (Table 29). Over a given twelve-month period, for each 1,000 head of population in the Latrobe Valley, it can be expected that two people will be admitted to hospital for treatment of sport and active recreation injuries, 17 will present at an emergency department and 19 people will present to a GP ('rounded' figures). The ratio of hospital admission to emergency department presentations to general practice consultations for sport and active recreation injuries in the Latrobe Valley region is 1:10:12.

**Table 29: Sports injury pyramid: Latrobe Valley**

<b>SOURCE OF TREATMENT</b>	<b>RATE PER 1000 POPULATION</b>	<b>RATIO</b>
Hospital admissions (VIMD)	2	1
Emergency dept visit (VISS)	17	10
GP visit (ELVIS)	19	12



## 6. COMMUNITY TELEPHONE SURVEY OF PARTICIPATION AND INJURIES

### 6.1 PROFILE OF THE SURVEYED HOUSEHOLDS

Table 30 provides data pertaining to the households participating in the telephone survey. Of the 416 households surveyed, the most frequently contacted household size was a 2-person household (35.4%), followed by a >4 person household (27.8%), 1 person household (21.2%) and, lastly, a 3 person households (15.6%).

In total, information was obtained on 1,084 household members amongst whom 47.9% were male and 51.5% were female. The ages of the household members ranged from 5 to 80+ years.

**Table 30: Profile of the surveyed households**

	ALL SURVEYS COMBINED	DECEMBER 1995	MARCH 1996	JULY 1996	SEPTEMBER 1996
<i>Number of households</i>	416	104	104	104	104
% 1 person households	21.2	30.8	19.2	13.5	21.2
% 2 person households	35.4	28.8	30.8	42.3	39.4
% 3 person households	15.6	14.4	17.3	15.4	15.4
% >4 person households	27.8	26.0	32.7	28.8	24.0
<i>Number of household members</i>	1084	262	282	271	269
% male	47.8	48.5	47.8	45.4	47.6
% female	51.6	49.2	51.6	54.6	52.4
% gender unknown	0.6	2.3	0.6	-	-
% 5-9 years	8.2	6.5	8.2	10.0	8.6
% 10-14 years	11.1	10.7	11.1	8.9	11.9
% 15-19 years	8.8	6.1	8.8	9.2	8.6
% 20-24 years	8.1	10.7	8.1	7.4	7.1
% 25-29 years	5.7	5.7	5.7	7.0	3.7
% 30-34 years	8.1	9.2	8.1	10.3	5.9
% 35-39 years	9.1	9.2	9.1	8.1	11.9
% 40-49 years	14.4	11.1	14.4	14.4	14.9
% 50-59 years	11.0	12.3	11.0	11.1	10.4
% 60-69 years	7.9	8.8	7.9	7.8	7.5
% 70-79 years	4.8	5.0	4.8	4.4	6.3
% 80+ years	2.1	3.0	2.7	1.4	3.3
% unknown	0.6	1.9	0.6	-	-

*Source: Household telephone survey, Latrobe Valley study region*

## 6.2 PROFILE OF HOUSEHOLD MEMBERS AND PARTICIPATION RATE ESTIMATES

The age and gender profile of the surveyed population and the proportion of these groups that participated in active sport and recreation are presented in Table 31. Overall, 60.1% of the 1,084 Latrobe Valley household members surveyed participated in some form of sport and active recreation in the two weeks prior to the survey (48.1% of surveyed males and 51.9% of surveyed females). The proportion of active participants decreased as age increased from 19.6% in the 5-14 years age group to 10.6% in 65+ years age group (table 31)

**Table 31: Proportion of gender and age groups of surveyed population who participated in sport and active recreation activities**

	Proportion of surveyed population in gender and age groups (n=1,084)		Proportion of gender and age groups that participated in sport and active recreation (n=648)	
	n	%	N	%
Gender				
Males	518	48.2	332	61.4
Females	559	51.8	335	59.0
<b>Total</b>	<b>1077</b>	<b>100.0</b>	<b>657</b>	<b>60.2</b>
Age group				
5-14 years	209	19.4	189	90.4
15-24 years	183	17.0	133	72.7
25-34 years	150	13.9	70	46.7
35-44 years	177	16.4	106	59.9
45-54 years	137	12.7	59	43.1
55+ years	104	9.7	48	46.2
65+ years	117	10.9	42	35.9
<b>TOTAL</b>	<b>1077</b>	<b>100.0</b>	<b>648</b>	<b>60.2</b>

Source: Household telephone survey, Latrobe Valley study region

Note: 7 missing cases

Overall, the most popular sport and active recreation activity (adjusted for participation per 10,000 population) was brisk walking, which was more than three times more popular than any other activity (Table 32). Swimming, basketball and bikeriding also had comparatively high participation levels (Table 32). Basketball, Australian football and netball were the most popular team sports, while walking, swimming, bikeriding, golf, tennis and 10-pin bowling were the most popular individual-based sports and recreation activities (table 32). Playing on play equipment was the most popular activity in children, mostly 5-9 year olds (80.8%).

**Table 32: The 10 most popular sport and active recreation activities (per 10,000 population) in survey population**

<b>ACTIVITY</b>	<b>PARTICIPATION PER 10,000 POPULATION</b>
Walking	2315
Swimming	746
Basketball	712
Bike riding	710
Australian football	477
Play equipment	439
Golf	426
Tennis	407
Netball	389
10 pin bowls	259

*Based on household telephone survey reported activities with >20 participants*

### **6.3 INJURY RATES**

The survey also collected data on injuries that occurred to residents during participation in sport and active recreation. Thirty-four (5%) of the 648 residents who participated in some form of sport and recreation in the two weeks prior to the survey were injured in that time period.

As reported above, only 60% of Latrobe Valley residents participated in some form of sport and active recreation. In this situation, it is more accurate to calculate and compare injury rates using the number of participants in sport and active recreation as the denominator (i.e. rate per 1,000 participants), rather than the number of residents (which would include active and inactive residents).

Cricket had the highest injury rate per 1,000 participants, followed by horse riding and soccer (Table 33). The most common mechanisms (causes) of cricket injuries were being struck by an object (67%, mostly a cricket ball) and overuse/overexertion (33%). The resultant cricket injuries were bruising (50%) and inflammation, sprains and strains (50%). The three mechanisms of soccer injuries were collisions with persons/moving objects (33%), overuse and overexertion (33 %) and falls (33%). Bruising (66%) and strains (33%) were the most frequent soccer injuries. The injuries in netball were evenly divided between inflammation (50%) and sprains (50%). All the Australian football injuries were bruising.

It should be noted that the information on mechanisms and types of injury is based on data from a small sample of injury cases (n=34).

**Table 33: Sport and active recreation activities with highest rates of injury per 1,000 participants**

<b>ACTIVITY</b>	<b>INJURIES PER 1,000 PARTICIPANTS</b>
Cricket	242
Horse-riding	122
Soccer	107
Netball	51
Australian football	37
Basketball	37
10 pin bowls	36
Tennis	23
Walking	9

*Based on household telephone survey reported activities with >20 participants*

*Note: scaled up from a small but representative sample of injury cases*

## **6.4 INJURY IMPACTS**

Information on the impact of the sport and active recreation injuries on the injured participants was obtained. Injuries were classified into three groups according to the nature of impact:

- injuries that required treatment;
- injuries that affected the person's performance or participation in physical activity; and
- injuries that affected the person's activities of daily living.

These groups were not mutually exclusive. Of the 34 injuries reported (5% of all participants in sport and active recreation activities), 27% received some form of treatment, but only 6% of injury cases received treatment from a doctor. Thirty-six percent of the injured participants had their performance or participation affected and 35% had a disruption to their daily routine as a result of their injury. Some injuries affected all aspects, but others affected only one or two aspects. For example, some of the people with injuries that affected their performance or participation in sport did not receive treatment for these injuries. Table 34 summarises the sports activities most commonly associated with significant injuries (i.e. those requiring treatment or those that interfered with activities of daily living or participation in sport and active recreation).

Significant injuries accounted for 53% of all self-reported injuries, the remainder were inconsequential.

**Table 34: The sport and active recreation activities most commonly associated with significant injuries**

<b>ACTIVITY</b>	<b>SIGNIFICANT INJURIES PER 1,000 PARTICIPANTS*</b>
Cricket	83
Soccer	51
Basketball	26
Netball	24
Tennis	23
Australian football	19
Walking	8

*Based on household telephone survey reported activities with >20 participants  
Note: scaled up from a small but representative sample of injury cases*

#### **6.4.1 Injuries requiring treatment**

As stated above, 27% of all injured sport participants received some form of treatment. Of these:

- 33% self-treated their injury
- 22% received some form of medical treatment
- 45% sought treatment from another source such as a dentist, masseur, coach, first aider.

Table 35 shows that soccer was associated with the highest rate of injuries requiring treatment (51 treated injuries per 1000 participants). Cricket (41 treated injuries per 1000 participants) and netball (24 treated injuries per 1000 participants) also had comparatively high rates of injuries that required treatment.

**Table 35: The top 3 activities associated with injuries requiring treatment**

<b>ACTIVITY</b>	<b>INJURIES REQUIRING TREATMENT PER 1,000 PARTICIPANTS*</b>
Soccer	51
Cricket	41
Netball	24

*Based on household telephone survey reported activities with >20 participants  
Note: scaled up from a small but representative sample of injury cases*

#### **6.4.2 Injuries affecting normal daily routine**

As stated above, 35% of all injured sport and active recreation participants had their normal daily routine disrupted because of the injury.

Table 36 shows that cricket recorded the highest rate of injuries affecting normal living routines (83 injuries per 1000 participants). A substantial number of soccer injuries (51 injuries per 1000 participants) and basketball injuries (26 injuries per 1000 participants) also affected people's normal living routines. Comparison of the data in Tables 35 and 36 shows that even if injuries do not require treatment, they can have a significant impact on the injured participants.

**Table 36: The top 6 activities resulting in injuries affecting participant's normal routine**

<b>ACTIVITY</b>	<b>INJURIES affecting normal daily living PER 1,000 PARTICIPANTS*</b>
Cricket	83
Soccer	51
Basketball	26
Netball	24
Tennis	23
Walking	4

*Based on household telephone survey reported activities with >20 participants  
Note: scaled up from a small but representative sample of injury cases*

### 6.4.3 Injuries affecting performance/participation

As stated above, 36% of all injured participants in sport and active recreation had the performance or participation in their sport/physical activity affected.

Table 37 shows that soccer was associated with the highest rate of injuries affecting performance/participation (51 injuries per 1000 participants). A substantial number of injuries in cricket (41 injuries per 1000 participants) and basketball (26 injuries per 1000 participants) also affected performance/participation levels. Comparison of the data in Tables 36 and 37 shows that even if injuries do not require treatment, they can have a significant impact on performance /participation. Although some injuries affect normal daily routines, they may not always affect participation in the chosen sport and active recreation activity.

**Table 37: The top 6 activities resulting in injuries affecting performance/participation in sport and active recreation**

<b>ACTIVITY</b>	<b>INJURIES affecting performance or participation in sport/active recreation PER 1,000 PARTICIPANTS*</b>
Soccer	51
Cricket	41
Basketball	26
Netball	24
Tennis	23
Australian football	19
Walking	8

*Based on household telephone survey reported activities with >20 participants  
Note: scaled up from a small but representative sample of injury cases*

## 6.5 A REVISED SPORTS INJURY PYRAMID

Table 38 compares the participation levels of sport and active recreation activities to the ranking of injury associated with ED hospital emergency departments and GP presentations and self reports (ie. survey data). Although walking and swimming were reported to have the highest level of participation, Australian football, basketball and bike-riding recorded the highest number of injuries within the population. This indicates that the popularity of a sport may not necessarily influence the injury rate in that sport. Instead, the characteristics

of the sport, for example, the degree of physical contact allowed is likely to play a significant role in injury occurrence.

**Table 38: Rank of sport and active recreation injuries against participation ranking**

ACTIVITY	PARTICIPATION	ED VISITS	GP VISITS	SELF-REPORT*
Walking	1			3 eq
Swimming	2			-
Bike riding	3	3	3	-
Basketball	4	2	2	2 eq
Australian football	5	1	1	3 eq
Play equipment	6			-
Tennis	7	11 eq	10	4 eq
Golf	8 eq	9	20	-
Netball	8 eq	3	4	3 eq
10 pin bowls	9 eq			4 eq
Horse riding	9 eq	6	9	2 eq
Cricket	10	4	6	1
Soccer	11	5	5	3 eq

*Note: \* includes all injury cases (significant and inconsequential)*

Based on the data obtained from this survey, and the data presented in the previous chapter, a revised (complete) sports injury pyramid for the Latrobe Valley can be generated. This is shown in Figure 3.

**Figure 3: The robe Valley sports injury pyramid**



For every sports injury case admitted to hospital there are 22 cases that receive medical attention in another setting (from a hospital emergency department or from a GP), forty-one cases that receive treatment for their injury from other than a medically-trained person and 145 people who do not require or receive any treatment at all. Thus, there are almost twice as many people who get their injuries treated outside the medical treatment system (ie 41 vs

1+10+12), as there are people who receive medical treatment from a hospital or a GP. Furthermore, there are 2.3 times as many people who do not require treatment (or do not receive treatment) for their injury as there are people who receive some form of treatment.

**6.6 SUMMARY**

The results of the survey are summarised in figure 4 below. Sport and active recreation activities are a common context for injury and can have serious outcomes that affect participants’ health or subsequent participation in sport and active recreation.

**Figure 4: Injury in sport and active recreation, Latrobe Valley region**

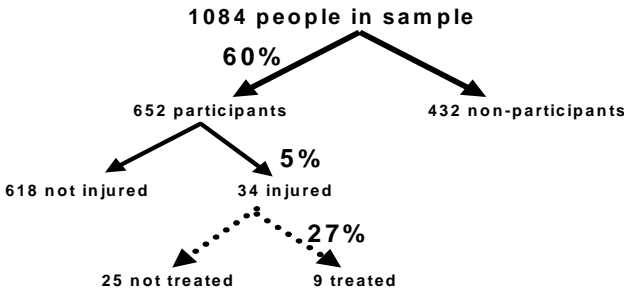


Table 39 compares the injury rate and the impacts of injuries on participants in each age-group. On the basis of injury frequency, sports injury prevention activities should be targeted to the 15-39 year old age-group, as this group has the highest overall rate of injury (26.1 injuries per 1000 participants).

Overall, children aged 5-14 years had the highest rate of significant injuries (12.3 injury cases per 1000 participants). In particular, children had the highest rate of injuries requiring treatment and affecting performance or participation in activity (7.4 per 1,000 participants). This highlights the need to target children for injury prevention activities, especially if life-long participation in physical activity is desired.

Note that these conclusions are based on the small but representative sample of injuries in the survey data and the data may not be robust.

**Table 39: Rate and impact of injuries (per 1,000 participants) in each age-group**

Age-group	All injuries	Injuries requiring treatment	Injuries affecting daily activities	Injuries affecting performance or participation	Significant injuries (i.e. those requiring treatment or affecting daily activities or participation or performance)
5-14 years	22.1	7.4	7.4	7.4	12.3
15-39 years	26.1	4.9	8.2	6.5	9.8
40+ years	14.2	5.3	5.3	7.1	7.1

Source: household survey in Latrobe Valley region

## 7. POSTAL SURVEY OF SCHOOLS

Overall, 42 schools were sent surveys (33 State schools, 9 Catholic/Independent schools). Of these, 11 (26%) returned completed surveys, 9 (21%) refused to take part and 22 (52.4%) failed to return the survey. Follow-up telephone contact had been made with 17 of the 22 schools that eventually failed to return the survey. The survey is in Appendix 3.

**Table 40: Response to schools sport participation and sports injury survey 1995-6**

Response type	School type		Total
	State (n=33)	Catholic/ Independent (n=9)	
Completed	8 (24%)	3 (33%)	11 (26%)
Refused	7 (21%)	2 (22%)	9 (22%)
Survey not returned	18 (55%)	4 (44%)	22 (52%)
<b>Total</b>	<b>33 (100%)</b>	<b>9 (100%)</b>	<b>42 (100%)</b>

Overall 42 schools were sent surveys (33 State schools, 9 Catholic/Independent). Of these, 11 (26%) returned completed surveys, 9 (21%) refused to take part, 17 (41%) failed to respond after a follow up telephone call and 5 (12%) were not able to be contacted.

Of the 11 completed surveys, 7 claimed to have had no sports related injuries, 2 had inadequate records to make a proper report, 1 failed to respond and 2 reported sports related injuries (12 cases).

**Table 41: Summary response rates**

Response type	School type		
	Total (N=42)	State (N=33)	Catholic/Independent (N=9)
Completed	11 (26%)	8 (24%)	3 (24%)
No contact	5 (12%)	4 (12%)	1 (11%)
Refused	9 (21%)	7 (21%)	2 (22%)
No response	17 (41%)	14(43%	3 (33%)

Given the very poor response rate it was not possible to provide a description of sports injuries that occurred in the school setting. It is apparent that schools needed more support to complete the survey form and this could be supplied through the employment of a research assistant to assist the sports coordinator to fill out the survey form. The current financial situation in schools probably warranted payment of time release to enable the sports coordinator to bring together the disparate documentation on sports and active recreation injuries and participation. Although the provision of this support was considered at the time of the survey, the project's budget could not be extended to accommodate the extra cost involved.



## 8. POSTAL SURVEY OF SPORT AND ACTIVE RECREATION CLUBS

### 8.1 RESPONSE RATE

In total, 206 sports and active recreation clubs were sent survey forms. A small number of clubs returned the survey form because they considered that it was not relevant to their recreational activity (for example, a flying school). As shown in table 4 the response rate was low (31%) despite telephone follow-up. The survey is in Appendix 4.

**Table 42: Response to mail-out survey to sport and active recreation bodies**

<b>Response</b>	<b>N</b>	<b>Proportion (%)</b>
Completed, survey returned	64	31
Refused to participate	6	3
Considered not relevant	8	4
Did not respond	128	62
	<b>206</b>	<b>100</b>

At least one follow-up telephone contact attempt was made for all non-responding clubs. Forty-one clubs (32% of all non-responding clubs) failed to send back the survey despite agreeing to do so when followed-up by telephone. Ten clubs (8%) were found to be disbanded when telephone contact was made with the listed contact person. Seventy-seven clubs (60% of all non-responding clubs) were unable to be contacted because there was no telephone contact listed by the Department of Sport and Recreation or in the local telephone book (40 clubs) they did not answer or return messages (33 clubs) or the contact telephone number was a wrong number (4 clubs). In total, 206 sporting clubs were sent surveys. Seventy eight (38%) returned surveys and of these 64 (31%) were completed surveys, 8 (4%) claimed not to be applicable, e.g. a flying school, and 6 (3%) refused to take part. Of the remaining 128 clubs, 10 (5%) were disbanded, 41 (20%) failed to respond after a follow up telephone call and 77 (37%) were unable to be contacted. Of the clubs not contacted, 33 (43%) did not answer or return messages, 40 (52%) had no telephone number that could be found and 4 (5%) were wrong numbers and could not be found.

This left 64 clubs for analysis. Most clubs had either male based teams (78 cases [48%]) or mixed sex (68 cases [42%]), with only 16 cases (10%) of female based teams.

### 8.2 INJURY SURVEY

Because of the poor response rate and lack of records at the club level, only poor quality injury data was able to be collected. Thirty clubs (47% of respondents) reported particular injuries, 6 (9%) reported only non-specific sprains and bruises and 28 (44%) reported no injuries during the survey period.

Sixty-eight types of sports-related injuries were recorded in the 172 cases reported. Most injuries resulted in first aid treatment only (46%), with just over a quarter (26%) being sent

to a GP or other health professional and another quarter (28%) receiving treatment at a hospital or emergency department.

Forty two clubs (66%) claimed to have taken measures to improve safety. Most measures could be coded into the broad categories of; safety education & training, purchase of new equipment and repairs to existing structures.

Thirty five (55%) clubs responded that their players were covered by injury insurance and listed 21 insurance companies/organisations providing cover.

Forty two (66%) clubs said that their players used some form of safety equipment, with 19 (30%) saying none was used (3 missing). Fifty one items/combinations of equipment were listed.

## 9. SUMMARY AND CONCLUDING REMARKS

The purpose of the Latrobe Valley sports injury survey was to determine what sports are played in a defined community in Australia and to describe the frequency, rate and pattern of associated injuries in the study community. It is important to recognise that the pattern of participation and injury could be different across regions of Australia because there may be different playing conditions and participation rates across a variety of sports. However, this survey methodology provides a model of how to perform a population-based sport and recreation injury study that can readily be duplicated in other regions of Australia.

On the basis of this study, it is concluded that a population-based telephone survey is a useful methodology for collecting data on participation in sport and active recreation at the local community level and associated injuries, which enables the calculation of injury rates. However, there appears to be little value in trying to identify sports injuries through postal surveys of schools and sporting clubs, because of the poor response rates and the poor quality of relevant or detailed information in the survey forms returned. Contact details of local clubs were provided by the regional sports assembly but the information was not accurate due to the difficulty of keeping up-to-date records on voluntary bodies. The data provided by schools and clubs was limited and little meaningful analysis was possible.

A significant proportion (60%) of residents in the Latrobe Valley participated in sport and active recreation activities. On the basis of the findings of household survey, 5% of these participants will be injured during these activities over a 12-month period. Approximately one-third of these injury cases will have participation restricted; one-third will have activities of daily living affected; and one-third will require treatment for their injuries. Only 6% of the injury cases that require treatment will actually seek medical attention from a general practitioner.

In the 12-month study period there were 112 hospital admissions, 1,179 ED presentations and 1,003 GP presentations of Latrobe Valley residents for sport and active recreation injuries. Comparison of the health sector data (hospital admissions, emergency department and general practitioners presentations) with the survey results, indicates that the available injury databases describe less than 30% of self-reported sports injury cases. However, almost one-half (47%) of the self-reported injuries were inconsequential in that they required no treatment and/or did not affect participation in sport and active recreation or activities of daily living. Health sector data (sports injury cases) and participation-adjusted figures give different rankings of sport and active recreation activities associated with injury, but this difference may be partially accounted for by the inclusion of inconsequential injuries in the community survey data. The injury results from the population survey should also be interpreted with caution due to the small numbers.

It appears that participation in ball team sports, rather than individual pursuits such as walking, are most likely associated with increased injury risk. Males are more at risk of injury than females. People aged 15-39 years have the highest sports and active recreation injury rate. Children have a lower overall risk of sports and recreation-related injury than 15-39 year olds (the highest risk group for injury), but are more likely to require treatment for their injuries.

The results of this study need to be replicated in other populations in urban and rural Victoria and elsewhere in Australia, before these conclusions can be extrapolated to the wider community. A survey with a larger sample size would also be needed to achieve adequate precision in the injury risk estimates. Some attempt to validate the self-report

injury details should also be undertaken in future studies. In setting priorities for sports injury prevention, consideration should be given to excluding inconsequential injuries from analyses if their inclusion directs attention away from the more risky sports.

Future surveys should also determine the extent to which the actual amount of participation affects injury risk. Related to this is the question of whether or not participation in more than one activity increases injury risk.

In summary, this project has shown that injuries during sport and active recreation activities are not rare events. They have a significant public health impact with consequences for injury treatment, quality of life and future participation in activity.

These findings suggest that preventive measures should be aimed at the following groups and sport and active recreation activities:

- Bicyclists, because of high frequency of medically treated injury and the severity of their injuries.
- Australian football and basketball because of high frequency of medically-treated injury.
- Other team ball sports (cricket, soccer and netball) because of comparatively high rates of injuries per 1,000 participants.
- Horseriders because of their comparatively high rate of injuries per 1,000 participants and frequency of hospital admissions.
- Children aged 4-15 years because of their comparatively high rate of injury requiring treatment.
- Adults 15-39 years because of their comparatively high frequency of injury in this age group compared to younger and older age groups.

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## INTERVIEW QUOTAS FOR THE HOUSEHOLD SURVEY

## Interview quotas for Morwell exchange

*Pop >4 years 17174 -1991 census, 26% of the target population- 27 interviews (over-sampled)*

Exchange	Number range (total number of nos.)	Interview Quota
<b>051</b>		
33	0000-0999 (1,000 nos.)	2 (Survey 1&2)
33	3000-3099 (100 nos.)	3 (survey 3&4)
		1 (abandoned from June survey because of small numbers at the exchange, an extra interview included in set above)
33	6000-9999 (4,000 nos.)	8
34	1000-6999 (6,000 nos.)	12
34	8000-8999 (1,000 nos.)	2
68 (Driffield)	1200-1499 (300 nos.)	1 (over-sampled)
66 (Hazelwood)	1200-1799 (600 nos.)	1
TOTAL	13,000	27

## Interview quotas for Moe &amp; district

*Pop > 4 years 20,461 (1991 census) - 30.2% of target population.- 32 interviews (over-sampled)*

Exchange	Number range (total number of nos.)	Interview quota
<b>051 &amp; 056</b>		
051 26 (Moe)	1000-2999 (2,000 nos.)	4
051 27(Moe)	0000-8999 (9,000 nos.)	20
051 67 (Yallourn)	1000-1999 (1,000 nos.)	2
051 65 (Erica)	3200-3599 (600 nos.)	1
056 34 (Narracan)	8200-8399 (200 nos.)	1 (over-sampled)
051 65 (Walhalla)	6200-6299 (100 nos.)	1 (over-sampled)
056 35 (Hill End)	4200-4399 (200 nos.)	1 (over-sampled)
051 60 (Tanjil South)	1200-1499 (300 nos.)	1 (over-sampled)
056 35 (Willow Grove)	2200-2499 (300 nos.)	1 (over-sampled)
TOTAL	13 700	32

### Interview quotas for Boolaro, Yinnar and Churchill

*[Pop > 4 years 6, 855 (1991 census) - 10.1% of target population - 11 interviews (over-sampled)] Because the pop. was known for exchange areas the allocation of interview quotas was made on % population rather than no of phone numbers on exchange.*

Exchange	Number range (total number of nos.)	Interview quota
<b>051</b>		
051 69 (Boolaro)	6200-6699 (pop 1035-15%)	2
051 63 (Yinnar)	1200-1799 (pop 3163-46% with Yinnar South – 600 nos. on exchange)	3
051 69 (Yinnar South)	1500-1799 (300 nos.)	2
051 22 (Churchill)	1000-3999 (pop 2 657-39%)	4
<b>TOTAL</b>	<b>6 855</b>	<b>11</b>

### Interview quotas for Traralgon & District

*Pop > 4 years old 23,169 (1991 census) - 34.2% of target population- 34 interviews*

Exchange	Number range (total number of nos.)	Interview quota
<b>051</b>		
051 74	0000-9999 (10 000 nos.)	22
051 75	0000-0999 (1 000 nos.)	2
051 76	0000-2999 (3 000 nos.)	6
051 95	5200-5599 (1 000 nos.)	1
051 94 (Currajung)	2200-2399 (200 nos.)	1
051 91 (Tyers)	8000-8999 (1 000 nos.)	2
<b>TOTAL</b>	<b>15 600</b>	<b>34</b>

TELEPHONE SURVEY

LATROBE VALLEY SPORTS INJURY SURVEY CASE NO .....

Insert survey household's telephone no. in space below

Enter the case no., telephone no. and time on running sheet.

Dial, allow phone to ring 15 times before abandoning attempt. Record abandoned call on running sheet.

*"Hello, I'm .....{name}..... from Monash University Accident Research Centre. We are doing a survey on people's recreational activities. Before we continue, I need to know if I have dialled the correct number and if you live in the right area for our survey. Is this.....{telephone no}?"*

**"No" → TERMINATE "Sorry to have bothered you I have dialled the wrong number".**

Adjust running sheet

**"Yes" →1. What is the name of the town in which you live? (If you live on a farm, the nearest town to your home?) (circle)**

Aberfeldv	Mid Vallev
Beardmores	Mirboo East
Blackwarry	Moe
Boolarra	Moondarra
Budgerree East	Morrells Hill
Callignee	Morwell
Carrajung	Morwell River Prison
Churchill	Narracan
Coalville	Newborough
Coopers Creek	Parker's Corner
Cumberland Park	Pax Hill
Driffield	Rawson
Erica	Robertson
Flynn	Roys
Flynn's Creek	Ryton
Fumina	Tanjil East
Gunyah Gunyah	Tanjil South
Hazlewood Nth	Traralgon
Hernes Oak	Tyers
Hill End	Tyers Junction
Hoods	Walhalla
Jeeralang	Westbury
Johnstones Hill	Western Camp
Jumbuk	Willow Creek
Koornalla	Willung Sth
LeRoy	Yallourn Nth
Lou Yang	Yinnar
Mavflower	

**2. What is your home postcode? (circle)**

3825

3840

3842

3844

3869

3870

Don't know/can't remember →

**→Terminate if there is not a match to town OR postcode. Record this outcome on running sheet.**

**3. Are you 18 years of age or older?**

**Yes → "Your telephone number was chosen at random from a list. I do not need to know your family name so your answers are confidential. The survey is about recreation activities including sports. It should take about 5-10 minutes of your time. Okay? (pause briefly)"**

**Yes** → administer sports injury survey

**Not convenient, haven't time** → "May I ring back at a more convenient time?"

**Yes** → record appointment on running sheet

**No** → TERMINATE, record outcome on running sheet

**Unwilling to be interviewed** → TERMINATE, record outcome on running sheet

**No → "Is there is a person in the household aged 18 years or older who would answer some questions about your household's recreation activities".**

Yes → *"Would you bring the person to the phone please?"* →

Yes (see below) administer appropriate home safety survey

Not available → *"May I ring the person back at a more convenient time?"*

Yes - make an appointment on running sheet.

No- TERMINATE, record outcome on running sheet

No/refuses to bring adult to phone /adult refuses interview → TERMINATE, record outcome on running sheet

If not already stated to respondent → *"Your telephone number was chosen at random from a list. I do not need to know your family name so your answers are confidential. The survey is about your household's recreation activities, including sports and should take about 5-10 minutes of your time. Okay?"*

4. *Including yourself, how many members of your household are aged five years or older?*

Specify (circle): 1 2 3 4 5 6 7 8 9 10 Other.....

5 a-d FILL IN TABLE 5 BELOW

5. *What are the (a) first names, (b) ages and (c) sex of all these household members aged five years and older (from youngest to oldest) - including your own?*

Fill details on table below. (If reluctant to give first names, first initial is sufficient).

d. *Did these household members aged five years or older participate in sports or active recreational activities in the past two weeks? Active recreational activities include organised sports and things like golf, horseriding, swimming, skateboarding, rollerblading, skiing, cycling, aerobics, power walking and dancing and, for children, playing on play equipment.*

If **Yes**→Mark box in table below and fill in name and age onto sports participation sheets overleaf.

If **No/ Don't know, can't remember for all** →to Q10

**TABLE 5 : HOUSEHOLD MEMBERSHIP**

Person	First Name	Age		Sex M/F	<i>Did ...name... participate in active recreational activities including sports <u>in the past two weeks</u>. Fill in name and age on sheets overleaf (one sheet for each participant)</i>					
		05-99	years							
1#					Yes		No		Don't know	
2#					Yes		No		Don't know	
3#					Yes		No		Don't know	
4#					Yes		No		Don't know	
5#					Yes		No		Don't know	
6#					Yes		No		Don't know	
7#					Yes		No		Don't know	
8#					Yes		No		Don't know	
9#					Yes		No		Don't know	
10#					Yes		No		Don't know	

*The next few questions are about the participation in active recreational activities for each of these household members in turn. Remember that active recreational activities include organised sports as well as things like golf, horseriding, swimming, skateboarding, rollerblading, skiing, cycling, aerobics, power walking and dancing and, for children, playing on play equipment.*

*"The last few questions in the sports survey are about sports injuries"*



**10. Were you or any person aged five years or over in your household injured while participating in sports or active recreation activities in the past two weeks, that is since last (.....name day.....) week?**

Yes....  to Q11

No....  END OF INTERVIEW- "*Thank you for your time*"

Don't know/can't remember  END OF INTERVIEW- "*Thank you for your time*"

IF "YES"

**PERSON A # (Do respondent first, if injured)**

**11. What is the age of the person who had the sports injury?**

- 05-09 years
- 10-14 years
- 15-24 years
- 25-34 years
- 35-44 years
- 45-54 years
- 55-64 years
- 65-74 years
- 75-84 years
- 85+ years
- Don't know can't remember  to Q12

**12. What kind of injury did you (she/he) get?**

- Graze/s (abrasions)
- Bruising
- Cut/s (lacerations)
- Concussion
- Foreign body
- Fracture/s
- Inflammation (swelling)
- Sprain (ligament eg. ankle)
- Strain (muscle eg. hamstring)

Other (specify).....

Don't know/Can't remember  to Q13

**13. Where did this accident occur?**

- games court
- gymnasium
- home/garden
- local club
- playground
- recreation park
- road or footpath
- school
- sports oval/field/park
- stadium/arena
- swimming/diving pool
- track

other (specify).....

Don't know/can't remember  to Q14

**14. What sport or recreation were you (was he/she) doing at the time?**

Specify .....

Don't know/Can't remember  to Q15

**15. How did this injury occur?**

Aggravation of previous injury

- Collision with a fixed object
- Collision with a moving object
- Fall from height
- Fall from the same level
- Struck by object
- Struck by person
- Overextension/over exertion
- Overuse
- Other (specify).....
- Don't know/can't remember  to Q16

**16. Did you (she/he) receive any medical treatment?**

- Yes  to Q17
- No  to Q18
- Don't know/Can't remember  to Q18

**17. Where did you (she/he) go for medical treatment for this injury?**

- Chemist
- Chiropractor
- Dentist
- Doctor
- First aider
- Hospital
- Masseur
- Medical centre
- Nurse

- Physiotherapist
- Sports medical clinic
- Sports trainer
- Other (specify).....
- Don't know/can't remember.  to Q18

**18. Were you (she/he) using any protective equipment, tape or support on the injured part at the time of the injury?**

- Yes   
Specify.....
- No
- Don't know/can't remember  to Q19

**19. Did this injury affect your(her/his) participation or performance in further sport or active recreation?**

- Yes
- No
- Don't know/can't remember  to Q20

**20. Did this injury restrict or disrupt your (her/his) usual daily activities? (Examples of restrictions: stopped you going to work or school and/or doing jobs around the house)**

- Yes
- No
- Don't know/can't remember  to Q21 if another person injured

If not TERMINATE interview ***"Thank you for your time"***.

**PERSON B #**

**21. What is the age of the person who had the sports injury?**

- 05-09 years
- 10-14 years
- 15-24 years
- 25-34 years
- 35-44 years
- 45-54 years
- 55-64 years
- 65-74 years
- 75-84 years
- 85+ years
- Don't know can't remember  to Q22

**22. What kind of injury did she/he get?**

- Graze/s (abrasions)
- Bruising
- Cut/s (lacerations)
- Concussion
- Foreign body
- Fracture/s
- Inflammation (swelling)
- Sprain (ligament eg. ankle)
- Strain (muscle eg. hamstring)
- Other (specify).....

Don't know/Can't remember  to Q23

**23. Where did this accident occur?**

- games court
- gymnasium
- home/garden
- local club
- playground
- recreation park
- road or footpath
- school
- sports oval/field/park
- stadium/arena
- swimming/diving pool
- track
- other (specify).....

Don't know/can't remember  to Q24

**24. What sport or recreation was she/he doing at the time of the injury?**

Specify .....

Don't know/Can't remember  to Q25

**25. How did this injury occur?**

- Aggravation of previous injury
- Collision with a fixed object

- Collision with a moving object
- Fall from height
- Fall from the same level
- Struck by object
- Struck by person
- Overextension/over exertion
- Overuse
- Other (specify).....
- Don't know/can't remember  to Q26

**26. Did she/he receive any medical treatment?**

- Yes  to Q27
- No  to Q28
- Don't know/Can't remember  to Q28

**27 Where did she/he go for medical treatment for this injury?**

- Chemist
- Chiropractor
- Dentist
- Doctor
- First aider
- Hospital
- Masseur
- Medical centre
- Nurse
- Physiotherapist

- Sports medical clinic
- Sports trainer
- Other (specify).....
- Don't know/can't remember.  to Q28

**28. Was she/he using any protective equipment, tape or support on the injured part at the time of the injury?**

- Yes
- Specify.....
- No
- Don't know/can't remember  to Q29

**29. Did this injury affect her/his participation or performance in further sport or active recreation?**

- Yes
- No
- Don't know/can't remember  to Q30

**30. Did this injury restrict or disrupt her/his usual daily activities? (Examples of restrictions: stopped you going to work or school and/or doing jobs around the house)**

- Yes
- No
- Don't know/can't remember  to TERMINATE *"Thank you for your time"*

**MONASH UNIVERSITY ACCIDENT RESEARCH CENTRE  
SPORTS INJURY PARTICIPATION SURVEY**

**CLUB/ASSOCIATION SPORTS PARTICIPATION AND  
INJURY SURVEY 1995-96**

**Name of club.....**

**Please complete all parts of survey:**

- 1. Participation survey (blue)**
- 2. Injury survey (green)**
- 3. Safety measures (yellow)**

**Return survey in envelope provided to:**

**Ms Erin Cassell**

**Monash University Accident Research Centre**

**Wellington Rd**

**Clayton Vic 3168**

**or by Fax: (03) 990 51809**

**Enquiries: phone (03) 990 51857 (Erin Cassell)**

**or (03) 990 51807 (Jason Boulter)**

**DUE DATE: FRIDAY 29 NOVEMBER 1996**



**1. PARTICIPATION SURVEY (CLUB):**

**FILL IN SEPARATE ENTRY FOR SPORT AT EACH LEVEL (GRADE OR AGE GROUP) FOR EVERY SEASON OVER THE PAST YEAR- from SPRING SEASON (from Oct 1st ) 1995 to END OF WINTER SEASON (to end September) 1996**

				Pre-season training			In-season training			Competition		
SPORT (season)	LEVEL/ GRADE	SEX M/F or Mixed	AGE of player s	Number of players (estimated average per session)	Number of training sessions	Duratio n of session (minutes per session)	Number of players (average per session)	Number of training sessions	Duratio n of session (minutes per session)	Number of players (average per game)	Number of games in season	Duration of game per player (est. average minutes per player)
<i>Football (autumn to winter)</i>	<i>A (Open age)</i>	<i>M</i>	<i>18-34</i>	<i>26</i>	<i>12</i>	<i>90 min</i>	<i>20</i>	<i>20</i>	<i>90</i>	<i>21</i>	<i>20</i>	<i>95</i>

**Participation survey (cont.)**

**FILL IN SEPARATE ENTRY FOR SPORT AT EACH LEVEL (GRADE OR AGE GROUP) FOR EVERY SEASON OVER THE PAST YEAR- from SPRING SEASON (from Oct 1st ) 1995 to END OF WINTER SEASON (to end September) 1996**

				Pre-season training			In-season training			Competition		
SPORT (season)	LEVEL/ GRADE	SEX M/F or Mixed	AGE of players	Number of players (estimated average per session)	Number of training sessions	Duration of session (minutes per session)	Number of players (average per session)	Number of training sessions	Duration of session (minutes per session)	Number of player (average per game)	Number of games in season	Duration of game per player (est. average minutes per player )
<i>Football (autumn to winter)</i>	<i>A (Open age)</i>	<i>M</i>	<i>18-34</i>	<i>26</i>	<i>12</i>	<i>90 min</i>	<i>20</i>	<i>20</i>	<i>90</i>	<i>21</i>	<i>20</i>	<i>95</i>

**Attach extra page if insufficient space**

## 2. INJURY SURVEY (CLUB)

**FROM CLUB RECORDS ITEMISE ALL SPORTS INJURIES THAT HAVE OCCURRED IN CLUB TRAINING AND COMPETITION IN THE 12 MONTH PERIOD FROM start of SPRING (October) 1995 TO end of WINTER (September)1996**

**OR ATTACH COMPUTER PRINTOUT OR PHOTOCOPY OF CLUB INJURY RECORDS IF EASIER**

N	SPORT	INJURY (Nature of injury and body part injured)	AGE (of injured person)	TREATMENT (Club first aid; taken/sent to GP; taken/sent to hospital emergency department; admitted to hospital)	N	SPORT	INJURY (Nature of injury and body part injured)	AGE (of injured person)	TREATMENT (Club first aid; taken/sent to GP; taken/sent to hospital emergency department; admitted to hospital)
<i>e.g.</i>	<i>Netball</i>	<i>sprain/ankle</i>	<i>14</i>	<i>club first aid/GP</i>	<i>e.g.</i>	<i>Football</i>	<i>concussion/head</i>	<i>16</i>	<i>taken to hospital E.D.</i>
<b>1</b>					<b>19</b>				
<b>2</b>					<b>20</b>				
<b>3</b>					<b>21</b>				
<b>4</b>					<b>22</b>				
<b>5</b>					<b>23</b>				
<b>6</b>					<b>24</b>				
<b>7</b>					<b>25</b>				
<b>8</b>					<b>26</b>				

<b>9</b>					<b>27</b>				
<b>10</b>					<b>28</b>				
<b>11</b>					<b>29</b>				
<b>12</b>					<b>30</b>				
<b>13</b>					<b>31</b>				
<b>14</b>					<b>32</b>				
<b>15</b>					<b>33</b>				
<b>16</b>					<b>34</b>				
<b>17</b>					<b>35</b>				
<b>18</b>					<b>36</b>				

**INJURY SURVEY (continued)**

N	SPORT	INJURY (Nature of injury and body part injured)	AGE (of injured person)	TREATMENT (Club first aid; taken/sent to GP; taken/sent to hospital emergency department; admitted to hospital)	N	SPORT	INJURY (Nature of injury and body part injured)	AGE (of injured person)	TREATMENT (Club first aid; taken/sent to GP; taken/sent to hospital emergency department; admitted to hospital)
37					55				
38					56				
39					57				
40					58				
41					59				
42					60				
43					61				
44					62				
45					63				
46					64				

<b>47</b>					<b>65</b>				
<b>48</b>					<b>66</b>				
<b>49</b>					<b>67</b>				
<b>50</b>					<b>68</b>				
<b>51</b>					<b>69</b>				
<b>52</b>					<b>70</b>				
<b>53</b>									
<b>54</b>					<i>Attach extra page if more than 70 injuries</i>				

**3. SAFETY MEASURES AND EQUIPMENT SURVEY (CLUB)**

**a. Has your club/association taken any measures to improve the safety of this sport in the past year? Yes/No**

**b. If yes, itemise the measures taken by the club/association on the table below.**

<b>1.</b>	
<b>2.</b>	
<b>3.</b>	
<b>4.</b>	
<b>5.</b>	
	<i>Attach extra page if insufficient space</i>

**c. How many accredited sports trainers and coaches are with the club?**

<b>Accredited sports trainers</b>	<b>Level 1</b>	<b>No.....</b>
	<b>Level 2</b>	<b>No.....</b>

Accredited coaches	Level 1	No.....
	Level 2	No.....
	Level 3	No.....

d. Are the players in your club covered by injury insurance? Yes/No

If yes, give name of scheme/insurance company.....

e. Itemise the safety equipment used by any players in club teams on the table overleaf (use a separate entry for each piece of equipment)

**EXAMPLES:**

<b>SPORT (grade/age group)</b>	<b>SAFETY EQUIPMENT (itemise separately)</b>	<b>COMPULSORY (Club/ association rule)  yes/no</b>	<b>VOLUNTARY (Player choice)  yes/no</b>	<b>Estimated use by players in training  (% of team)</b>	<b>Estimated use by players in competition  (% of team)</b>
<i>Football(A-Open age)</i>	<i>mouthguard</i>	<i>No</i>	<i>yes</i>	<i>20%</i>	<i>40%</i>
<i>Football(A-Open age))</i>	<i>helmet</i>	<i>No</i>	<i>yes</i>	<i>5%</i>	<i>5%</i>

*Please continue on next page*

**e. (cont) Safety equipment used by players (cont.)**

<b>SPORT (grade/age group)</b>	<b>SAFETY EQUIPMENT (itemise separately)</b>	<b>COMPULSORY (Club/ association rule)  yes/no</b>	<b>VOLUNTARY (Player choice)  yes/no</b>	<b>Estimated use by players in training  (%)</b>	<b>Estimated use by players in competition  (%)</b>

*Attach extra page if insufficient space*

*SEND COMPLETED SURVEYS TO MONASH UNIVERSITY ACCIDENT RESEARCH CENTRE IN STAMPED ADDRESSED ENVELOPE PROVIDED BY FRIDAY 29 NOVEMBER 1996 OR FAX (03) 990 51809*

Contacts: Ms Erin Cassell (Phone 9905 1857) or Mr Jason Boulter (Phone 9905 1807)



**SCHOOLS SURVEY**

**MONASH UNIVERSITY ACCIDENT RESEARCH CENTRE  
SPORTS INJURY IN THE LATROBE VALLEY**

**SCHOOLS SPORTS PARTICIPATION AND SPORTS  
INJURY SURVEY 1995-96**

**Parts:**

- 1. Inter-school sports participation (blue)**
- 2. In-school sports- organised competition (pink)**
- 3. Athletics, cross country, swimming and other organised physical activity (cream)**
- 4. School sports injury (green)**
- 5. School sports safety measures (yellow)**

Name of school:.....

Contact person.....

Return survey in envelope provided to:

Ms Erin Cassell

Monash University Accident Research Centre

Wellington Rd

Clayton Vic 3168

or by Fax: (03) 990 51809

Enquiries: phone (03) 990 51857

**DUE DATE FRIDAY 18 OCTOBER 1996**

1. MUARC SCHOOL SPORTS PARTICIPATION SURVEY:

<b>INTER-SCHOOL COMPETITION</b>
---------------------------------

**FILL IN SEPARATE ENTRY FOR EACH SPORT AT EACH LEVEL (GRADE OR AGE GROUP) OVER THE PAST YEAR**

***SURVEY PERIOD: FROM START TERM 4 1995 to END TERM 3 1996***

INTER-SCHOOL SPORTS				Pre-season training conducted by school			In-season training conducted by school			Schools competition		
SPORT  (excluding athletics and swimming)	LEVEL/ GRADE	AGE (of players)	SEX M/F or mixed	Number of players  (estimated average per session)	Number of pre- season training sessions	Duration of session  (minutes per session)	Number of players  (average per session)	Number of training sessions	Duration of session  (minutes per session)	Number of players  (average per game)	Games  (number)	Duration of game per player  (est. average minutes per player)
<i>Football</i>	<i>Under 16</i>	<i>14&amp;15</i>	<i>M</i>	<i>26</i>	<i>12</i>	<i>90 min</i>	<i>20</i>	<i>40</i>	<i>90</i>	<i>21</i>	<i>20</i>	<i>95</i>

1. (cont): SURVEY PERIOD: FROM START TERM 4 1995 to END TERM 3 1996

<b>INTER-SCHOOL COMPETITION</b>
---------------------------------

INTER-SCHOOL SPORTS				Pre-season training conducted by school			In-season training conducted by school			Schools competition		
SPORT  (excluding athletics and swimming)	LEVEL/ GRADE	AGE (of players)	SEX M/F or mixed	Number of players  (estimated average per session)	Number of pre- season training sessions	Duration of session  (minutes per session)	Number of players  (average per session)	Number of training sessions	Duration of session  (minutes per session)	Number of players  (average per game)	Games (number)	Duration of game per player  (est. average minutes per player)
<i>Football</i>	<i>Under 16</i>	<i>14&amp;15</i>	<i>M</i>	<i>26</i>	<i>12</i>	<i>90 min</i>	<i>20</i>	<i>40</i>	<i>90</i>	<i>21</i>	<i>20</i>	<i>95</i>

1. (cont.): SURVEY PERIOD: FROM START TERM 4 1995 to END TERM 3 1996

<b>INTER-SCHOOL COMPETITION</b>
---------------------------------

INTER-SCHOOL SPORTS				Pre-season training conducted by school			In-season training conducted by school			Schools competition		
SPORT  (excluding athletics and swimming)	LEVEL/ GRADE	AGE (of players)	SEX  M/F or mixed	Number of players  (estimated average per session)	Number of pre- season training sessions	Duration of session  (minutes per session)	Number of players  (average per session)	Number of training sessions	Duration of session  (minutes per session)	Number of players  (average per game)	Games  (number)	Duration of game per player  (est. average minutes per player)
<i>Football</i>	<i>Under 16</i>	<i>14&amp;15</i>	<i>M</i>	<i>26</i>	<i>12</i>	<i>90 min</i>	<i>20</i>	<i>40</i>	<i>90</i>	<i>21</i>	<i>20</i>	<i>95</i>

2. MUARC SCHOOL SPORTS PARTICIPATION SURVEY:

**IN-SCHOOL ORGANISED COMPETITION**

**FILL IN SEPARATE ENTRY FOR EACH SPORT AT EACH LEVEL (GRADE AND/OR AGE GROUP) OVER THE PAST YEAR**

*SURVEY PERIOD: FROM START TERM 4 1995 to END TERM 3 1996*

<b>IN-SCHOOL HOUSE/CLASS/CAMPUS SPORTS (ORGANISED COMPETITION)</b>				<b>Pre-season training</b>			<b>In-season training</b>			<b>Competition</b>		
SPORT <small>(excluding athletics and swimming)</small>	LEVEL/ GRADE	AGE <small>(of players)</small>	SEX <small>M/F or mixed</small>	Number of players <small>(estimated average per session)</small>	Number of pre-season training sessions	Duration of session <small>(minutes per session)</small>	Number of players <small>(average per session)</small>	Number of training sessions	Duration of session <small>(minutes per session)</small>	Number of players <small>(average per game)</small>	Games <small>(number)</small>	Duration of game per player  <small>(est. average minutes per player)</small>

2. (cont.): SURVEY PERIOD: FROM START TERM 4 1995 to END TERM 3 1996

<b>IN-SCHOOL ORGANISED COMPETITION</b>
--

<b>IN-SCHOOL HOUSE/CLASS/CAMPUS SPORTS (ORGANISED COMPETITION)</b>				<b>Pre-season training</b>			<b>In-season training</b>			<b>Competition</b>		
<b>SPORT</b> (excluding athletics and swimming)	<b>LEVEL/ GRADE</b>	<b>AGE</b> (of players)	<b>SEX</b> M/F or mixed	<b>Number of players</b> (estimated average per session)	<b>Number of pre-season training sessions</b>	<b>Duration of session</b> (minutes per session)	<b>Number of players</b> (average per session)	<b>Number of training sessions</b>	<b>Duration of session</b> (minutes per session)	<b>Number of players</b> (average per game)	<b>Games</b> (number)	<b>Duration of game per player</b> (est. average minutes per player)

2. (cont.): *SURVEY PERIOD: FROM START TERM 4 1995 to END TERM 3 1996*

<b>IN-SCHOOL ORGANISED COMPETITION</b>
--

<b>IN-SCHOOL HOUSE/CLASS/CAMPUS SPORTS (ORGANISED COMPETITION)</b>				<b>Pre-season training</b>			<b>In-season training</b>			<b>Competition</b>		
<b>SPORT</b>  (excluding athletics and swimming)	<b>LEVEL/ GRADE</b>	<b>AGE</b>  (of players)	<b>SEX</b>  M/F or mixed	<b>Number of players (estimated average per session)</b>	<b>Number of pre- season training sessions</b>	<b>Duration of session (minutes per session)</b>	<b>Number of players (average per session)</b>	<b>Number of training sessions</b>	<b>Duration of session (minutes per session)</b>	<b>Number of players (average per game)</b>	<b>Games (number)</b>	<b>Duration of game per player  (est. average minutes per player)</b>

**3. ATHLETICS, CROSS COUNTRY, SWIMMING AND OTHER ORGANISED PHYSICAL ACTIVITY (not P.E. classes)**

*SURVEY PERIOD: FROM START TERM 4 1995 to END TERM 3 1996*

<b>INTER- AND IN-SCHOOL ORGANISED COMPETITION</b>		<b>Pre-event training</b>			<b>Competition</b>	
SPORT	AGE of participants	Participants (estimated number)	Sessions (number)	Duration of session (minutes per session)	Participants (estimated number)	Duration of competition (average minutes per participant)
<b>Inter-school athletics competition</b>						
<i>Male track events</i>						
<i>Female track events</i>						
<i>Male field events</i>						
<i>Female field events</i>						
<b>In-school athletics competition</b>						
<i>Male track events</i>						
<i>Female track events</i>						
<i>Male field events</i>						
<i>Female field events</i>						
<b>Inter-school cross country competition</b>						
<i>Male participants</i>						
<i>Female participants</i>						

3. (cont.): Athletics, cross country, swimming and other- not P.E. classes

*SURVEY PERIOD: FROM START TERM 4 1995 to END TERM 3 1996*

INTER- AND IN-SCHOOL ORGANISED COMPETITION		Pre-event training			Competition	
SPORT/PHYSICAL RECREATION ACTIVITY	AGE of participants	Participants (estimated number)	Sessions (number)	Duration of session (minutes per session)	Participants (estimated number)	Duration of competition (average minutes per participant)
<b>Inter-school cross-country competition</b>						
<i>Male participants</i>						
<i>Female participants</i>						
<b>Inter-school swimming competition</b>						
<i>Male participants</i>						
<i>Female participants</i>						
<b>Inter-school swimming competition</b>						
<i>Male participants</i>						
<i>Female participants</i>						
<b><i>Other organised physical recreational activities (not PE classes) – mark whether male/female or both</i></b>						

*Attach extra page if insufficient space*

#### 4. SCHOOL SPORTS INJURY SURVEY

**FROM SCHOOL RECORDS ITEMISE ALL SPORTS INJURIES THAT HAVE OCCURRED IN TRAINING AND COMPETITION DURING THE PERIOD FROM THE START OF TERM 4 1995 TO THE END OF TERM 3 1996**

N	SPORT	INJURY (Nature of injury and body part injured)	AGE (of injured person)	TREATMENT (School first aid; taken/sent to GP; taken/sent to hospital emergency department; admitted to hospital)	N	SPORT	INJURY (Nature of injury and body part injured)	AGE (of injured person)	TREATMENT (School first aid; taken/sent to GP; taken/sent to hospital emergency department; admitted to hospital)
<i>e.g.</i>	<i>Netball</i>	<i>sprain/ankle</i>	<i>14</i>	<i>school first aid/GP</i>	<i>e.g.</i>	<i>Football</i>	<i>concussion/head</i>	<i>16</i>	<i>taken to hospital E.D.</i>
<b>1</b>					<b>19</b>				
<b>2</b>					<b>20</b>				
<b>3</b>					<b>21</b>				
<b>4</b>					<b>22</b>				
<b>5</b>					<b>23</b>				
<b>6</b>					<b>24</b>				
<b>7</b>					<b>25</b>				
<b>8</b>					<b>26</b>				
<b>9</b>					<b>27</b>				

<b>10</b>					<b>28</b>				
<b>11</b>					<b>29</b>				
<b>12</b>					<b>30</b>				
<b>13</b>					<b>31</b>				
<b>14</b>					<b>32</b>				
<b>15</b>					<b>33</b>				
<b>16</b>					<b>34</b>				
<b>17</b>					<b>35</b>				
<b>18</b>					<b>36</b>				

**4. (cont.): School sports injury survey**

***SURVEY PERIOD: FROM START TERM 4 1995 to END TERM 3 1996***

N	SPORT	INJURY (Nature of injury and body part injured)	AGE (of injured person)	TREATMENT (School first aid; taken/sent to GP; taken/sent to hospital emergency department; admitted to hospital)	N	SPORT	INJURY (Nature of injury and body part injured)	AGE (of injured person)	TREATMENT (School first aid; taken/sent to GP; taken/sent to hospital emergency department; admitted to hospital)
37					55				
38					56				
39					57				
40					58				
41					59				
42					60				
43					61				
44					62				
45					63				
46					64				

<b>47</b>					<b>65</b>				
<b>48</b>					<b>66</b>				
<b>49</b>					<b>67</b>				
<b>50</b>					<b>68</b>				
<b>51</b>					<b>69</b>				
<b>52</b>					<b>70</b>				
<b>53</b>									
<b>54</b>					<i>Attach sheet if more than 70 cases</i>				

**5. SCHOOL SPORTS SAFETY MEASURES AND EQUIPMENT SURVEY**

*SURVEY PERIOD: FROM START TERM 4 1995 to END TERM 3 1996*

- a. **Has your school taken any measures to improve the safety of school sports in the past year? Yes/No**
  
- b. **If yes, itemise the measures taken by the school on the table below.**

1.	
2.	
3.	
4.	
5.	
	<i>Attach extra page if insufficient space</i>

- c. **Itemise the safety equipment used by players in school teams on the table below (use a separate entry for each piece of equipment)**

<b>SPORT</b>	<b>SAFETY EQUIPMENT USED</b> <b>(itemise separately)</b>	<b>COMPULSORY</b> <b>(School/</b> <b>competition rule)</b> <b>yes/no</b>	<b>VOLUNTARY</b> <b>(Player choice)</b> <b>yes/no</b>	<b>Estimated use</b> <b>by players in</b> <b>training</b> <b>(%)</b>	<b>Estimated use</b> <b>by players in</b> <b>competition</b> <b>(%)</b>
<i>Football</i>	<i>mouthguard</i>	<i>no</i>	<i>Yes</i>	<i>10%</i>	<i>40%</i>

**5c. (cont.) Itemise safety equipment used by players.**

<b>SPORT</b>	<b>SAFETY EQUIPMENT USED</b> <b>(itemise separately)</b>	<b>COMPULSORY</b> <b>(School/</b> <b>competition rule)</b>  <b>yes/no</b>	<b>VOLUNTARY</b> <b>(Player choice)</b>  <b>yes/no</b>	<b>Estimated use</b> <b>by players in</b> <b>training</b>  <b>(%)</b>	<b>Estimated use</b> <b>by players in</b> <b>competition</b>  <b>(%)</b>

*Attach extra pages if insufficient space*

***SEND COMPLETED SURVEYS TO MONASH UNIVERSITY ACCIDENT RESEARCH CENTRE IN STAMPED ADDRESSED ENVELOPE PROVIDED. DUE DATE: FRIDAY 18 OCTOBER 1996 OR FAX (03) 990 51809***

Contacts: Ms Erin Cassell (Phone 9905 1857) or Ms Alicia McGrath (Phone 9905 1807)