



MONASH  
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MONASH UNIVERSITY ACCIDENT RESEARCH CENTRE

# HAZARD

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PROFILE OF HOSPITAL-  
TREATED CHILD INJURY  
IN PRIMARY SCHOOLS,  
VICTORIA, 2009/10  
TO 2018/19





## PROFILE OF HOSPITAL- TREATED CHILD INJURY IN PRIMARY SCHOOLS, VICTORIA, 2009/10 TO 2018/19

This issue of *Hazard* analysed injuries sustained by primary school-aged children during regular school days at school in the state of Victoria, Australia.

The systematic collection of data on primary school child injuries is vital in providing information on the causes of injury, identifying associated risk factors, at-risk groups, emerging injury patterns and quantifying the overall scale of injury. Injury data inform the next steps towards the development of strategies to address priority injury issues.

The aim of this edition of *Hazard* was to provide an in-depth description of hospital-treated primary school child injury in Victoria for the most recent three years of available data (2016/17-2018/19). An overview of 9-year trends (2010-2018, by calendar year) of hospital admissions among children aged between 4 years 9 months and 12 years is also provided.

The data sources for this report were: VISU-held injury surveillance datasets which include emergency department presentations recorded in the Victorian Emergency Minimum Dataset (VEMD) and hospital admissions recorded in the Victorian Admitted Episodes Dataset (VAED). Primary school enrolment and population data were sourced from the Australian Bureau of Statistics (ABS).

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# EXECUTIVE SUMMARY

Child injuries remain a major cause of deaths, disability, hospital admissions and emergency department (ED) presentations, both nationally and globally. These are not considered inevitable or accidental: they are preventable or can be controlled (World Health Organisation (WHO), 2008; Australian Institute of Health and Welfare (AIHW), 2018). Children spend a great deal of their time outside of the home, attending school and undertaking educational activities. Approximately 23% of all injury-related hospital admissions and the same proportion of ED presentations, for primary school-aged children, occurred in the school environment, excluding the summer holiday period (2016/17 to 2018/19, Victoria). In comparison, hospital admissions for home injuries, within the same cohort, accounted for 15% of admissions and 35% of ED presentations. Primary school child injury is unacceptably high and mostly preventable, and more needs to be done to ensure a safe environment for students, teachers and carers.

The systematic collection of data on child school injuries is vital for providing information on their causes, identifying associated risk factors, at-risk groups, emerging patterns of injury and quantifying the overall scale of injury. Injury statistics inform the next steps towards the development of prevention strategies to address priority hazards.

The aim of this edition of Hazard was to provide an in-depth description of primary school-related injuries in Victoria, among children aged between 4 years 9 months to 12 years of age during school days (all holidays and weekends were excluded). Nine-year trends and injury patterns in the most recent three years are presented, based on emergency department presentations, recorded in the Victorian Emergency Minimum Dataset (VEMD) and hospital admissions, recorded in the Victorian Admitted Episodes Dataset (VAED).

## Patterns – 2016/17 to 2018/19:

### Emergency Department Presentations

- In the three-year period from 2016/17 to 2018/19, there were 26,970 ED presentations for primary school child injuries in Victoria; an average of 8,990 ED presentations annually.
- ED presentations for injuries at school accounted for 22% of all child injury ED presentations.
- The median age for presentations was 8 years of age, while 41% of cases were children aged 7-9 years of age; 57% of all cases were male.
- Common injuries included bone fractures, accounting for 38% of cases, followed by sprains/strains (19%), superficial injuries (11%), open wounds (10%), and intracranial (head) injuries (4%).
- Of the fractures (n=10,335), the most common were fractures of the wrist/hand (44%, n=4,515), elbow/forearm (38%, n=3,937), shoulder/upper arm (8%, n=788) and ankle/foot (6%, n=657).
- Common causes of injury were falls (63%, n=16,852), unintentionally being struck by/colliding with an object (15%, n=4,051), and unintentionally being struck by/colliding with another person (7%, n=1,910).
- Primary school children presenting to the ED were mostly triaged as semi-urgent (recommended treatment less than 60 minutes) accounting for 62% (n=16,606 children), followed by the urgent group (recommended treatment less than 30 minutes) at 23% (n=6,271).
- The most common activity recorded among ED presentations for school injury was leisure/free play (46%, n=12,473), education/learning activities (22%, n=6,042), sports (18%, n=4,732) and other specified/unspecified activities (14%, n=3,723).
- Of those children presenting to the ED, 11% (n=2,919) were admitted to hospital for further treatment.

### Hospital Admissions

- There were 3,736 hospital admissions for primary school child injuries in Victoria in the period 2016/17 to 2018/19; an annual average frequency of 1,245 admissions.
- Hospital admissions for injuries sustained at school accounted for 21% of all injury admissions in children.
- The median age for admissions was 8 years of age, with children aged between 7-9 years accounting for 43% of admissions; 60% of cases were male.
- Common types of injuries included (bone) fractures (60%, n=2,222), open wounds (13%, n=481) and intracranial (head) injuries (10%, n=363).
- Of the fractures (n=2,222), the most common were fractures of the elbow/forearm (61%, n=1346), shoulder/upper arm (22%, n=497), wrist/hand (8%, n=166) and knee/lower leg (5%, n=110). Of the open wounds (n=481), 58% (n=280) were to the head, followed by the wrist/hand (19%, n=92) and knee/lower leg (15%, n=73).
- Orthopaedics was the most common clinical speciality involved with episodes of care, accounting for over half (58%, n=2,163) of hospital admissions for primary school child injuries. Other clinical specialities involved included Neurology (16%, n=612), General Medicine (8%, n=282), Plastics (7%, n=269), and ENT (4%, n=141).
- Three-quarters (76%, n=2,837) of admissions for primary school injury to children were caused by falls, followed by children being hit/struck/crushed (18%, n=652).
- Of the 2,837 fall-related admissions, 45% (n=1,286) were due to falls involving playground equipment, followed by same-level falls due to slipping/tripping or stumbling (16%, n=466), and same level falls as a result of colliding with or being accidentally pushed by another person (5%, n=153). Ten percent of falls (n=286) were coded with unspecified cause of fall type.
- The most common activity being undertaken was leisure-related (includes free play) accounting for 38% of admissions (n=1,427), followed by sports-related activities (14%, n=528) and 'other types of work (includes learning activities)' at 6% (n=237). Just over a third (38%, n=1,425) of admissions recorded an *unspecified activity type*.



### Burden of Injury: Hospital Length of Stay

- In Victoria for the three years 2016/17 to 2018/19, hospital beds were occupied for 4,493 days as a result of primary school child injury.
- Overall, 59% of bed days were attributed to male students; the boy/girl hospital bed day ratio increased with increasing age, reaching 1.6 in the age group 10-12 years.
- The length of stay categories showed that 90% (n=3,568) of admissions resulted in the utilisation of fewer than two bed days.
- Hospital stays of two days or longer were relatively common among girls aged 10-12 years, with 13% of those admitted staying for two or more days, and relatively uncommon among boys aged 4-6 years, with 9% of those admitted staying for two or more days.

### Burden of Injury: Hospital Costs

- In the two-year period 2016/17 to 2017/18, hospital costs for primary school child injury was estimated to be \$7.3 million.
- Of this total cost, 56% (\$4.1 million) was accounted for by males. However, as 61% of hospital admissions in the three-year period were attributed to males, this suggests that female admissions were relatively costlier.

### Other special interest profiles of primary school child injury (2016/17 to 2018/19)

#### Boys vs girls (ED presentations and hospital admissions)

The main differences observed between genders, in terms of **ED presentations** were:

- Activity at time of injury (sports): **Boys (20%)** vs Girls (15%)
- Body region injured (upper extremity): Boys (52%) vs **Girls (61%)**
- Body region injured (head/face/neck): **Boys (30%)** vs Girls (19%)
- Nature of injury (dislocation/sprain/strain): Boys (18%) vs **Girls (24%)**
- Cause of injury (unintentional fall): Boys (59%) vs **Girls (68%)**.

The main differences observed between genders, in terms of **hospital admissions** were:

- Activity at time of injury (leisure/free play): Boys (35%) vs **Girls (43%)**
- Activity at time of injury (sports): **Boys (16%)** vs Girls (11%)
- Body region injured (upper extremity): Boys (56%) vs **Girls (62%)**
- Body region injured (head/face/neck): Boys (34%) vs **Girls (28%)**
- Nature of injury (fracture): Boys (57%) vs **Girls (63%)**.

#### Hospitalised injuries involving falls from school playground equipment

- There were 1,286 (34%) hospital admissions for primary school children due to falls from playground equipment at schools.
- Almost half of these were children aged 7 to 9 years (48%, n=612), while 53% were male.
- Falls involving climbing apparatus such as monkey bars and climbing frames accounted for 70% of admissions within this playground equipment subset and 24% of all primary school-related injury hospital admissions.

#### Hospitalised injuries occurring during school sports activities

- There were 528 (14%) hospital admissions for primary school child injury due to school sport activities occurring on school grounds.
- Almost half (47%, n=249) of these were children aged between 10 to 12 years of age; 70%, (n=369) were male.
- Of those records allocated a sports-related activity code, 19% (n=100) involved Australian Football, followed closely by soccer (17%, n=87), basketball (9%, n=49) and jogging/running activities (6%, n=34).

## Trends – 2010 to 2018:

In the nine-year period from 2010 to 2018 (calendar years), there were 10,060 children who required hospital admission for injuries sustained in primary schools in Victoria.

### Hospital admissions

- Hospital admissions were most common at Prep and Year 1 levels, for both boys and girls. The number of admissions decreased with increasing Year-level, particularly for girls: the boy to girl ratio increased from 1.3 (Prep-level) to 2.0 (Year 6-level).
- The average rate of hospital admissions for primary school injury in the nine-year period was 224.2 per 100,000 per full-time equivalents (as per Victorian primary school enrolment data).
- There were no statistically significant sustained upward or downward time trends in overall primary school injury admission rates. Rates of *overnight admissions* (a subset of the overall admissions) decreased by 2.2% per year during the nine-year period.

## Recommendations

The findings presented in this report indicate that increased attention needs to be given to reducing unintentional injury in primary schools, particularly for falls involving playground equipment, and injuries occurring during sports, physical education (PE) and free-play outdoor activities. This requires a coordinated strategy at the state-wide, regional and local school levels.

The following recommendations are made to relevant child school safety and public health agencies in light of the findings from the current study and cited previously published research.

### Government policies, guidelines, interventions and curriculum

1. It is recommended that the Department of Education and Training (DET) develops learning programmes around children's safety skills, safety behaviours and safety knowledge for schools to implement. This can include assigning a 'safety captain' role for older primary school students to actively involve students in potential injury hazard and injury incident reporting, and promoting safe practices.
  2. It is recommended that DET develop sports injury prevention programmes, if not already part of the curriculum, for older children (school years 4-6) to not only reduce primary school sports injury rates but also to set up healthy practices for safe sports participation in high school and beyond. Schools may also wish to provide further sport and injury prevention programs as part of their health and physical activity unit.
  3. Increased awareness and adherence in primary schools to the DET *Physical and Sport Education – Safety* policy and resources for sport-specific precautionary safety measures and requirements is recommended (Department of Education and Training (Victoria), 2020d).
- ### Local School Level Measures
4. It is recommended that schools implement/ upgrade and maintain a system for reporting and documenting all injuries, including hazards and near misses, using simplified data collection protocols and promote the regular review of this information to address school-specific safety issues. Injury reporting should be transparent with aggregate or summary data included in school newsletters or annual reports.
  5. Establish and adhere to a playground safety management system and review on a regular basis as per Australian Standard (AS 4685.0: 2017).
  6. Younger children are most likely to suffer injuries due to falls from playground equipment and these are most likely to occur early in the year: therefore, a playground safety induction for children in Prep and Year 1 is recommended to help reduce playground falls. Staggering recess times for younger children in the first few weeks of school may help prevent them from mimicking older children or competing for access to play equipment. Staggered recess times may coincide with "COVID normal" school restrictions.
  7. Increased supervision of children using playground equipment during recess and lunch breaks is recommended, in particular for younger children.



8. It is recommended that primary schools review the management of key transition times such as the 3-4pm period when children leave formal school teacher supervision to go to parents/carers supervision and/or after school care workers supervision. It is also recommended that schools review the out of hours access to school grounds and advise the school community of supervision responsibilities when allowing children to access school playgrounds out of hours (or alternatively, ban access).

### **Physical School Environment and Equipment**

9. All playground equipment should conform to the current Australian Standards with consideration given to reducing the fall height of any new equipment to 1.5m. Innovative landscaping (mounding and excavation) can be used to reduce fall height of slides and climbing equipment.
10. All playground equipment should be inspected regularly for wear and tear. Faults should be repaired promptly and unsafe equipment removed.
11. Loose-fill surfacing should be maintained to at least 30cm depth in all fall zones around and under play equipment by raking each day, and loose-fill in playgrounds should be replenished twice a term (a depth marker of 30cm should be painted on leg supports of equipment and used, along with a marked probe as a guide).
12. Children using playground equipment should be closely supervised at all times to prevent overcrowding and unsafe practices.
13. Regular safety inspection and maintenance of school playground equipment and surfacing is recommended to help address unsafe playground equipment and environment.
15. It is recommended that aggregate injury incident data at the state and/or school regional level is published on the Department of Education website or in annual reports; this information can be used to inform primary school injury prevention policy and practice.
16. It is recommended that playground observational studies are conducted, focused on outdoor play areas and areas containing fixed playground equipment and structures. In particular, observation of the use of these during morning and afternoon (lunch) recesses will help to obtain a better understanding of common precipitating injury scenarios and mechanisms.
17. Qualitative studies of the school community (principals, level leaders, teachers, support staff, school first-aiders, students, parents) in the form of surveys and/or focus groups can be conducted to gather insight into varying perspectives and approaches to school injury prevention that has been successful and share this knowledge.

### **ED and Hospital Admission Injury Surveillance and Research**

### **Primary School Injury Research**

14. Additional primary school injury data could be collected through existing child health surveys conducted by the Department of Education and Training (DET) by including questions (to parents) on child school injuries. This can provide additional information on the cause, circumstances involved, potential supervision issues and equipment issues. The results can be included in the annual *State of Victoria's Children Report*.
18. Additional descriptive data collected through VEMD free-text fields could lead to improved identification of primary school child injury causes and hazardous circumstances. This would include improvements to the recording of location of the injury event and the activity undertaken at the time of injury. This recommendation can be achieved through the current, ongoing in-depth injury surveillance data quality project of ED data in Victoria.
19. Continued monitoring of trends in primary school child injury hospital admissions is recommended, to determine time trends including the impact of the pandemic and return to school after episodes of remote learning.



# INTRODUCTION

Child injuries remain a major cause of deaths, disability, hospital admissions and emergency department (ED) presentations, both nationally and globally, and are not considered inevitable or accidental: they are preventable or can be controlled (World Health Organisation (WHO), 2008; Australian Institute of Health and Welfare (AIHW), 2018). In 2018/19, Victorian children aged 0 to 14 years recorded the highest rate of injury-related ED presentations (8,122.3 per 100,000 population) compared to all other age groups. Fall-related injuries were the leading cause of hospital admissions for children aged 5-14 years of age, accounting for 46% of admissions, followed by hit/struck/crush injuries at 16% (Hayman et al., 2020). These injuries most often occur in the home, yet a significant proportion (13%) also occur in the school environment.

Children spend a great deal of their time outside of home, attending school and undertaking educational activities. Some of their time at school involves varying levels of physical activity and varying levels of injury risk, including participation in structured physical education classes, organised school sports and free play (morning and lunch time recesses). Approximately 23% of all injury-related hospital admissions and the same proportion of ED presentations for primary school-aged children occurred in the school environment, excluding the summer holiday period. In the same cohort, home injuries accounted for 15% of admissions and 35% of ED presentations. It should be noted that a large proportion of admissions (42%) and a smaller proportion of ED presentations (16%) were allocated “unspecified” location codes. Negative impacts of hospital-treated child school injury include long absences from school, medical costs and special care for recovery by families and carers. The long term sequelae of injury can be severe and can have a profound effect on a child’s development and learning capacity. The impact on health care systems is also considerable.

## Childhood

Childhood is considered to be a time for children to play and grow, to be in school to learn, and to develop foundations for future wellbeing with the love and support of their family and an extended community of caring adults (Australian Institute of Health and Welfare (AIHW), 2019; UNICEF, 2020). It is also important to balance injury prevention measures with the need for children to maintain a healthy level of physical activity and a safe level of physical development. Children need to learn how to manage risk and avoid injury while exploring their environment in challenging ways (Little et al., 2010; Brussoni et al., 2012).

The following is an excerpt from a report by Australia’s Berry Street Childhood Institute (Berry Street, 2017) on some of the key issues impacting childhood wellbeing in the 21st century:

- Greater challenges in balancing work and family responsibilities
- Weakening parental confidence around parenting
- Security and safety concerns having an impact on our children’s social interactions
- Insufficient resilience and coping strategies amongst children and young people
- Poor diet – rise of pre-packaged and processed foods
- Lack of exercise – too much time spent indoors on sedentary activities
- Insufficient sleep for children and young people
- The impact of technology and the media.

The health and wellbeing of all children should be an essential priority for all members of the community, including parents and carers, educators, service providers and governments (Berry Street, 2017). As at June 2019, the estimated number of children of approximate primary school age (5 to 12 years) living in Australia was 2.57 million (648,881 in Victoria), with boys making up a slightly higher proportion (51%) of this population compared to girls (49%) (Australian Bureau of Statistics (ABS), 2019).



## Primary school years

Education is compulsory for children aged from 6 to 17 years of age in the state of Victoria. Students attend school for a total of 13 years across the primary and secondary school levels. Primary school classes are divided into Prep (now called Foundation) and Years 1 to 6 (total duration up to 7 years).

Children starting primary school in Victoria must be 5 years of age by 30 April of the year they start school. Year 6 is the final year of primary school at which time students are usually 12 to 13 years of age (Department of Education and Training (Victoria), 2020i). As of February 2020, there were 552,386 full-time equivalent primary school students enrolled in 1,806 Government, Catholic and Independent schools combined in Victoria, 240 of which were Primary through to Secondary school types (Department of Education and Training (Victoria), 2020h).

School takes place five days per week, from around 8:30am to 3:30pm, Monday to Friday. There are four terms in the Victorian school year. School usually starts in late January or early February and runs until mid-December, covering approximately 40 weeks per year. Holidays between school terms last two weeks while the longer summer holiday in December and January runs for 5-6 weeks (Department of Education and Training (Victoria), 2020i).

## Primary schools' duty of care

Central to the health, safety and wellbeing of all students is a school's duty of care obligations. In the state of Victoria, the Department of Education and Training (DET) provides a detailed policy on how to meet these basic requirements (Department of Education and Training (Victoria), 2020b). According to the policy, all school staff *"must take reasonable steps to minimise the risk of reasonably foreseeable harm"* by undertaking the following:

- Providing suitable and safe premises
- Providing an adequate system of student supervision
- Undertaking risk assessments for school activities and events
- Implementing strategies to prevent reasonably foreseeable injuries, whether physical or psychological, to students (including injuries suffered as a result of bullying)

- Ensuring that appropriate medical assistance is provided to a sick or injured student
- Ensuring the school complies with the Child Safe Standards, etc.

In addition to these general requirements, most schools have their own local policies to support staff to meet their duty of care, such as specific health policies, bullying prevention, yard duty and supervision policies and many more. The effective implementation of these policies by all school staff is considered a reasonable step towards preventing foreseeable harm (Department of Education and Training (Victoria), 2020b).

School injury incident reporting should serve several purposes with the key objective being to measure the scale and patterns of child injury and to inform the subsequent development of effective injury prevention strategies. A policy is available on the Victorian Department of Education's website which prescribes a practical six-step approach to school incident management, including identifying and responding to incidents, reporting procedures, ongoing support and recovery, investigation, reviewing and action planning, and lastly, analysing and learning through summary reports and diagnostic analysis of trends (Department of Education and Training (Victoria), 2020g).

In Victoria, all student injury incidents at school or at a school-organised activity are required by the Department of Education to be recorded in a component of the Computerised Administrative System Environment for Schools (CASES/CASES21) administration and finance system used in government schools (Department of Education and Training (Victoria), 2020e, 2020f). Student-related hazard and injury management systems that report to the Victorian state education department are well established; however, aggregate data are not available in the public domain.

## Available data

The incidence of primary school-related injuries treated by GPs and those not requiring health services but treated by school staff or out of school hours service staff are not captured in VISU injury surveillance datasets. Figure 1 depicts the hierarchy of injury in the form of a pyramid representing approximated increasing levels of injury severity. The lowest tier represents the proportion of injuries that occur in the population that are minor and/or require no treatment. They also include injuries that may otherwise require treatment but go unreported. This issue of Hazard describes the second and third tiers (coloured in red), representing injuries resulting in hospital admission and ED presentation, respectively. Ambulance Victoria data are a valuable source of injury incident information and have been effectively utilised by VISU in previous editions of Hazard (87 and 85) but not included in this edition. Cause of Death Unit Record Data (COD) are held by VISU but were not used for this report as case numbers for Victoria were very small: less than 5 for the 11-year period 2007 to 2017.

Figure 1

### Injury Pyramid



## COVID-19 and Remote Learning

At the time of writing, COVID-19 has had a major impact on everyone's day to day lives, particularly on school-aged children and their adaption to remote learning during the various stages of pandemic-related restrictions. These circumstances are unprecedented and the potential effects on children returning to school from a period of remote learning need to be closely monitored.

## Aim

The aim of this edition of Hazard is to provide an in-depth description of primary school injuries in Victoria for the most recent three years of available data and an overview of nine-year injury trends in primary school-aged children, in terms of ED presentations and hospital admissions.

Additional aims are to provide insight into:

1. Profile of injury by age and gender injury profiles
2. Types of injury, causes, and activities undertaken
3. Common scenarios or injury circumstances
4. Changes over time in injury incidence trends.

The utilisation of VISU surveillance data to describe hospital-treated primary school injury can identify key safety issues and related risk factors. Relevant findings can act as the basis for evidence-based priority setting through effective injury prevention and safety promotion initiatives.

## Data Sources

The data sources for this edition of Hazard are the Victorian Emergency Minimum Dataset (VEMD) and the Victorian Admitted Episodes Dataset (VAED). Primary school enrolment and population data were sourced from the Australian Bureau of Statistics (ABS).

IT IS IMPORTANT TO BALANCE INJURY PREVENTION MEASURES WITH THE NEED FOR CHILDREN TO MAINTAIN A HEALTHY LEVEL OF PHYSICAL ACTIVITY AND A SAFE LEVEL OF PHYSICAL DEVELOPMENT. CHILDREN NEED TO LEARN HOW TO MANAGE RISK AND AVOID INJURY WHILE EXPLORING THEIR ENVIRONMENT IN CHALLENGING WAYS.



# RESULTS

**Section A** is a detailed examination of child primary school injuries from the past three years, in terms of various demographic and clinical details.

**Section B** is a broad examination of primary school child injury trends over the past 9 years.

## Overview of methods used to determine patterns of primary school child injury

For the correct interpretation of the presented emergency department presentation and hospital admission data statistics, an understanding of the case selection for each data source is essential.

### Overall case selection

Injury records are extracted from each data set using the same selection criteria to ensure consistency in obtaining comparable subsets. Specific criteria are:

1. Children (resident in Victoria) 4 years and 9 months<sup>1</sup> to 12 years of age (using a year-by-year cohort approach, based on the cut-off dates utilised in Victoria – see Appendix for more detail)
2. All injury causes (all intents)
3. Location of injury event: School and other educational institution
4. Injuries occurring Monday-Friday during school terms (**excluding** school holidays, public holidays and weekends).

<sup>1</sup> Including children who turned five years old by 30 April of the year they started school. For example, for the 2009 calendar year, those born between 1 May 1997 and 30 April 2004 were included in the school cohort for hospital-treated injuries in 2009.

A young boy with brown hair, wearing a white short-sleeved shirt, grey shorts, and black boots, is hanging from a yellow pull-up bar. He is looking upwards with a focused expression. The playground structure is blue with yellow bars. In the background, there is a brick building with a corrugated metal roof and a clear blue sky.

## SECTION A:

# PRIMARY SCHOOL CHILD INJURIES (3 YEARS)

## PRIMARY SCHOOL CHILD INJURY: 2016/17 TO 2018/19, VICTORIA

### **Emergency Department Presentations**

In the three-year period from 2016/17 to 2018/19, there were 26,970 ED presentations for primary school injury among Victorian children, representing an annual average of 8,990 ED presentations. The median age for ED presentations was 8 years and ranged from 4 to 12 years of age; 57% of all cases were male. ED presentations for school injury accounted for approximately 22% of all child injury ED presentations over the 3-year period under study, excluding the summer holiday period.

The number of injuries per year, distribution across age groups, year levels and gender are shown in Table 1. Forty-one percent of children were 7 to 9 years of age, while 36% were aged 10 to 12 years. Alternatively, analysing ED presentations by individual age, ED presentations increased steadily by age, peaking at 11 years (16%, n=4368). However, looking at injuries sustained at school, as a proportion of all child injury ED presentations, children 6 years of age represented the highest proportion at 25%, followed by children 10 years of age at 23%.

Dividing individual year levels into three main groups: junior school (Prep to Year 2), middle school (Year 3 to Year 4) and senior school (Year 5 to Year 6) levels, provides an alternative perspective. In this instance, junior school levels represented 38% of ED presentations, followed by senior school (33%) and middle school (29%). Alternatively, analysing by individual year level, the same increasing linear pattern is observed. Year 6 students represented the highest proportion of ED presentations (17%), followed closely by Year 5 students (16%) and Year 4 students (15%).

SCHOOL INJURY INCIDENT REPORTING SHOULD SERVE SEVERAL PURPOSES WITH THE KEY OBJECTIVE BEING TO MEASURE THE SCALE AND PATTERNS OF CHILD INJURY AND TO INFORM THE SUBSEQUENT DEVELOPMENT OF EFFECTIVE INJURY PREVENTION STRATEGIES.



Table 1

## Primary School Child Injury ED Presentations, 2016/17 to 2018/19: Presentations by Year, Age and Gender

	ED Presentations (school injury)		ED Presentations (all injury) <sup>1</sup>		ED Presentations for school injury as a proportion of all child injury
	N	%	N	%	%
<b>Year</b>					
2016/17	9069	33.6	40174	33.1	22.6
2017/18	8888	33.0	41008	33.8	21.7
2018/19	9013	33.4	40123	33.1	22.5
<b>Age group</b>					
4-6 years <sup>2</sup>	6100	22.6	29197	24.1	20.9
7-9 years	11132	41.3	49482	40.8	22.5
10-12 years <sup>2</sup>	9738	36.1	42626	35.1	22.8
<b>Age</b>					
4 years <sup>2</sup>	96	0.4	688	0.6	14.0
5 years	2514	9.3	12762	10.5	19.7
6 years	3490	12.9	15747	13.0	25.0
7 years	3445	12.8	15722	13.0	21.9
8 years	3694	13.7	16199	13.4	22.8
9 years	3993	14.8	17561	14.5	22.7
10 years	4348	16.1	18900	15.6	23.0
11 years	4368	16.2	19293	15.9	22.6
12 years <sup>2</sup>	1022	3.8	4433	3.7	23.1
<b>Grouped year levels</b>					
Junior (Prep – Year 2)	10214	37.9	47993	39.6	21.3
Middle (Years 3 – 4)	7871	29.2	34339	28.3	22.9
Senior (Years 5 – 6)	8885	32.9	38973	32.1	22.8
<b>School year levels</b>					
Prep/Foundation	3334	12.4	16729	13.8	19.9
Year 1	3444	12.8	15628	12.9	22.0
Year 2	3436	12.7	15636	12.9	22.0
Year 3	3820	14.2	16574	13.7	23.0
Year 4	4051	15.0	17765	14.6	22.8
Year 5	4389	16.3	18997	15.7	23.1
Year 6	4496	16.7	19976	16.5	22.5
<b>Gender</b>					
Male	15480	57.4	67685	55.8	22.9
Female	11490	42.6	53620	44.2	21.4
<b>Total:</b>	<b>26970</b>	<b>100.0</b>	<b>121305</b>	<b>100.0</b>	<b>22.2</b>

<sup>1</sup> Includes typical school calendar year period (late January to mid-December), excludes summer break, includes weekends.<sup>2</sup> Children in these age groups represent only those within minimum enrolment age requirements.

Figure 2 depicts the distribution of ED presentations by year level and gender. A slightly increasing pattern was observed for both genders across year levels, with males peaking in Year 6 (17%, n=2686) and females peaking in Year 5 (16%, n=1870). The ratio of male to female ED presentations also increased with year levels, ranging from 1.3 (57% males vs 43% females) in Prep to 1.9 (66% males vs 34% females) in Year 6 (Figure 3).

Figure 2

Primary School Child Injury ED Presentations, 2016/17 to 2018/19: School Year Levels and Gender

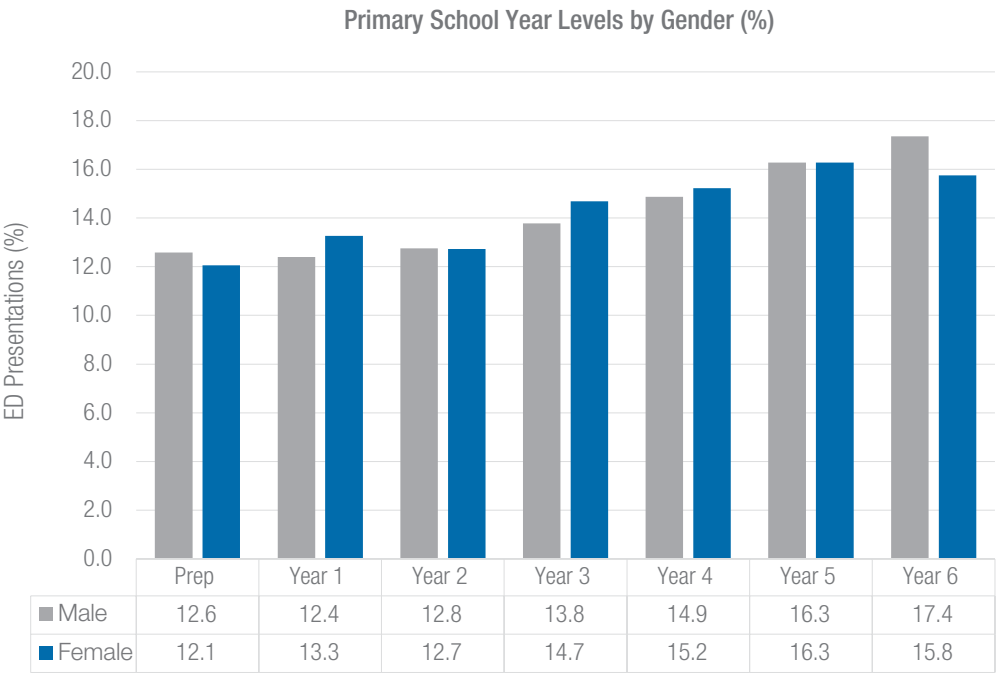
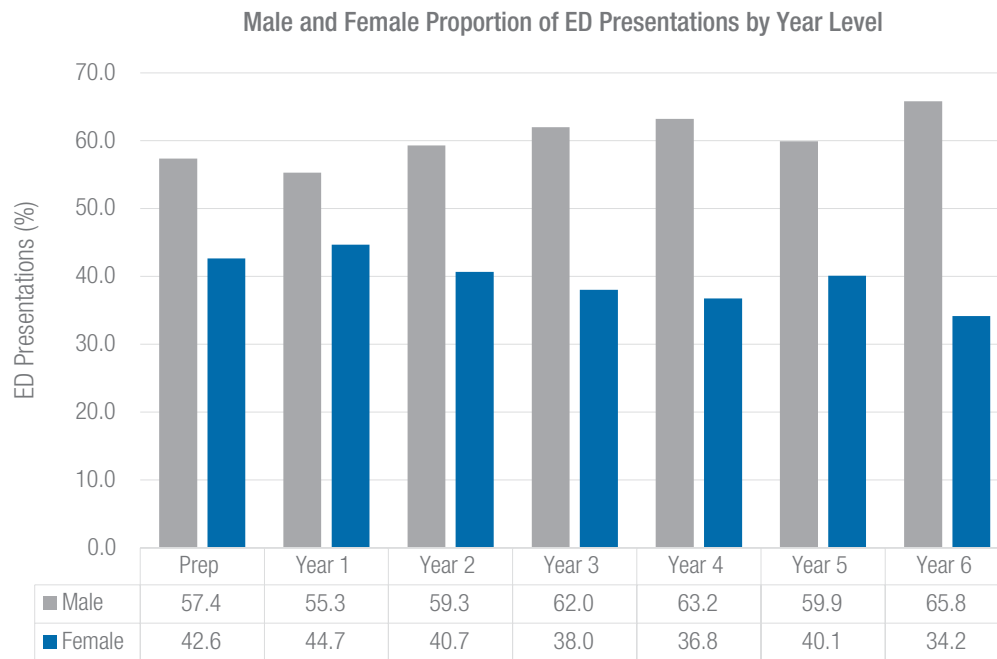


Figure 3

Primary School Child Injury ED Presentations, 2016/17 to 2018/19: Male to Female Proportions by Year Level



Of the 26,970 ED presentations, the largest population, 16,852 (63%) were caused by falls, 4051 (15%) were caused by the child being struck by or colliding with an object, 1869 (7%) were caused by being struck by or colliding with another person unintentionally, 1910 (7%) recorded as other specified unintentional cause and 558 (2%) unspecified unintentional causes (Table 2). There were 24 (0.1%) ED presentations for intentional self-inflicted injuries, 114 (0.4%) ED presentations for intentional injuries inflicted by others and approximately 3% of cases classed as being caused by *other and underdetermined intent*.



Table 2

## Primary School Child Injury ED Presentations, 2016/17 to 2018/19: Cause of Injury

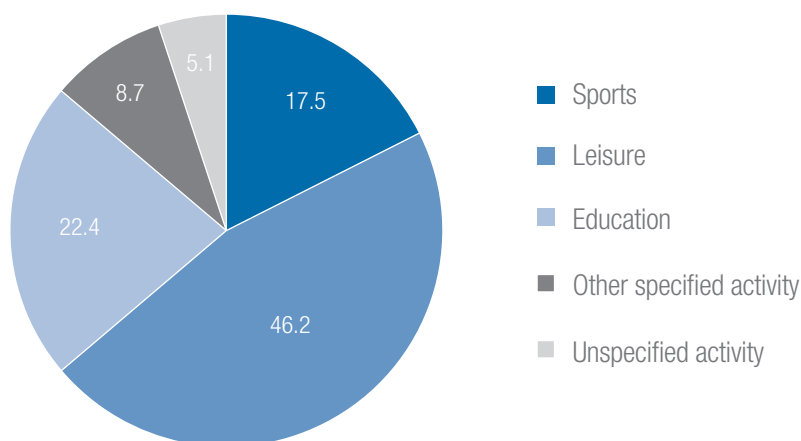
Cause of injury	N	%
Transport	44	0.2
Fall	16852	62.5
Poisoning	18	0.1
Fires/burns/scalds	20	0.1
Natural/environmental/animal	67	0.2
Struck by/collision with person	1869	6.9
Struck by/collision with object	4051	15.0
Cutting/piercing by object	369	1.4
Foreign body	368	1.4
Other specified unintentional cause	1910	7.1
Unspecified unintentional cause	558	2.1
Intentional: self-inflicted	24	0.1
Intentional: inflicted by other	114	0.4
Other or undetermined intent	706	2.6
<b>Total:</b>	<b>26970</b>	<b>100.0</b>

Figure 4 describes the activity at the time of the injury event that the child was undertaking. The most common activity recorded among ED presentations for primary school child injury was leisure/free play (46%, n=12,473), education/learning activities (22%, n=6042), sports (18%, n=4732) and other specified/unspecified activities (14%, n=3723).

Figure 4

## Primary School Child Injury ED Presentations, 2016/17 to 2018/19: Activity at Time of Injury

## ED Presentations: Activity at Time of Injury (%)



The most common injury type among primary school children presenting to the ED in relation to primary school injury type was (bone) fracture, which accounted for 38% of cases (Table 3). Other common injuries included sprains/strains (19%), superficial injuries (11%), open wounds (10%) and intracranial injuries (4%). In 8% of cases, the injury was 'other' or unspecified.

Of the fractures (n=10,335), most common were fractures of the wrist/hand (44%, n=4515), elbow/forearm (38%, n=3937), shoulder/upper arm (8%, n=788) and ankle/foot (6%, n=657). Of the sprains and strains (n=5173), 39% (n=2010) were to the wrist/hand, followed by the ankle/foot (26%, n=1070) and elbow/forearm (15%, n=796). Just over half of superficial injuries (55%, n=1609) and 70% (n=1945) of open wounds were to the head, face or neck.

Table 3

#### Primary School Child Injury ED Presentations, 2016/17 to 2018/19: Overview of Injury Types

Cause of injury	N	%
Superficial injury	2932	10.9
Open wound (excludes eye)	2777	10.3
Fracture (excludes tooth)	10335	38.3
Dislocation	299	1.1
Sprain or strain	5173	19.2
Injury to nerve	15	0.1
Injury to blood vessel	23	0.1
Injury to muscle or tendon	620	2.3
Crushing injury	166	0.6
Injury to internal organ	61	0.2
Burn	17	0.1
Eye injury (excludes foreign body)	275	1.0
Foreign body	518	1.9
Intracranial injury	1163	4.3
Dental injury	114	0.4
Poisoning or toxic effects (excludes bites)	15	0.1
Bite (venomous)	24	0.1
Bite (non-venomous)	74	0.3
Multiple injuries	143	0.5
Other & unspecified injury	2226	8.3
<b>Total:</b>	<b>26970</b>	<b>100.0</b>

An overview of body regions injured is provided in Figure 5. The most commonly injured body region was the upper extremity (n=15,018). Among the upper extremity injuries, the most commonly injured region was the wrist and hand (54%, n=8135), followed by the elbow and forearm (37%, n=5602) and the shoulder and upper arm (9%, n=1281). A quarter of injuries (n=6818) involved the head, face and neck, while 15% (n=4025) accounted for injuries to the lower extremity.

Figure 5

# Primary School Child Injury ED Presentations, 2016/17 to 2018/19: Overview of Injured Body Region

## ED Presentations: Body Region Injured (%)

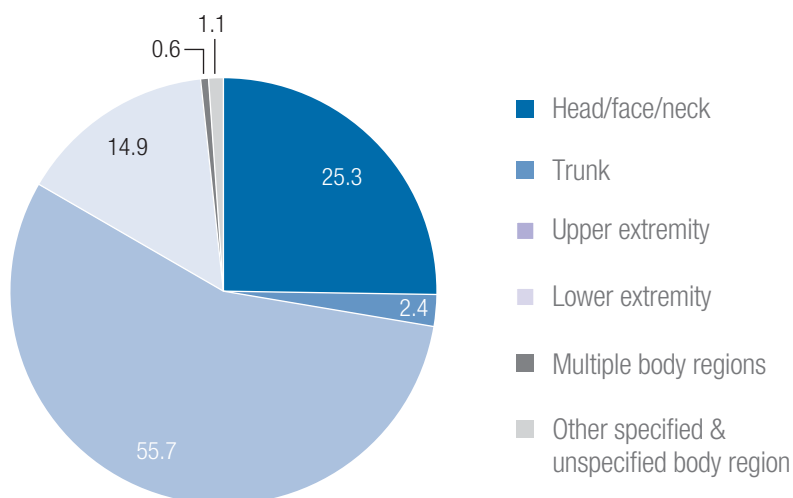
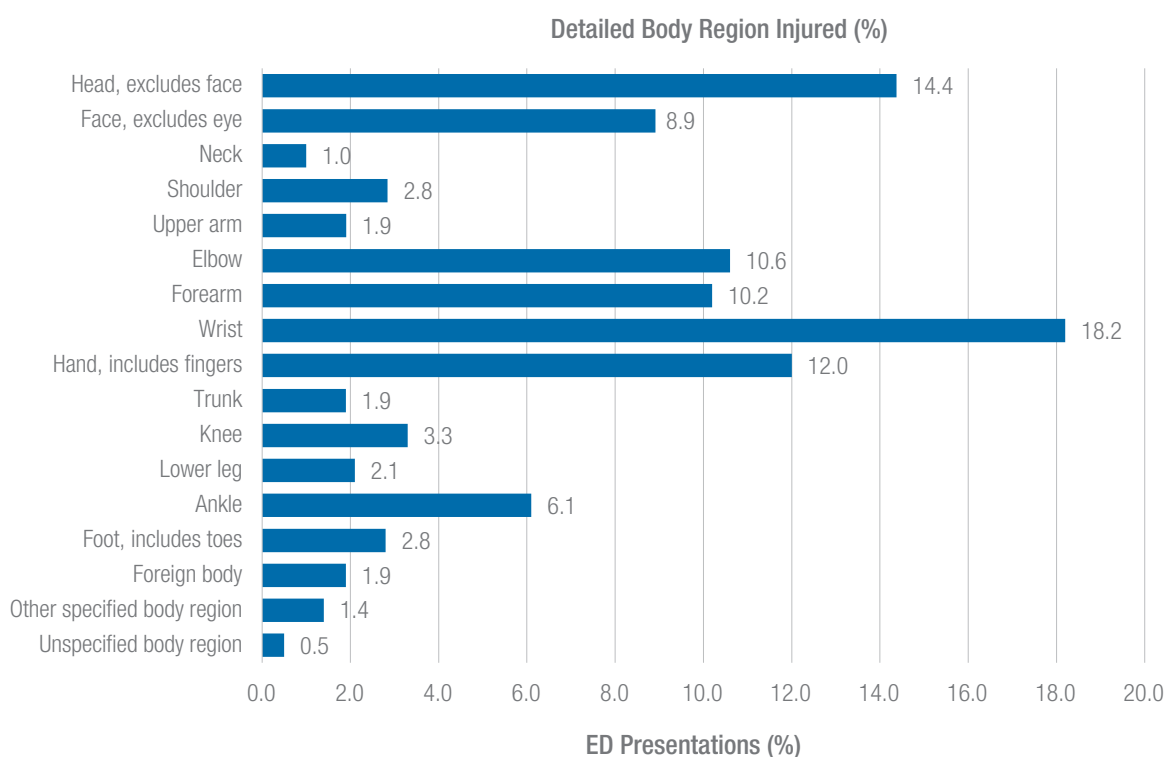


Figure 6 provides a more detailed representation of body region injured among ED presentations for primary school child injury incidents. Injuries involving the wrist accounted for 18% (n=4899) of all ED presentations, followed by injuries involving the head (excluding the face or neck) at 14% (n=3878), and hand/finger injuries representing 12% (n=3236).

Figure 6

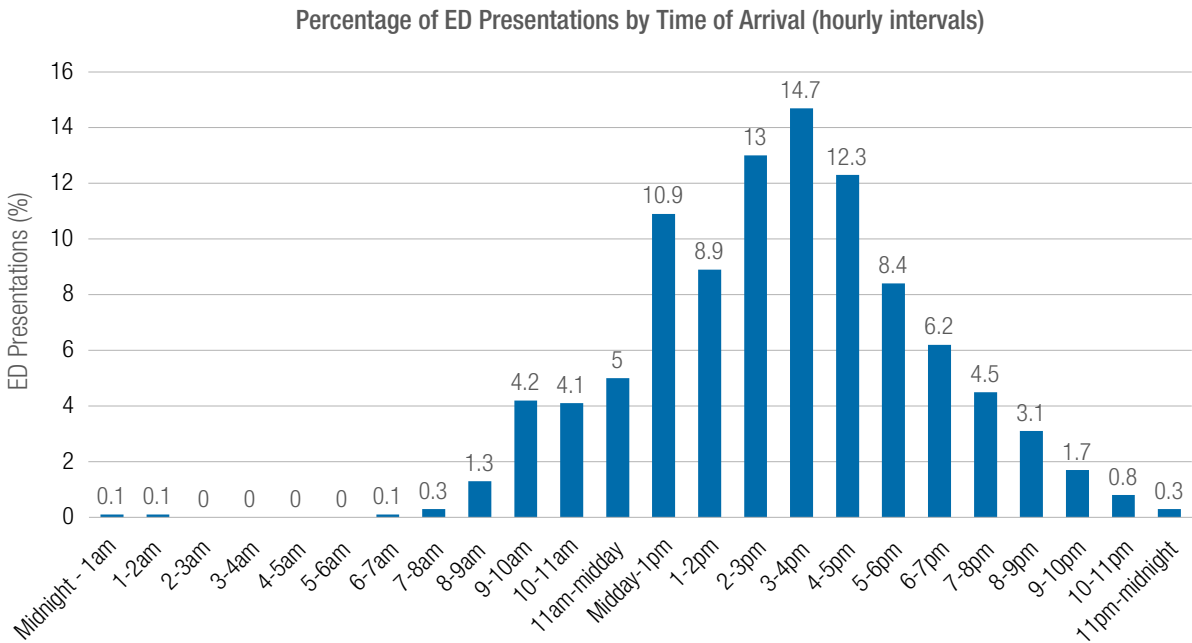
# Primary School Child Injury ED Presentations, 2016/17 to 2018/19: Detailed Injured Body Region



ED presentation times of arrival were collated using hourly intervals and are presented in Figure 7 below. The majority of ED presentations for primary school injuries occurred in the time period of 9am to 9pm, with peaks occurring at midday to 1pm (11%, n=2939), 2-3pm (13%, n=3506), 3-4pm (15%, n=3970) and 4-5pm (12%, n=3314).

Figure 7

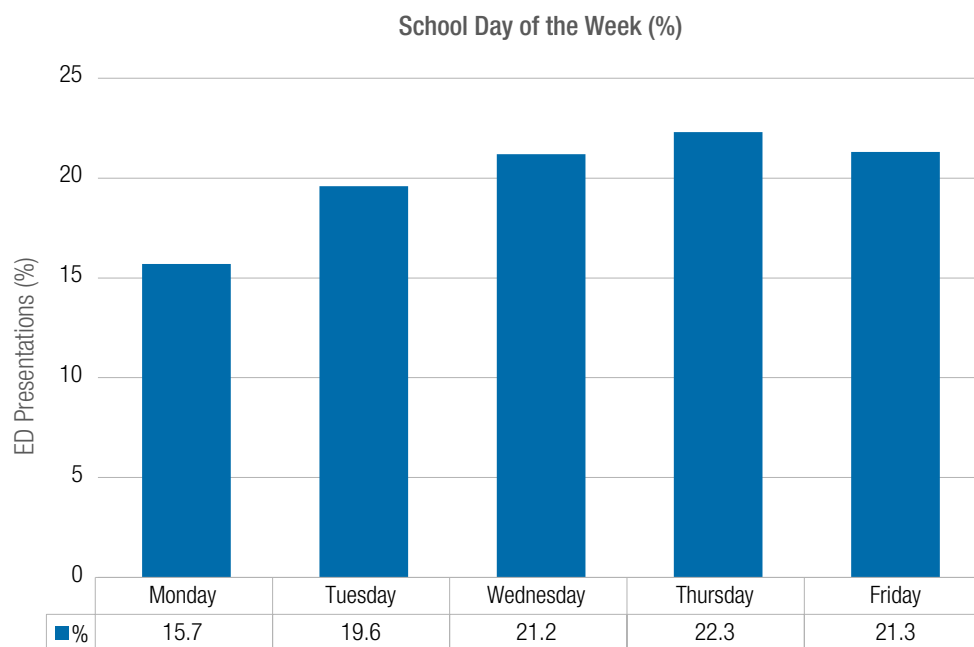
Primary School Child Injury ED Presentations, 2016/17 to 2018/19: Time of Arrival at ED



The number of primary school child injury presentations to the ED differed by day of the usual school week: the pattern is shown in Figure 8. The number of presentations was greatest on Thursdays (22%, n=6013), followed by Fridays (21%, n=5738) and Wednesdays (21%, n=5720). Although proportions were relatively similar, there was a slight observable increase in ED presentations from the beginning of the school week towards the end of the school week. This pattern does not account for day-to-day exposure, i.e. how many children attended school, per day of the week.

Figure 8

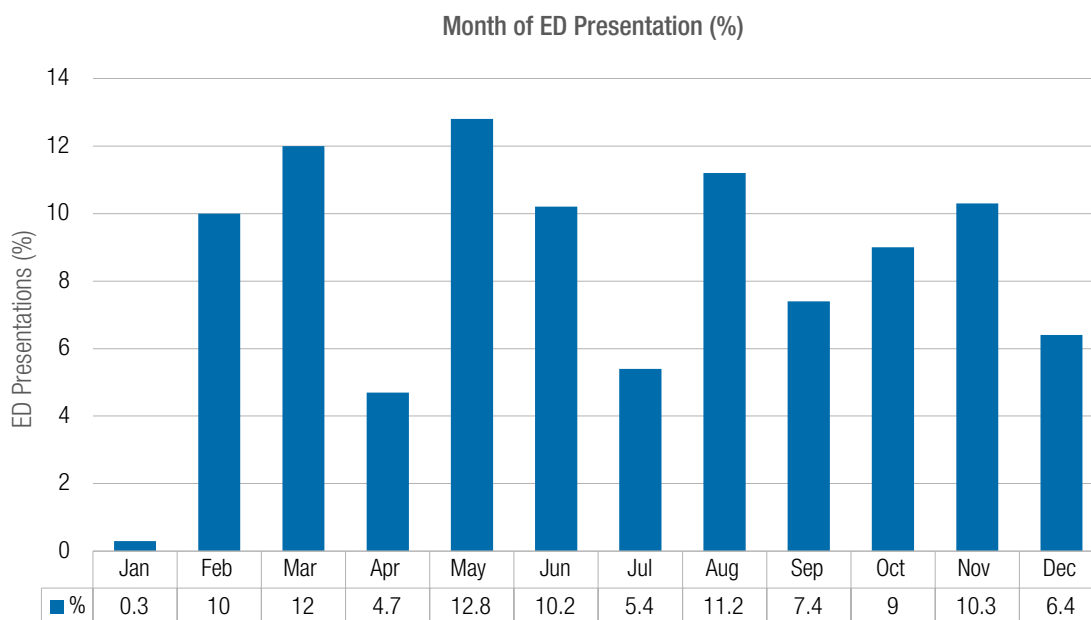
Primary School Child Injury ED Presentations, 2016/17 to 2018/19: Presentations by Day of the School Week



Monthly variation in ED presentations related to primary school injuries is shown in Figure 9. Injuries were most common in May (13%, n=3465) and March (12%, n=3247), and least common in January (0.3%, n=82). It should be noted that, in Victoria, extended school holidays run over the late December period through to almost all of January, as well as the first 2 weeks of April and July, and the last week of September and first week of October. Lower ED presentations during these extended non-school periods can be observed in Figure 9 for the months of January, April, July and December, as expected.

Figure 9

Primary School Child Injury ED Presentations, 2016/17 to 2018/19: Presentations by Month of the School Week



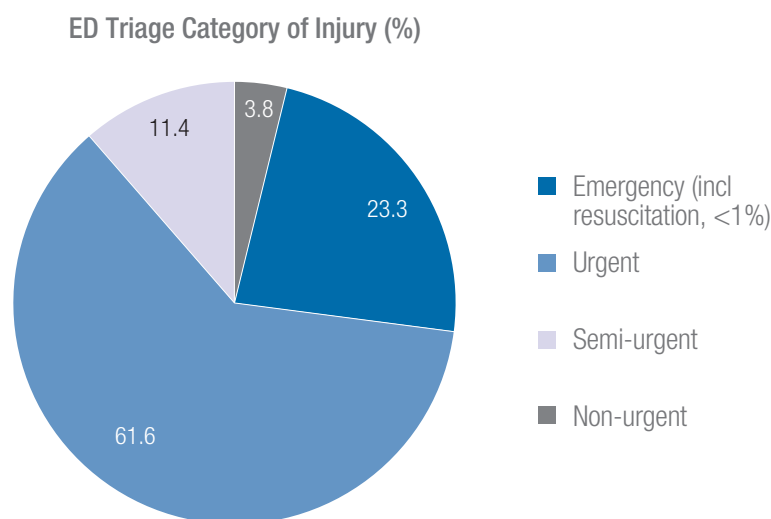


Each ED presentation undergoes triage which involves the use of a systematic classification according to urgency of need for medical and nursing care, using the National Triage Scale. Categories range in scale from 'non-urgent: recommended time to treatment is less than or equal to 120 minutes' through to 'resuscitation: recommended time to treatment immediate, less than or equal to 1 minute'.

Primary school children presenting to the ED were mostly triaged as semi-urgent (recommended treatment less than 60 minutes) accounting for 62% (n=16,606) of children, followed by the urgent group (recommended treatment time less than or equal to 30 mins) at 23% (n=6,271) (Figure 10). Approximately 11% (n=3,069) were grouped as non-urgent (recommended treatment time less than or equal to 120 minutes), while 4% (n=1018) were treated as emergency patients requiring treatment within 10 minutes. A very small proportion (<1%, n=6) required resuscitation (immediate treatment).

Figure 10

Primary School Child Injury ED Presentations, 2016/17 to 2018/19: Triage Category of Injury



An overview of the departure status of children presenting to the ED in relation to primary school injuries is shown in Table 4. Those presenting to hospital were most likely discharged to home (88%), with about 11% (n=2919) of ED presentations being admitted to hospital for further treatment. A small proportion (1%) were transferred to another hospital, while 113 (<1%) cases left before their treatment was completed. No deaths were recorded.

Table 4

Primary School Child Injury ED Presentations, 2016/17 to 2018/19: Overview of Departure Status

Departure Status	N	%
Discharge to home/returning to usual residence	23682	87.8
Admission to ward/procedure room - this campus	2919	10.8
Transfer to another hospital campus	256	0.9
Left before treatment completed	113	0.4
<b>Total:</b>	<b>26970</b>	<b>100.0</b>

## Hospital Admissions

There were 3736 hospital admissions related to primary school child injury in Victoria from 2016/17 to 2018/19. This translates to an average annual frequency of 1245 admissions for this group. The median affected age over this 3-year period was 8 years and ranged from 4 to 12 years of age; 60% of cases were male.

The majority of admissions resulted in the patient separating to home (98%, n=3663) while the remaining 2% were coded as other separation types (e.g., transferred to another hospital or left against medical advice). Approximately 88% (n=3279) of admissions occurred through the emergency department (ED) while the remaining proportion represented a combination of elective, planned or interim care admissions.

The annual number of injury admissions, distribution across age groups, year levels and gender are shown in Table 5. Children aged 7 to 9 years of age accounted for 43% of hospital admissions for primary school injuries over the three-year period. In this age group, school injuries accounted for 23% of all injury admissions. Unlike ED presentations, admissions for injured primary school children decreased with age and year level with Preps accounting for 16% of admissions and Year 6 students accounting for 12%. Almost half (48%) of admissions for primary school injury occurred to children in Prep to Year 2 (Junior levels). Approximately 93% (n=3490) of admissions were to Victorian public hospitals.

INJURY STATISTICS INFORM THE NEXT STEPS TOWARDS THE  
DEVELOPMENT OF PREVENTION STRATEGIES TO ADDRESS  
PRIORITY HAZARDS.

Table 5

## Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Admissions by Year, Age and Gender

	Hospital Admissions (school injury)		Hospital Admissions (all injury) <sup>1</sup>		Hospital admissions for school injury as a proportion of all child injury
	N	%	N	%	%
<b>Year</b>					
2016/17	1209	32.4	5631	31.9	21.5
2017/18	1286	34.4	6096	34.5	21.1
2018/19	1241	33.2	5943	33.6	20.9
<b>Age group</b>					
4-6 years <sup>2</sup>	1132	30.3	5059	28.6	22.4
7-9 years	1604	42.9	7099	40.2	22.6
10-12 years <sup>2</sup>	1000	26.8	5512	31.2	18.1
<b>Age</b>					
4 years <sup>2</sup>	27	0.7	123	0.7	22.0
5 years	474	12.7	2184	12.4	21.7
6 years	631	16.9	2752	15.6	22.9
7 years	567	15.2	2513	14.2	22.6
8 years	526	14.1	2269	12.8	20.9
9 years	511	13.7	2317	13.1	22.1
10 years	470	12.6	2421	13.7	19.4
11 years	425	11.4	2458	13.9	17.3
12 years <sup>2</sup>	105	2.8	633	3.6	16.6
<b>School year levels</b>					
Prep/Foundation	612	16.4	2868	16.2	21.3
Year 1	631	16.9	2711	15.3	23.3
Year 2	558	14.9	2442	13.8	20.6
Year 3	526	14.1	2240	12.7	23.5
Year 4	525	14.1	2389	13.5	22.0
Year 5	454	12.2	2410	13.6	18.8
Year 6	430	11.5	2610	14.8	16.5
<b>Grouped year levels</b>					
Junior (Prep – Year 2)	1801	48.2	8021	45.4	22.5
Middle (Years 3 – 4)	1051	28.1	4629	26.2	22.7
Senior (Years 5 – 6)	884	23.7	5020	28.4	17.6
<b>Type of hospital</b>					
Public	3490	93.4	15961	90.3	21.9
Private	246	6.6	1709	9.7	14.4
<b>Total:</b>	<b>3736</b>	<b>100.0</b>	<b>17670</b>	<b>100.0</b>	<b>21.1</b>

<sup>1</sup> Includes typical school calendar year period (late January to mid-December), excludes summer break, includes weekends.<sup>2</sup> Children in these age groups represent only those within minimum enrolment age requirements.

An overview of the injury cause is provided in Table 6. Three-quarters (76%, n=2837) of admissions for primary school injury to children were caused by falls, followed by children being hit/struck/crushed (18%, n=652). Smaller proportions of admissions were caused by cutting/piercing injuries (1%, n=47), overexertion or strenuous movements (1%, n=45), foreign body (1%, n=28) and natural/environmental/animal-related causes (1%, n=26). Admissions for intentional injuries inflicted by another person accounted for less than 1% (n=13) of cases.

Table 6

Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Number of Admissions per Cause Group

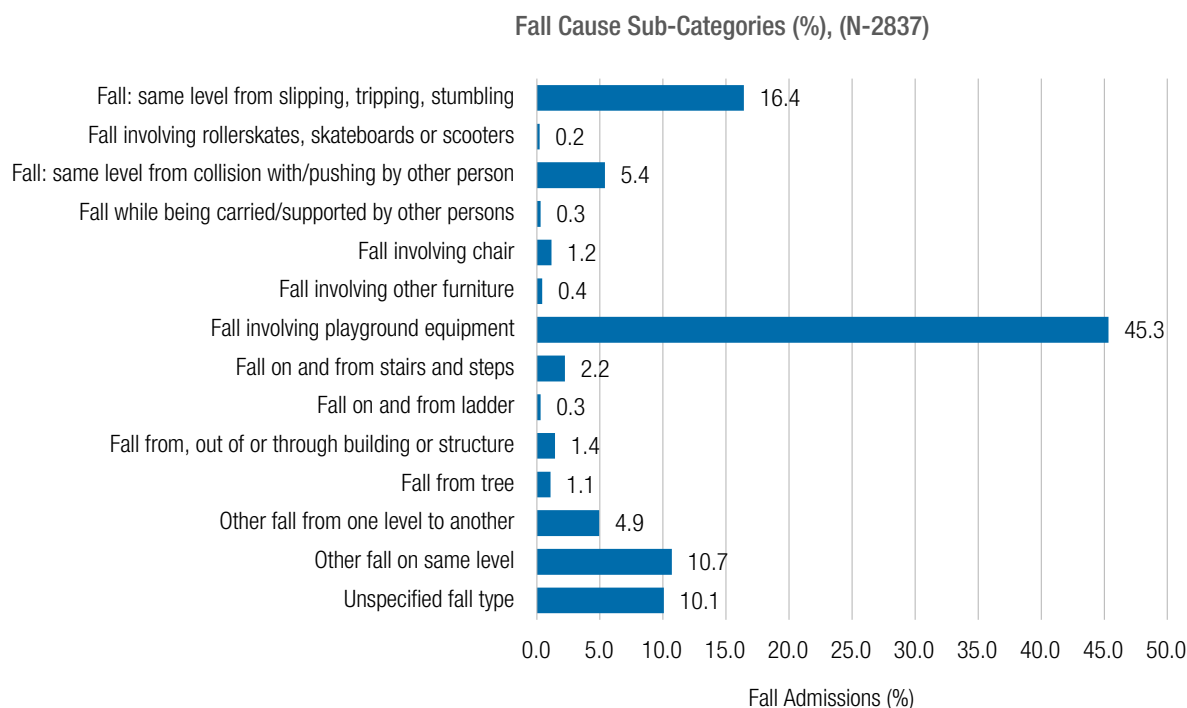
External cause of injury	N	%
Transport accidents	12	0.3
Poisoning	6	0.2
Falls	2837	75.9
Fires/burns/scalds	*	*
Natural/environmental/animals	26	0.7
Choking/suffocation	*	*
Hit/struck/crush	652	17.5
Cutting/piercing	47	1.3
Foreign body	28	0.7
Overexertion or strenuous movements	45	1.2
Other specified unintentional causes	11	0.3
Unspecified unintentional causes	45	1.2
Intentional: self-inflicted	*	*
Intentional: inflicted by other	13	0.3
Other or undetermined intent	8	0.2
<b>Total:</b>	<b>3736</b>	<b>100.0</b>

\*Cases have been suppressed due to small cell counts (<5).

Fall-related admissions were broken down into sub-categories and presented in Figure 11. Of the 2837 fall-related admissions, 45% (n=1286) were due to falls involving playground equipment, followed by same-level falls due to slipping/tripping or stumbling (16%, n=466), and same level falls as a result of colliding with or being accidentally pushed by another person (5%, n=153). Ten percent of falls (n=286) were coded with unspecified cause of fall type.

Figure 11

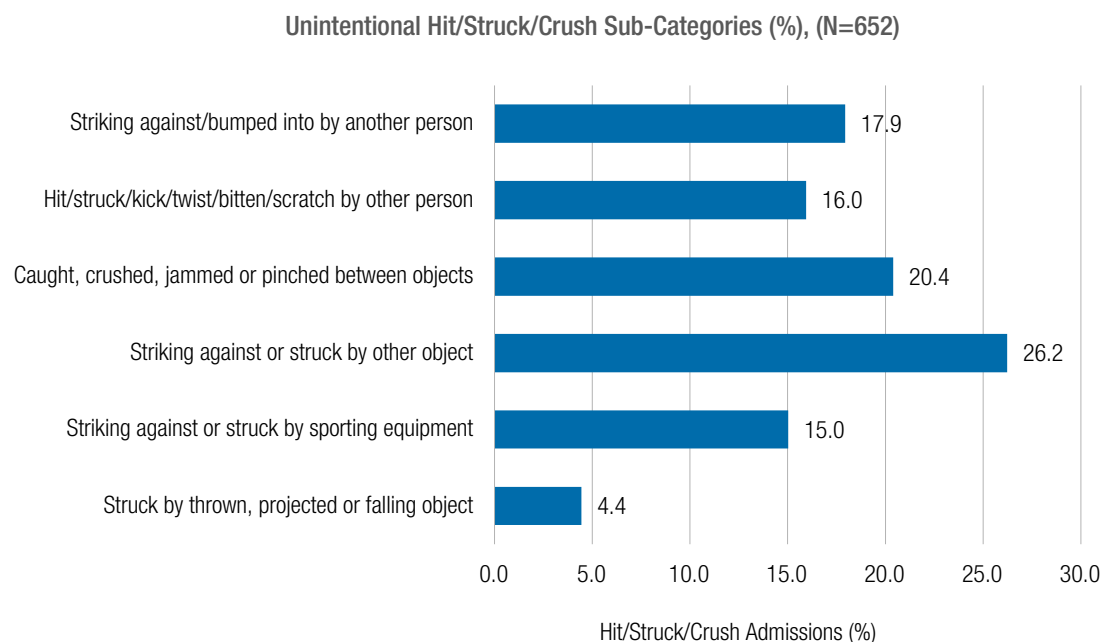
Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Fall Cause Sub-Categories (N=2837)



Unintentional hit, struck and crush primary school child injury admissions were broken down further in Figure 12. Of the 652 admissions relating to unintentional hit/struck/crush injuries, 26% (n=171) were caused by children striking against or being struck by an object, while 20% (n=133) were due to children being caught/crammed, jammed or pinched between objects and 18% (n=117) were due to accidentally striking against or bumping into another person.

Figure 12

Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Unintentional Hit/Struck/Crush Cause Sub-Categories (N=652)





The broad type of activity undertaken by the child at the time of the injury event leading to a hospital admission is shown in Figure 13. Similar to ED presentations, the most common activity being undertaken was leisure-related (includes free play) accounting for 38% of admissions (n=1427), followed by sports-related activities (14%, n=528) and 'other types of work (includes learning activities)' at 6% (n=237). Just over a third (38%, n=1425) of admissions recorded an *unspecified activity* type with this proportion being much higher than the *unspecified activity* proportion of the ED presentations at 18%.

Figure 13

Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Broad Activity Groups

#### Admissions: Broad Activity at Time of Injury Groups (%)

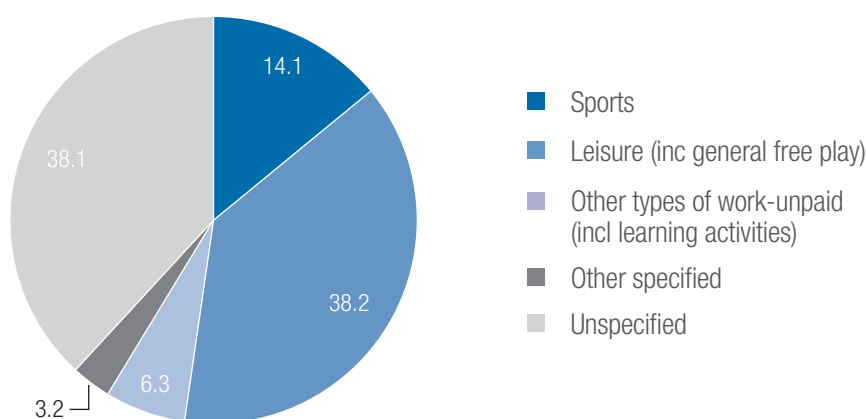


Table 7 highlights the differences in types of activity undertaken at the time of the injury by age group and gender. Girls 4 to 6 years of age were relatively likely to get injured during free play (49%) with only 5% of injuries attributed to school sport activities; however, this pattern changed among girls 10 to 12 years of age where the proportion increased to 18% for sport-related injury. Similarly, for boys, sport-related injury admissions accounted for 8% of admissions among the 4 to 6-year-old group and increased to 29% for 10 to 12-year old children.

Table 7

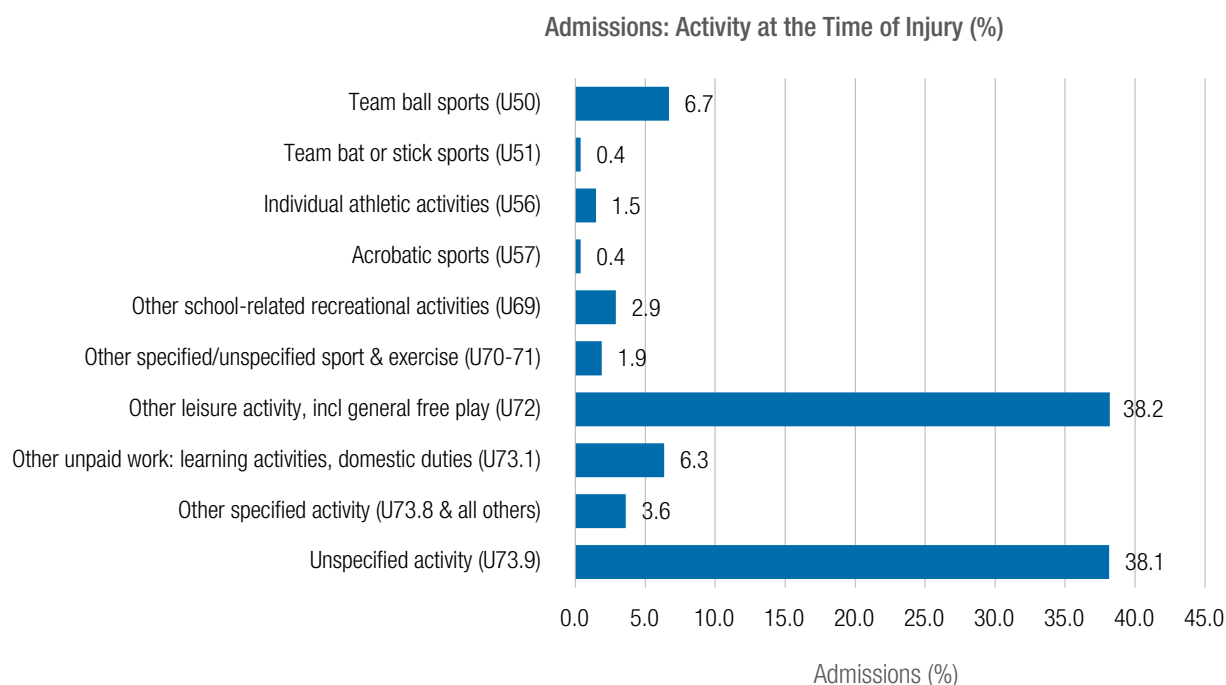
Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Broad Activity Group by Age Group, Gender (%)

Activity	Males %			Females %			All %		
<b>Age group (years)</b>	<b>4-6</b>	<b>7-9</b>	<b>10-12</b>	<b>4-6</b>	<b>7-9</b>	<b>10-12</b>	<b>4-6</b>	<b>7-9</b>	<b>10-12</b>
Sport	8.0	13.9	29.1	5.2	10.5	18.0	6.8	12.6	24.9
Leisure (free play)	39.7	38.9	24.2	49.3	43.4	33.7	43.9	40.6	27.8
Other specified	9.9	8.8	10.7	8.1	9.5	10.9	9.1	9.1	10.8
Unspecified	42.4	38.4	36.0	37.4	36.6	37.4	40.2	37.7	36.5
<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>	<b>100.0</b>	<b>100.0</b>
<b>Total N</b>	<b>635</b>	<b>986</b>	<b>623</b>	<b>497</b>	<b>618</b>	<b>377</b>	<b>1132</b>	<b>1604</b>	<b>1000</b>

Figure 14 provides additional information regarding specific activities undertaken at the time of injury. As mentioned, 38% of activities involved free play/leisure which cannot be broken down further. Sport-related activities accounted for 14% of admissions overall and comprised team ball sports (7% of admissions) such as football (n=100), soccer (n=87) and basketball (n=49). Also included in the sport-related category were individual athletic activities (2%, n=55), team bat or stick sports (<1%, n=14) and acrobatic sports (<1%, n=14). Other school-related recreational activities including school physical education classes accounted for 3% (n=108) admissions.

Figure 14

#### Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Activity at Time of Injury



The most common type of injury among children admitted to hospital in relation to primary school injury was (bone) fracture (60%, n=2222), followed by open wounds (13%, n=481), intracranial injury (10%, n=363), superficial injuries (3%, n=99) and dislocations/sprains and strains (2%, n=69) (Table 8). Ten percent (n=380) of cases were categorised as *other* or *unspecified* injury.

Of the fractures (n=2222), most common were fractures of the elbow/forearm (61%, n=1346), shoulder/upper arm (22%, n=497), wrist/hand (8%, n=166) and knee/lower leg (5%, n=110). Of the open wounds (n=481), 58% (n=280) were to the head, followed by the wrist/hand (19%, n=92) and knee/lower leg (15%, n=73). Just over half of superficial injuries (70%, n=69) were to the head, face or neck. Other and unspecified injuries mostly involved the head/face/neck area (85%, n=322).

Table 8

## Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Overview of Injury Types

Injury type	N	%
Superficial injury	99	2.6
Open wound	481	12.9
Fracture	2222	59.5
Dislocation, sprain & strain	69	1.8
Injury to nerves & spinal cord	*	*
Injury to blood vessels	*	*
Injury to muscle & tendon	17	0.5
Crushing injury	10	0.3
Traumatic amputation	17	0.5
Eye injury- excl foreign body	*	*
Intracranial injury	363	9.7
Injury to internal organs	15	0.4
Foreign body	29	0.8
Systemic: poisoning/toxic effects	22	0.6
Other & unspecified injury	380	10.2
<b>Total:</b>	<b>3736</b>	<b>100.0</b>

\*Cases have been suppressed due to small cell counts (<5)

Figure 15 provides an overview of body region injured and Figure 16 breaks down body regions injured into more detail. Overall, upper extremity injuries accounted for 58% (n=2183) of hospital admissions for primary school child injury, followed by head/face/neck injuries (31%, n=1174). Smaller proportions accounted for lower extremity injuries (7%, n=250), trunk area injuries (3%, n=106) and other specified and unspecified body regions (1%, n=23).

Of the upper extremity injuries, the most common were elbow and forearm injuries (37%), followed by shoulder and upper arm injuries (14%) and wrist and hand injuries (8%). Common head/face/neck injuries were mainly head injuries (29%) and less commonly, neck injuries (2%).

Figure 15

## Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Overview of Injured Body Region

## Admissions: Body Region Injured (%)

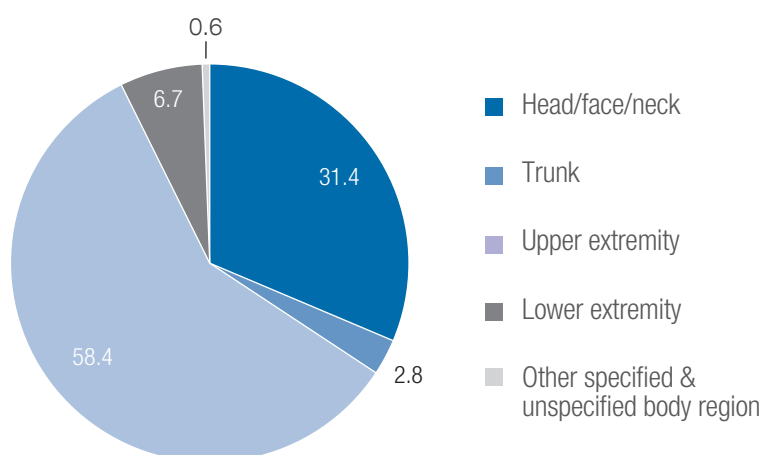
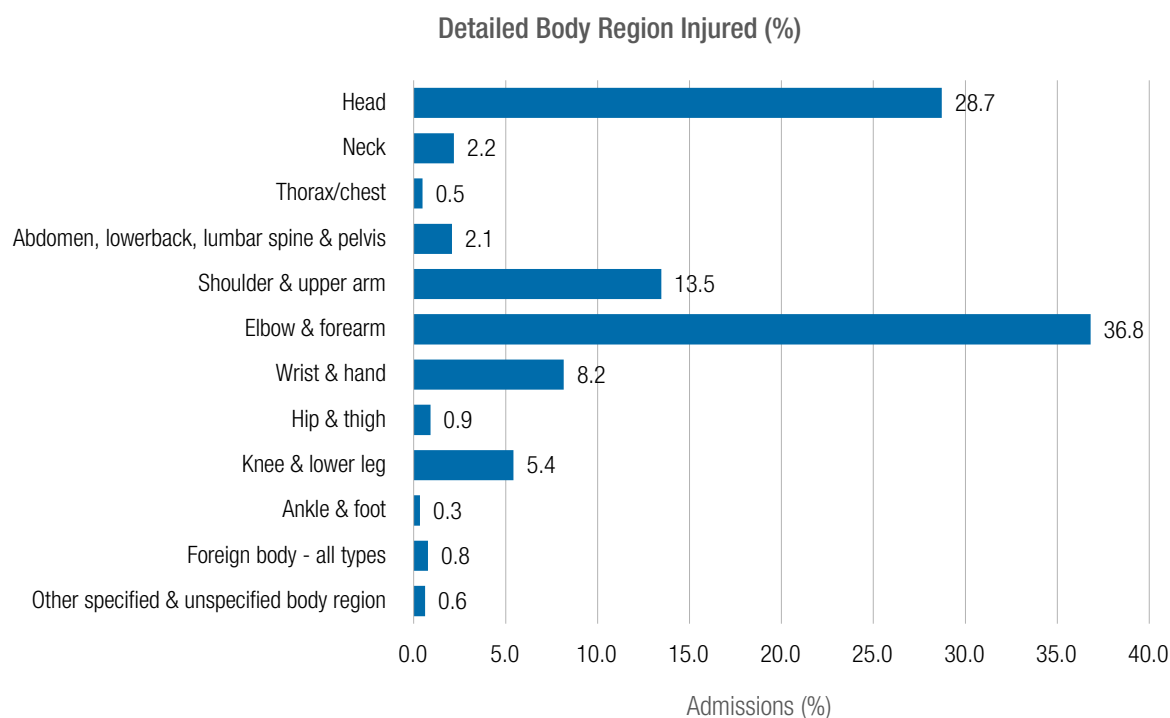


Figure 16

Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Detailed Body Region Injured

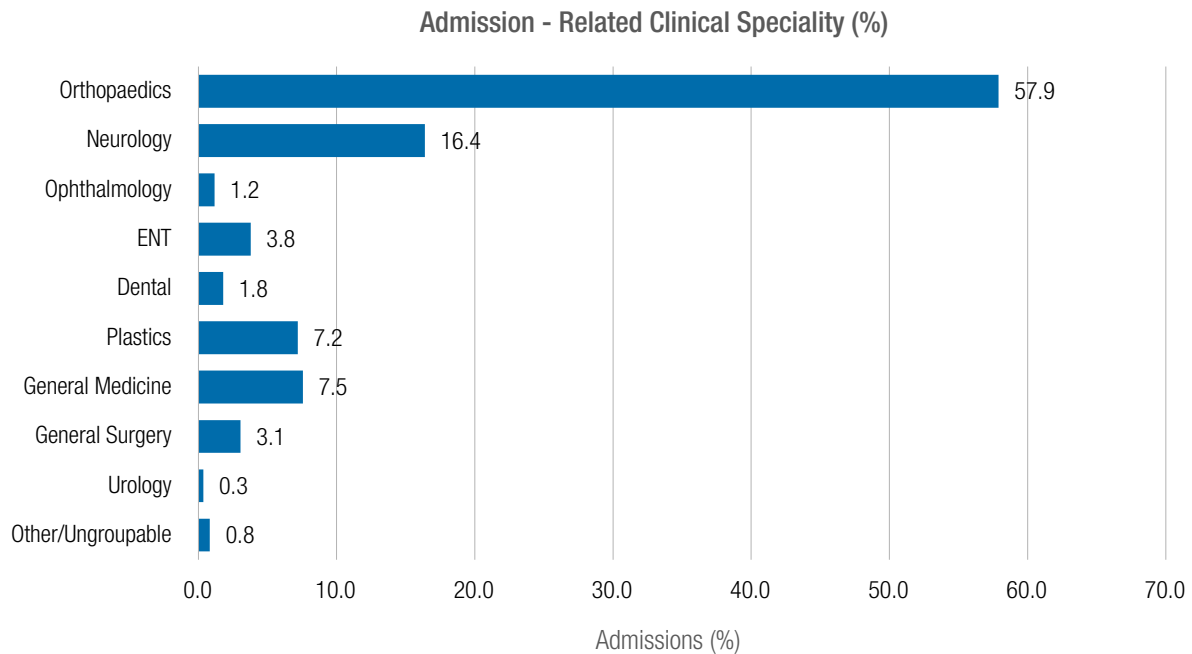


The main clinical speciality involved with each episode of care is detailed in Figure 17. Orthopaedics was recorded for over half (58%, n=2163) of hospital admissions for child primary school injuries. Other clinical specialities included Neurology (16%, n=612), General Medicine (8%, n=282), Plastics (7%, n=269), and ENT (4%, n=141).



Figure 17

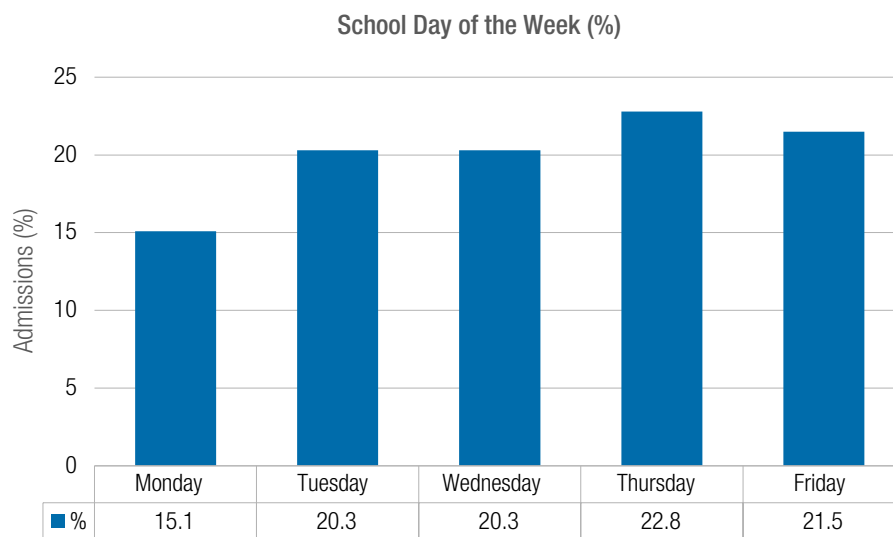
Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Clinical Speciality Associated with Admission



The number of injury admissions differed per day of the week; Figure 18 shows the pattern per weekday. The number of admissions was greatest on Thursdays (23%, n=852) and Fridays (22%, n=802) and lowest on Mondays (15%, n=564). These findings do not take exposure into account; i.e. difference in the number of children attending school, per day of the week.

Figure 18

Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Admissions per Day of the Week

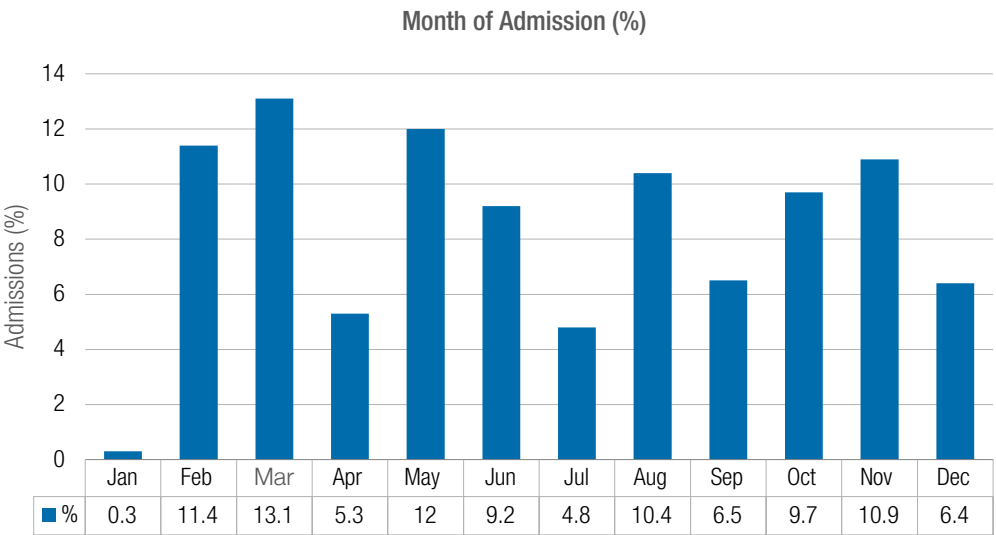


The monthly variation in primary school child injury admissions is shown in Figure 19. Child primary school injuries were most common in March (13%, n=490), February (11%, n=425), November (11%, n=406) and August (10%, n=390) and least common in January (0.4%, n=11). Monthly admission patterns and proportions were very similar to those for ED presentations.

It should be noted that, in Victoria, extended school holidays run over the late December period through to most or all of January, as well as the first 2 weeks of April and July, and the last week of September and first week of October. Lower school-injury hospital admissions during these extended non-school periods can be observed in Figure 19 for the months of January, April, July and December, as expected.

Figure 19

Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Admissions per Month of the Year



THE LONG TERM SEQUELAE OF INJURY CAN BE SEVERE AND CAN HAVE A PROFOUND EFFECT ON A CHILD'S DEVELOPMENT AND LEARNING CAPACITY.

## Burden of Primary School Child Injury

### Length of Stay: 2016/17 – 2018/19 (3 years)

An overview of hospital admission bed days by patient demographics is provided in Table 9. Of the 4493 hospital bed days overall, 2660 (59%) were attributed to boys. The boy to girl hospital bed day ratio increased with increasing age, reaching 1.6 in the age group 10 to 12 years.

Table 9

Summed Length of Hospital Admission Stay (days) Primary School Child Injury, by Age Group and Gender, Victoria, 2016/17-2018/19\*

	Males		Females		Persons	
Age groups	Stay (days)	Column %	Stay (days)	Column %	Stay (days)	Column %
4 – 6 years	752	28.3	616	33.6	1368	30.4
7 – 9 years	1155	43.4	748	40.8	1903	42.4
10 – 12 years	753	28.3	469	25.6	1222	27.2
<b>Total:</b>	<b>2660</b>	<b>100.0</b>	<b>1833</b>	<b>100.0</b>	<b>4493</b>	<b>100.0</b>

\*Calculations for length of hospital stay included transfers within and between hospitals to more accurately estimate burden of injury.

An analysis of the length of stay categories showed that 90% (n=3568) of admissions resulted in the utilisation of fewer than two bed days (Table 10). Similarly, the breakdown by gender showed that males and females experienced a similar proportion of stay fewer than two days (91%, n=2145 vs. 89%, n=1423 respectively). Proportionally, hospital stay of two days or longer were most likely among girls aged 10 to 12 years, with 13% of those admitted staying for two or more days, and least likely among boys aged 4 to 6 years, with 9% of those admitted staying for two or more days (Table 10).

Table 10

Length of Stay (categories) of Primary School Child Injury Hospital Admissions by Age Group and Gender, Victoria, 2016/17-2018/19

	Hospital Admissions			
Age groups	Same day (row %)	Overnight (row %)	2+ days (row %)	Total
<b>Males</b>				
4 – 6 years	305 (45.0)	314 (46.3)	59 (8.7)	678 (100.0)
7 – 9 years	486 (47.1)	446 (43.3)	99 (9.6)	1031 (100.0)
10 – 12 years	353 (54.0)	241 (36.8)	60 (9.2)	654 (100.0)
<b>Male Total:</b>	<b>1144 (48.4)</b>	<b>1001 (42.4)</b>	<b>218 (9.2)</b>	<b>2363 (100.0)</b>
<b>Females</b>				
4 – 6 years	205 (38.4)	274 (51.3)	55 (10.3)	534 (100.0)
7 – 9 years	275 (41.4)	326 (49.1)	63 (9.5)	664 (100.0)
10 – 12 years	195 (49.2)	148 (37.4)	53 (13.4)	396 (100.0)
<b>Female Total:</b>	<b>675 (42.4)</b>	<b>748 (46.9)</b>	<b>171 (10.7)</b>	<b>1594 (100.0)</b>
<b>Grand Total:</b>	<b>1819 (46.0)</b>	<b>1749 (44.2)</b>	<b>389 (9.8)</b>	<b>3957 (100.0)</b>

\*Total N=3957 includes transfers within and between hospitals to more accurately estimate burden of injury.

### Hospital Costs: 2016/17 – 2017/18 (two years)

An overview of primary school child injury hospital admission costs for the two-year period 2016/17 to 2017/18 is given in Table 11. The hospital costs presented here are aggregate figures based on estimations of the direct financial costs incurred by hospitals for an episode of care. Overall, there was an estimated total of \$7.3 million in hospital costs for this time period. Of this total, 56% (\$4.1 million) was accounted for by males. As 60% of primary school hospital admissions in the two-year period were attributed to males (Table 11), this suggests that female admissions were relatively costlier. This is congruent with the previous section which showed that girls 10 to 12 years of age were the group most likely to stay two or more days, when admitted to hospital.

Table 11

Cost of Child Primary School Student Injury Hospital Admissions by Age Group and Gender, Victoria, 2016/17-2017/18\*

	Males		Females		Persons	
<i>Age groups</i>	AU\$	Column %	AU\$	Column %	AU\$	Column %
4 – 6 years	1,206,273	29.3	1,203,385	37.5	2,409,659	32.8
7 – 9 years	1,797,986	43.6	1,238,391	38.6	3,036,377	41.4
10 – 12 years	1,119,355	27.1	770,649	24.0	1,890,003	25.8
<b>Total:</b>	<b>4,123,614</b>	<b>100.0</b>	<b>3,212,425</b>	<b>100.0</b>	<b>7,336,039</b>	<b>100.0</b>

\* Calculations for costs of hospital admissions included transfers within and between hospitals to more accurately estimate burden of injury.



# SPECIAL INTEREST PROFILES OF PRIMARY SCHOOL CHILD INJURY: 2016/17 – 2018/19 (THREE YEARS)

## Injury Profile by Gender

### ED Presentations

#### Boys

There were 15,480 ED presentations for male primary school-aged children injured at school for the 3-year period 2016/17 to 2018/19. The median age for these children was 9 years and the peak-affected individual age was 11 years, accounting for 17% of ED presentations. Notable statistics included:

- 45% injured during leisure/free play activities, while 20% injured during sports activities
- 52% presented with upper extremity injuries followed by head/face/neck injuries (30%)
- 37% of injuries were fractures, followed by open wounds and superficial injuries (12% each), and intracranial injuries (5%)
- 59% of injuries caused by unintentional falls, and 26% due to unintentionally being struck by or colliding with an object or person
- specific injuries were wrist and hand fractures (16%, n=2488), elbow and forearm fractures (14%, n=2130), open wounds to the head (9%, n=1332), and dislocation/sprain/strain of the wrist/hand (7%, n=1074).

A random sample of 500 male cases and their corresponding narrative descriptions were analysed to further understand common injury scenarios. In summary:

- 75 (15%) ball sport-related injury cases including football (n=32), soccer (n=20), basketball (n=13), as well as dodgeball and volleyball: due to falls, collisions, and hit by balls
- 70 cases (14%) involved falls from playground equipment, specifically monkey bars (n=48) – other types included flying foxes, fireman's poles and swings
- 41 cases involved injuries caused by interactions with other children (unintentionally pushed, colliding with, hit by/against); a small number of cases involved instances of fighting, punching, and pushing among students
- 31 cases injured while running (falling, hitting solid objects, into other children); there were 15 cases of boys accidentally running into poles
- 22 cases mentioned seeing a GP first and then being directed to the ED by their doctor.

#### Girls

There were 11,490 ED presentations for female primary school-aged children injured at school for the 3-year period 2016/17 to 2018/19. The median age for these children was 9 years and the peak-affected individual age was 10 years, accounting for 16% of ED presentations. Notable statistics included:

- 49% injured during leisure/free play activities, while 15% injured during sports activities
- 61% presented with upper extremity injuries followed by head/face/neck injuries (19%)
- 40% of injuries were fractures, followed by dislocations/sprains/strains (24%), superficial injuries (10%) and open wounds (8%)
- 68% of injuries caused by unintentional falls, and 24% due to unintentionally being struck by or colliding with an object or person
- specific injuries for girls were wrist and hand fractures (18%, n=2027), elbow and forearm fractures (16%, n=1807), dislocation/sprain/strain of wrist/hand (9%, n=1050), and dislocation/sprain/strain of the ankle/foot (6%, n=660).

A random sample of 500 female cases and their corresponding narrative descriptions were analysed to further understand common injury scenarios. In summary:

- 95 cases (19%) involved falls from playground equipment, specifically monkey bars (n=64, 13%) – other types included flying foxes, balance beam/bars, parallel bars, slides and swings

- Falls from trips/slips (n=27), while running (n=22) – other falls from doing handstands/cartwheels/backflips, down steps/stairs, from trees, from chairs/tables
- Injuries (falls, hit by, colliding with players) involving ball sports (n=37) – football, basketball, soccer, netball, dodgeball, touch rugby, volleyball, tennis
- 37 cases involved injuries caused by interactions with other children (unintentionally pushed, colliding with, hit by/against); 28 cases injured while running (falling, hitting solid objects-walls/poles/other children)
- 22 cases mentioned seeing a GP first and then being directed to the ED by their doctor.

### Boys vs Girls

The main differences observed between genders, in terms of ED presentations were:

- Activity at time of injury (sports): **Boys (20%)** vs Girls (15%)
- Body region injured (upper extremity): Boys (52%) vs **Girls (61%)**
- Body region injured (head/face/neck): **Boys (30%)** vs Girls (19%)
- Nature of injury (dislocation/sprain/strain): Boys (18%) vs **Girls (24%)**
- Cause of injury (unintentional fall): Boys (59%) vs **Girls (68%)**.

## Hospital Admissions

### Boys

There were 2244 hospital admissions for male primary school-aged children injured at school for the 3-year period 2016/17 to 2018/19. The median age for these children was 8 years and the peak-affected individual age was 6 years, accounting for 16% of hospital admissions. Notable statistics included:

- 35% injured during leisure/free play activities, while 16% were injured during sports activities
- 56% admitted for upper extremity injuries followed by head/face/neck injuries (34%)
- 57% of injuries were fractures, followed by open wounds (14%) and intracranial injuries (11%)
- 75% of injuries were caused by unintentional falls, and 19% due to unintentionally being hit/struck/crushed an object or person.

### Girls

There were 1492 hospital admissions for female primary school-aged children injured at school for the 3-year period 2016/17 to 2018/19. The median age for these children was 8 years and the peak-affected individual age was 6 years, accounting for 19% of hospital admissions. Notable statistics included:

- 43% injured during leisure/free play activities, while 11% were injured during sports activities
- 62% admitted for upper extremity injuries followed by head/face/neck injuries (28%)
- 63% of injuries were fractures, followed by open wounds (11%) and intracranial injuries (8%)
- 78% of injuries were caused by unintentional falls, and 15% due to unintentionally being hit/struck/crushed an object or person.

### Boys vs Girls

The main differences observed between genders, in terms of hospital admissions were:

- Activity at time of injury (leisure/free play): Boys (35%) vs **Girls (43%)**
- Activity at time of injury (sports): **Boys (16%)** vs Girls (11%)
- Body region injured (upper extremity): Boys (56%) vs **Girls (62%)**
- Body region injured (head/face/neck): **Boys (34%)** vs Girls (28%)
- Nature of injury (fracture): Boys (57%) vs **Girls (63%)**.

# INJURIES INVOLVING FALLS FROM SCHOOL PLAYGROUND EQUIPMENT

## Hospital Admissions (n=1286)

There were 1286 hospital admissions for primary school children due to falls from playground equipment at schools in Victoria over the three-year study period 2016/17 to 2018/19. This represents 34% of all primary-school injury-related hospital admissions. Cases were selected using the specific ICD-10-AM code for “*Falls involving playground equipment – W09*”. This category includes tree houses, flying foxes, monkey bars, slides, trampolines and more.

The median age for these children was 7 years and the peak-affected individual age was 6 years, accounting for 22% (n=278) of hospital admissions for falls involving playground equipment. Almost half of these cases were between 7 to 9 years of age (48%, n=612), while 53% were male (Table 12).

Falls involving climbing apparatus such as monkey bars and climbing frames accounted for 70% of admissions within this playground equipment subset and 24% of all injurious primary school-related hospital admissions. Girls and boys were evenly divided in terms of frequency of hospital admissions for falls involving flying foxes and climbing apparatus; however, boys comprised almost three-quarters (72%, n=78) of admissions involving slides.

Table 12 lists the most frequent injury types by playground equipment type, which were similarly ranked for each category with varying proportions. As reported in previous sections, fractured elbows and forearms topped the list accounting for 56% of falls involving playground equipment overall, followed by fractured shoulders and upper arms (24%), and open wounds to the head (4%).

Table 12

Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Falls Involving Playground Equipment Overview

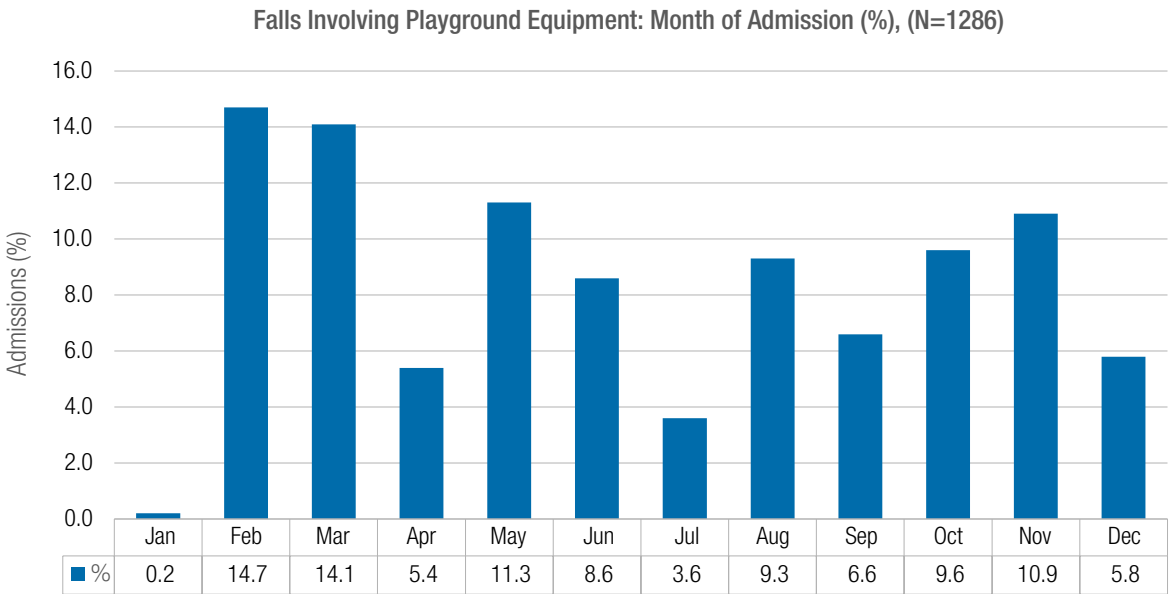
Characteristic	Flying fox (n=64)		Climbing apparatus (n=894)		Slide (n=108)		Other specified & unspecified (n=220)		All school playground equipment falls (n=1286)	
	N	%	N	%	N	%	N	%	N	%
<b>Age groups</b>										
4 – 6 years	16	25.0	368	41.2	48	44.4	70	31.8	502	39.0
7 – 9 years	38	59.4	423	47.3	46	42.6	105	47.7	612	47.6
10 – 12 years	10	15.6	103	11.5	14	13.0	45	20.5	172	13.4
<b>Gender</b>										
Male	32	50.0	429	48.0	78	72.2	140	63.6	679	52.8
Female	32	50.0	465	52.0	30	27.8	80	36.4	607	47.2
<b>Injury type</b>										
Fracture (elbow and forearm)	43	67.2	527	58.9	61	56.5	94	42.7	725	56.4
Fracture (shoulder and upper arm)	11	17.2	229	25.6	22	20.4	47	21.4	309	24.0
Open wound – head	*	*	30	3.4	*	*	16	7.3	49	3.8
Intracranial (head) injury	*	*	22	2.5	*	*	12	5.4	43	3.3
Other specified and unspecified injuries	7	10.9	86	9.6	16	14.8	51	23.2	160	12.4

\*Cases have been suppressed due to small cell counts (<5).

Summer and early autumn months, early in the school year accounted for the bulk of admissions (45%) with February recording 15% (n=189) of admissions, followed by March (14%, n=181) and May (11%, n=145) (Figure 20). April admissions, however, were low at 5% (n=70), presumably due to school holidays and the Easter break. Weekday admissions peaked on Thursdays (24%, n=307) and were lowest on Mondays (16%, n=212). This does not take exposure into account: i.e., attendance vs. absenteeism per day of the week.

Figure 20

Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: Admissions per Month of the Year for Falls Involving Playground Equipment (N=1286)



OBSERVATIONAL STUDIES OF PLAYGROUND EQUIPMENT USE BY SCHOOL CHILDREN DURING RECESS TIMES WOULD PROVIDE GREAT INSIGHT AS TO HOW CHILDREN USE SCHOOL PLAYGROUND EQUIPMENT, THE NUMBER OF CHILDREN USING THE EQUIPMENT AT ANY ONE TIME AS WELL AS INTERACTIONS WITH EACH OTHER AND THE VARYING LEVELS OF ADULT/TEACHER SUPERVISION.

# INJURIES OCCURRING DURING SCHOOL SPORT ACTIVITIES

## Hospital Admissions (n=528)

There were 528 primary school children who required hospital admission, due to school sport activities in Victoria, during the three-year period spanning 2016/17 to 2018/19. Sport-related activities accounted for 14% of all primary school-related admissions and were selected if there was a sport-related ICD-10-AM activity code included in the diagnoses. It should be noted that 38% (n=1425) of all primary school-related admissions were allocated an “unspecified activity” code and therefore sport-related injuries are likely to be underestimated based on coded hospital admission data. It should also be noted that the coding does not allow for the distinction between sport played during a physical education (PE) lesson, at inter-school sports or casual sport-playing activities during recess times or school breaks.

The median age of children in this subset was 9 years, while the peak-affected individual age was 11 years, comprising 24% (n=124) of hospital admissions for school sport-related injury. Almost half (47%, n=249) of these cases were aged between 10 to 12 years of age. A large proportion (70%, n=369) were male students. Stratifying by gender revealed a similar pattern for both boys and girls, with the proportion of sport-related admissions increasing with age: boys 4-6 years (14%, n=51) vs 10-12 years (49%, n=181), and girls 4-6 years (16%, n=26) vs 10-12 years (43%, n=68).

In summary, admissions including a sport-related activity code comprised the following:

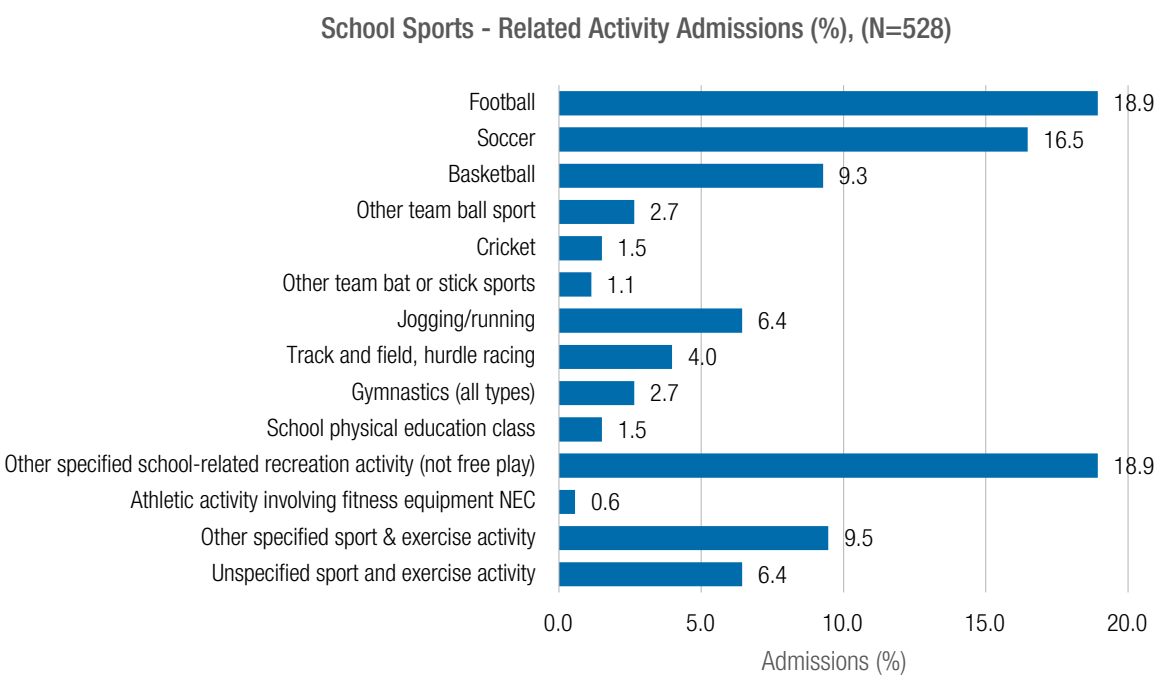
- **Nature of injury:** fractures (60%, n=317), intracranial injury (14%, n=75), open wound (7%, n=35)
- **Body region injured:** upper extremity (51%, n=270), head/face/neck (36%, n=188), lower extremity (11%, n=59)
- **Specific injury types:** fracture of forearm (32%, n=168), intracranial injury (14%, n=75), fracture of wrist/hand (10%, n=53), fracture of shoulder/upper arm (8%, n=43)
- **Cause of injury:** falls (64%, n=338), hit/struck/crush (27%, n=140), overexertion/strenuous movements (4%, n=20)
- **Fall types:** same level from slip/trip/stumble (15%, n=80), involving playground climbing apparatus (11%, n=60), same level due to collision with, or pushing by, another person (8%, n=44)
- **Unintentional hit/struck/crush types:** striking against or struck by ball (8%, n=41), striking against or struck by bat or racquet (2%, n=12), hit/struck by another person (8%, n=40), striking against or bumped into by another person (4%, n=21).



Figure 21 provides an overview of hospital admissions for school sports-related activities. Of those records allocated a sports-related activity code, 19% (n=100) involved Australian Football, followed closely by soccer (17%, n=87), basketball (9%, n=49) and jogging/running activities (6%, n=34). A large proportion (19%, n=100) were coded as “other specified school-related recreation activity”. This category is not further defined in ICD-10-AM apart from the caveat that it does not include “free play” type activities that would occur during recess and lunch break times.

Figure 21

Figure 21 Primary School Child Injury Hospital Admissions, 2016/17 to 2018/19: School Sports-Related Activities, (N=528)



## INJURIES OCCURRING AT OUT OF SCHOOL HOURS CARE (OSHC) SERVICES

### ED Presentations (n=74)

There were 74 ED presentations for injuries to primary school children occurring at Out of School Hours Care (OSHC) Services (also known as Before/After School Care) at schools in Victoria over the three-year period, 2016/17-2018/19. These cases were identified via a VEMD narrative search for the following terms: *after care, before care, after school care, before school care, before school daycare, after school daycare, afterschool care, school care*. The majority (96%) occurred at After School Care. In summary, narratives containing OSHC-related injury terms comprised the following:

- **Age:** 60% between 7-9 years of age; 51% were male
- **Nature of injury:** 37% of injuries were fractures, 23% were superficial injuries/open wounds
- **Body region injured:** 49% involved upper extremity injuries, 35% were head injuries
- **Cause of injury:** 61% caused by falls, 16% by being hit/struck/crushed; 16% were admitted to hospital
- **Fall types:** 30% of injuries involved falls from playground equipment, falls from monkey bars alone accounted for 20% of injuries
- **Triage status:** 30% triaged as requiring urgent/emergency treatment, 55% were semi-urgent.

## INJURIES OCCURRING DURING BEFORE OR AFTER SCHOOL TIMES (NOT IN OFFICIAL CARE SERVICES)

### ED Presentations (n=35)

A total of 35 ED presentations for injuries to primary school children occurring before or after school in Victoria over the three-year period, spanning 2016/17 to 2018/19 were identified via VEMD narrative search. This search identified 8 ED presentations for injuries occurring before school time and 27 occurring after school time on school grounds. Sixty percent were aged between 7-9 years of age and 63% were male; 66% of ED presentations were triaged as semi-urgent.

The majority of injuries were to the upper extremity (60%) and head (23%), while specific injuries were commonly fracture injuries (43%) and open wounds (17%). Almost three-quarters (71%) were caused by falls. Playground equipment-related injuries accounted for 34%, mostly monkey bars, while 17% were sport-related (playing soccer, basketball and football). It should be noted that this is most likely an underestimate of injuries occurring before/after school hours as this information may not be captured in the VEMD narrative.

## INJURIES OCCURRING ON SCHOOL CAMPING TRIPS

### ED Presentations (n=204)

Following an extensive narrative search for common school camp-related terms, a total of 204 ED presentations for injuries to primary school children occurring at school camps in Victoria over the three-year period (2016/17-2018/19) were identified. It should be noted that these cases were extracted from the primary school cohort dataset which included **all** injuries for primary school-aged children (n=121,305). All place of injury groups and ED presentations for every day of the week and months of the year were included, with the exception of the 6-week summer break period. School camps are held in a variety of locations including national parks, farms, holiday/camping resorts and therefore, using the school location code (school injury dataset) would not capture all cases.

In summary, narratives containing school camp-related injury terms comprised the following:

- **Age range:** 5 – 12 years, 60% aged 10 and 11 years; 59% were male
- **Nature of injury:** 35% fractures, 21% dislocation/sprain/strain, 14% open wound
- **Body region injured:** 28% wrist/hand, 20% elbow/forearm, 15% head
- **Cause of injury:** 51% were falls, 15% hit/struck/crush; 11% admitted to hospital
- **Triage status:** 62% semi-urgent, 19% emergency/urgent
- **Activity undertaken (coded data):** 57% leisure, 15% educational
- **Location:** 34% place for recreation, 27% schools and public buildings
- **Peak days/months:** Wednesday (20%), Thursday (21%); March, October, November (15% each)

Common scenarios from narrative analysis included:

- 10% occurred during vital activities – eating, sleeping, bathing (including falls from the top of bunk beds (n=10), fingers jammed in doors (n=8) and 7 cases of children slipping in bathrooms and running into doors).
- The majority of falls were from heights such as climbing walls, giant swings, trees, playground equipment, ropes, flying foxes, bunk beds, and the rest involved trips/slips on rocks and logs, falls from bike riding and ice-skating.
- 31 cases involved the child being unintentionally hit/struck/colliding with an object or another child. Objects included sticks, torches, sporting equipment (golf club, frisbee, swing, surfboard).



## SECTION B:



# SECTION B: PRIMARY SCHOOL CHILD INJURY TRENDS (9 YEARS)

## NINE-YEAR TRENDS IN PRIMARY SCHOOL CHILD INJURY (2010-2018)

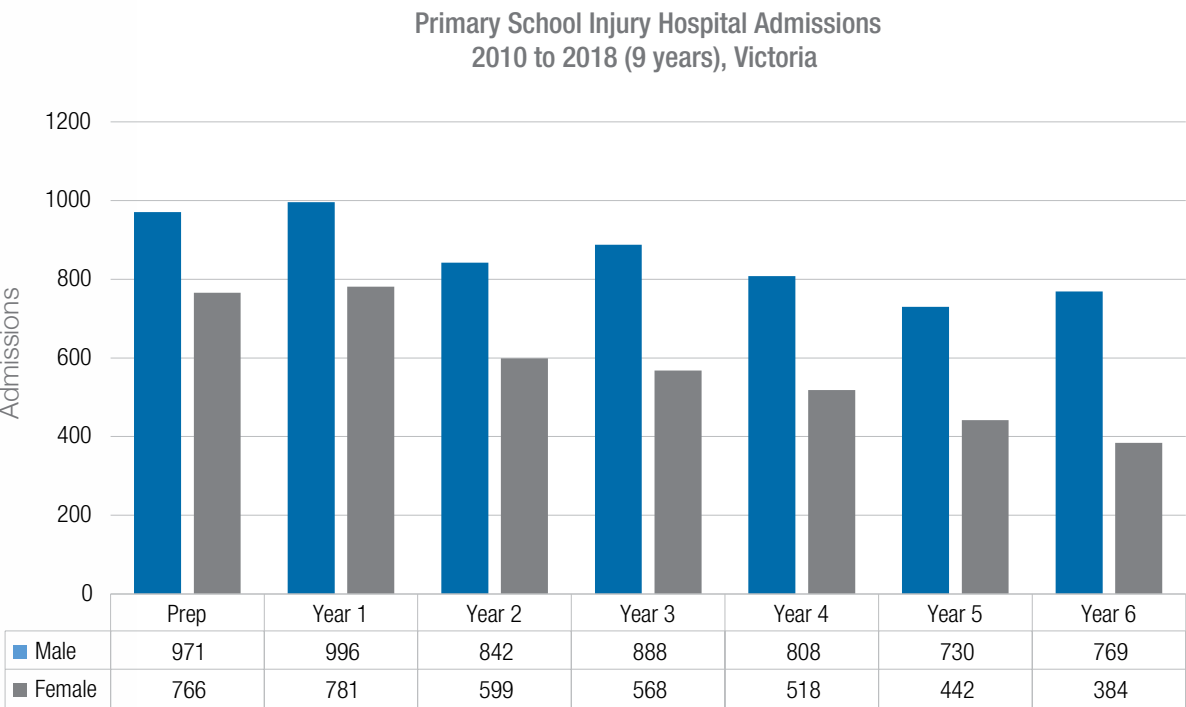
In the nine-year period from 2010 to 2018, there were 10,062 hospital admissions (an average of 1006 per year) in relation to primary school child injury in Victoria. An overview of the frequencies, school enrolment-based rates and trends are given in the tables and figures below.

### Hospital Admissions

The hospital admissions profile related to primary school child injury for boys and girls, by school Year-level, for the 9-year period in focus, is shown in Figure 22. Hospital admissions were most common at Prep and Year 1 levels, for both boys and girls. The number of admissions decreased with increasing Year-level, but this pattern was much more pronounced among girls than boys: the boy to girl ratio increased from 1.3 at Prep-level to 2.0 at Year 6-level.

Figure 22

Nine Years of Primary School Child Injury Related Hospital Admissions in Victoria, 2010 to 2018 (calendar years): Frequencies by School Year Level (Yr) and Gender





For the nine-year period 2010 to 2018, enrolment-adjusted rates of child primary school-related hospital admissions are shown in Figure 23; the results are shown per school Year levels (grouped as Prep and Year 1; Years 2- 4, and Years 5 & 6) and overall.

Statistical analysis of the rates and trends in primary school child injury-related hospital admissions are summarised in Table 13. The average annual rate over the nine-year period was 224.6 hospital admissions per 100,000 full-time equivalents (FTEs). These rate changes may have been influenced by the Victorian hospital admission change in 2012, as further explained in the Discussion section. Overall, there were no statistically significant time trends in primary school injury admission rates over this time period. Appendix C provides an overview of *overnight hospital admission* rates, which are less sensitive to the 2012 Victorian hospital admission policy change. The average annual rate over the nine-year period was 129.2 *overnight* hospital admissions per 100,000 FTEs; there was a 2% annual decrease in overnight admissions during this time period. This trend was observed among boys (-2.3% per year) and girls (-2.1% per year).

Figure 23

Nine Years of Primary School Child Injury Hospital Admissions in Victoria, 2010 to 2018 (calendar years): Admission Rates by School Year Level. Rates are calculated per 100,000 full-time equivalents (FTE), as per Victorian school enrolment data

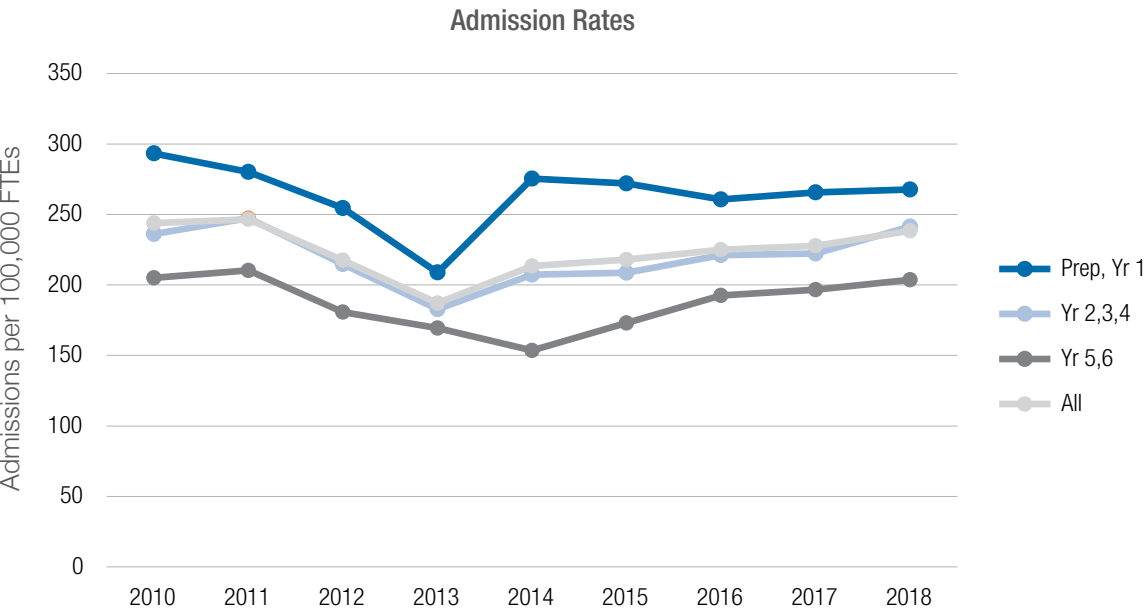


Table 13

Nine Years of Primary School Child Injury Hospital Admissions in Victoria, 20010 to 2018 (calendar years): Admission Rates by School Year Level. Rates are calculated per 100,000 full-time equivalents (FTE), as per Victorian school enrolment data

	Hospital Admissions	
	Average annual rate (admissions per 100,000 FTE) *	Annual change in rate (%) <sup>†</sup>
<b>Male</b>		
Prep, Year 1	288.3	-0.1 [-2.3, +2.2]
Year 2, 3, 4	259.2	+1.3 [-0.5, +3.0]
Year 5, 6	236.8	-0.2 [-2.1, +1.8]
All males	261.7	+0.5 [-0.7, +1.6]
<b>Female</b>		
Prep, Year 1	238.2	-0.7 [-3.1, +1.8]
Year 2, 3, 4	179.6	-1.9 [-4.5, +0.9]
Year 5, 6	136.1	-0.3 [-3.1, +3.7]
All females	184.9	-1.0 [-2.6, +0.6]
<b>Grand total</b>	<b>224.2</b>	<b>-0.1 [-1.2, +0.9]</b>

\*FTE= Full time equivalents, as per Victorian school enrolment data. †None of the annual changes displayed in this table were statistically significant





# DISCUSSION

## Main findings from the most recent three years

In the three-year period, from 2016/17 to 2018/19, there were 26,970 ED presentations and 3,736 hospital admissions for children injured in Victorian primary schools. Male students represented the majority of ED presentations (57%) and hospital admissions (60%). The peak affected age for hospital-treated injury was 8 years and the most frequently injured age group were 7 to 9-year old children, accounting for 41% and 43% of ED presentations and hospital admissions, respectively.

Common injuries from both sources involved fractures, mostly to the wrist/hand and elbow/forearm; several included the shoulder/upper arm as well. Other injuries mentioned were open wounds to the head and upper extremity areas, and intracranial injuries including concussions. Overwhelmingly, the most frequent cause of these injuries was falls (63% of ED presentations, 76% of hospital admissions), followed by being unintentionally hit/struck by objects or other persons (22% of ED presentations, 18% of hospital admissions).

In the results presented in this edition of *Hazard*, almost half (45%) of fall-related hospital admissions were due to falls from school playground equipment, and 16% were a result of children slipping/tripping or stumbling. The most common activity recorded at the time of the injury were leisure/free play type activities (46% of ED presentations, 38% of hospital admissions). School sports-related activities accounted for 18% of ED presentations and 14% of hospital admissions. Younger children tended to be involved in playground equipment falls, while older children were more commonly injured playing school sports.

Boys and girls generally had similar injury patterns but some noticeable differences were found: boys were more likely to be injured while playing sports (boys 20% vs girls 15% of ED presentations; boys 16% vs girls 11% of hospital admissions), and more likely to sustain injuries to the head/face area (boys 30% vs girls 19% of ED presentations; boys 34% vs girls 28% of hospital admissions). Hospital admissions for leisure/free play activity were relatively slightly more common for girls (63%) compared to boys (57%).

### School playground equipment injuries

There were 1,286 (34%) hospital admissions of primary school children due to falls from playground equipment on school grounds. Children tended to be young with the most frequent age at the time of injury being 6 years (22%); almost half of these cases were aged between 7 to 9 years of age (48%), while 53% were male. Falls involving climbing apparatus such as monkey bars and climbing frames, accounted for 70% of admissions within

this playground equipment subset and 24% of all injurious primary school-related hospital admissions. Fracture-related school injuries were the focus of a New Zealand study that found almost half occurred as a result from playground equipment falls, with forearm/elbow fractures the most common type of fracture involved (Rubie-Davies et al., 2007).

Playground falls continue to be a common cause of injury for children in all settings, nationally and internationally (Nixon et al., 2003; Pitone et al., 2006; R. Mitchell et al., 2007; Moorin et al., 2008; Macpherson et al., 2010; Morrongiello et al., 2015; Bierbaum et al., 2018).

The issue of falls from playground equipment has formed the basis for several past issues of VISU's *Hazard* publication (see editions 3, 10, 14, 16, 25, 29, 44, 53, 61, 65, 77). *Hazard* 77, published in 2014, in particular provides a detailed overview of hospitalised fall injuries from playground equipment that also includes the school setting. Historically, analytic studies conducted in Victoria and elsewhere have demonstrated strong associations between playground equipment fall injury (and arm fracture) with equipment-related risk factors and surface-related risk factors. Research studies have shown that falling from playground equipment heights greater than 1.5 metres significantly increases a child's risk of injury (Chalmers et al., 1996; Mott et al., 1997; Macarthur et al., 2000; Sherker et al., 2005).

### Equipment-related risk factors

- The height of the equipment (Chalmers et al., 1996; Mott et al., 1997; Mowat et al., 1998; Macarthur et al., 2000; Laforest et al., 2001; Sherker et al., 2005)
- The height of the fall (Macarthur et al., 2000; Sherker et al., 2005)
- Inadequate hand/guardrails (Mowat et al., 1998)

### Surface-related risk factors

- Surface impact attenuation (Laforest et al., 2001; Sherker et al., 2005)
- The use of appropriate (non-impact absorbing) surface material (Chalmers et al., 1996; Mowat et al., 1998; Laforest et al., 2001)
- Surfacing not meeting recommended standards (Mowat et al., 1998)
- Inappropriate under-surfacing substrate material (soil rather than sand under tanbark) (Sherker et al., 2005)



The current Australian Standards for playground equipment (AS 4685.0: 2017 and AS 4685.1:2014) specify maximum free fall heights of 3.0 metres, increased from the 2004 standard which was set at 2.5 metres. However, the maximum free height of fall from upper body equipment such as monkey bars and track rides (flying foxes) in the current standard remains at 2.2 metres (Standards Australia, 2014, 2017). As this report's focus is on schools and not on playground equipment-related injury in all settings, it is not possible to make any comparisons with playground fall injury rates and changes in these standards for recent years.

Additional protection against injury involving playground equipment is provided by various types of cushioning and under-surfacing materials used in and around playground equipment (and its maintenance). The Australian Standard outlines commonly used impact attenuating materials (tan bark, woodchips, sand and loose gravel), depths and corresponding critical fall heights (Standards Australia, 2014). Generally, a minimum depth of 30mm of loose particulate material is required for fall heights of 3 metres or less which must be adequately maintained to ensure compliance and contribute to injury risk reduction. Section 8 of the 2017 standard specifically requires the establishment of a playground equipment safety management system comprising systematic documentation and record-keeping processes, the development of risk assessments and reporting procedures, relevant staff training, incident procedures and a schedule of regular inspections, maintenance and repairs (Standards Australia, 2017). In this edition of Hazard, analysis of ED data narratives did not provide any information regarding the type or depth of playground under-surfacing material associated with playground equipment fall injuries. Timely follow-up studies with on-site investigation of where the injury occurred would be beneficial in providing information regarding surfacing issues and other potential contributing factors.

There are many voices in the discussion around making playground equipment safer: child play activists argue that reducing the risk of injury diminishes the fun, challenge and developmental benefits of playground equipment (Little et al., 2010; Brussoni et al., 2012; Cassell et al., 2014; Brussoni et al., 2015). However, injury prevention professionals support a more collaborative and evidence-based approach that can lead to thoughtful and creative playground equipment designs that meet all the objectives (fun, challenging, meeting physical activity guidelines and safe).

School playground equipment is used slightly differently to public park playground equipment: they are generally used by a large number of children at once; there is no parental supervision; instead, supervision is provided by the 'yard duty teacher(s)' who are responsible for students in all areas of the school and not just areas

with playground equipment. The injury data presented in this edition of Hazard suggest that there is potential to improve playground equipment safety in schools.

Falls involving playground equipment were relatively common in February and March compared with the period September to November, which are also warm weather months. This could be due to children being new to the playground and the setting; this is supported by the relatively high rates of falls observed in younger school children. Strategies to reduce playground falls can include improved supervision during recess and lunch breaks, improved equipment safety, and better awareness of safety among school children. The latter could be achieved by a 'playground safety induction' for Preps and Year 1 students at the start of the school year: for example, setting guidelines for the number of children using the playground at the same time.

Ultimately, to obtain a clearer picture of common injury scenarios and precipitating events involving school playground equipment and structures, observational studies of playground equipment use by school children during recess times would be highly beneficial. Exposure studies would provide great insight as to how children use school playground equipment, the number of children using the equipment at any one time as well as interactions with each other and the varying levels of adult/teacher supervision. In addition, as Victorian schools already record student and staff injury incident reports systematically using the DET CASE21 platform, opportunities for injury prevention researchers to access and analyse aggregated and deidentified data would assist in the early detection of emerging injury patterns and issues. Finally, qualitative studies of staff, students and parents from representative schools in metropolitan and regional areas in the form of surveys and/or focus groups to obtain perspectives and ideas around what works well in their schools in terms of playground injury would also add value.

### **Injuries during school sport activities**

School sports activities accounted for 14% of hospital admissions for injury within this cohort. Based on injury surveillance datasets, it cannot be distinguished if these sports took place during free play time or during physical education (PE) classes or in-school organised sports sessions. Almost half of the cases (47%) were older children, 10 to 12 years of age, 70% of whom were male. Common types of injury included fractured forearm (32%), intracranial injuries (14%), fractured wrists/hands (10%) and shoulder/upper arm fractures (8%). Two-thirds of injuries were caused by falls and 27% by being hit or striking against objects/other people. Of those records allocated a sports-related activity code, 19% involved Australian Football, followed closely by soccer (17%), basketball (9%) and jogging/running activities (6%).

It is unclear how many of these injuries occurred during physical education (PE), in-school organised sports or free-play: free-play time is particularly challenging to address because it involves issues related to supervision, suitability of the playing environment for sporting activities and interactions between children of different ages. There may also be different sports and activities happening simultaneously on-field or in play spaces.

### **Out of School Hours Care injuries**

There were 74 ED presentations for injuries to primary school children recorded as occurring at Out of School Hours Care (OSHC) Services (also known as Before/After Care) at schools in Victoria over the three-year period, 2016/17 -2018/19. Cases were identified via narrative search in the description of injury variable for relevant terms, which may have resulted in an underestimate of cases, as OSHC may not have been consistently reported in the VEMD narrative. Injuries occurring during *after care* services accounted for 96% of narratives containing OSHC-related injury terms. Although the number of cases was small, it is important to include this subset of cases as they (mostly) occurred on school grounds. After Care services must be managed by staff adequately trained to supervise young children; mandatory staff-to-student ratios must also be adhered to (1 carer to 15 children) (Department of Education and Training (Victoria), 2020a). In a small group of injury narratives descriptions, it was reported that some injuries that had occurred earlier in the day during school hours, were noticed and dealt with by After Care workers at after school care sessions. It is important that children report their injuries as soon as they occur to school staff and clearly understand the importance of doing so. Delays in treatment could worsen injury outcomes.

### **School camp injuries**

Following a narrative search for common school camp-related terms, 204 ED presentations for injuries to primary school children occurring at school camps in Victoria over the three-year period were identified. These cases were extracted from the primary school cohort dataset which included **all** injuries for primary school-aged children (n=121,305). Injured children needing to attend the ED while on camping activities tended to be older; 60% were aged between 10 to 11 years and more likely to be male (59%). Fractures were common (35%) and half (51%) of camp-related injuries leading to an ED presentation were caused by falls. The number of ED presentations identified as involving school camps were small but still considered an important activity to report on. When injuries occur at camp and require hospital treatment, it can be stressful for the child who is away from home and their family and also stressful for teachers in terms of managing the situation. It can also be distressing for parents who are usually some distance away from the camp location.

The data presented here highlight the need for injury prevention strategies, in particular falls prevention, not only within the school grounds but also extended to school camps and other off-site settings such as excursions. Adult supervision, by teachers and/or provider staff, needs to be adequately suited to the activity being undertaken in these circumstances. In addition, where it is applicable, camp facilities should comply with Australian Standards, for instance: sleeping facilities that include bunk beds should comply with the mandatory standard for bunk beds. Regular safety audits and inspections by camp facilitators should be conducted, including risk assessments for camp activities. The DET has detailed guidance information for schools regarding venue selection for residential campsites insisting on the use of accredited campsites to ensure minimum criteria regarding safety and suitability are met (Department of Education and Training (Victoria), 2020c).

### **The school environment: occupational health and safety perspective**

There are very few studies published that describe school injuries in general. Most focus on a particular aspect of school injury such as playground/playground equipment falls and injuries associated with sporting activities. However, several studies from other countries such as Canada, USA, China, Sweden and Finland have described school injuries in primary school children using a variety of approaches including follow-up surveys, analysis of hospital administrative and urgent care clinic data, and specialised injury surveillance data systems (Laflamme et al., 1998a; Linakis et al., 2006; Sun et al., 2006; S. Salminen et al., 2008; Josse et al., 2009; Simo Salminen et al., 2014; Somerkoski, 2017; Park et al., 2018; Zagel et al., 2019). Negative impacts of hospital-treated child school injury include long absences from school, medical costs and special care for recovery by families and carers. The long term sequelae of injury can be severe and can have a profound effect on a child's development and learning capacity. The impact on health care systems is also considerable.

In all schools, students currently have the opportunity to contribute to school operations and provide feedback on a range of school issues through Junior School Council, school captaincy roles and other specific leadership and representation positions. In addition to this, to enhance school safety, older student involvement could include the creation of "Safety Captain" roles and/or health and safety representative equivalent positions. Involving students in hazard and incident investigations and contributing to risk assessments may also be a novel approach to introducing older children to common adult workplace safety practices and procedures, and a general safety culture. This isn't as far-fetched as it sounds, as in Sweden, young students are given the opportunity to take on student

safety representative roles and participate in workplace safety management and join safety committees (Swedish Work Environment Authority, 2020). In 1991, the Swedish Work Environment Act stipulated that injuries involving students at school were considered to be occupational injuries in the same sense as those sustained by people at work (Laflamme et al., 1997).

Schools are considered to be a good setting for educational programs regarding injury prevention in terms of lowering injury rates, improving students' knowledge about injury prevention and in improving their behaviours with regard to safety (Bena et al., 2016; Orton et al., 2016). Common recommendations from international school injury studies to effectively reduce school injuries mainly include environmental modification and increased supervision (Josse et al., 2009). Based on the data presented in this edition of *Hazard*, effective injury prevention strategies could focus on improved recess/lunchtime supervision by the 'teacher on duty', particularly for younger children playing on climbing racks and other types of playground equipment. For older children, sports injury prevention programmes could be introduced. This would not only address the relatively high contribution of sports injuries to the school injury burden in this age group, but it would also provide a good introduction to safe and healthy practices for high school and beyond.

## Main findings about trends over the past 9 years

Trends were observed for the nine-year period 2010-2018. Over this time period, there were 10,060 hospital admissions for children injured in primary schools in Victoria. The *overall rate* was stable over time; although a 2% annual decrease in the rate of admissions that included an *overnight stay* was observed. Nation-wide, the rate of injury hospitalisations for children aged 0-14 over ten-year the period 2007/08 (1419 per 100,000) to 2016/17 (1445 per 100,000) was relatively stable (Australian Institute of Health and Welfare (AIHW), 2019). Similar findings were found in a linked hospitalisation and mortality data study of children aged 16 years or less for the period July 2001 to June 2012, where child injury hospitalisation rates had also not decreased in the 10-year period (R. J. Mitchell et al., 2018).

## COVID-19 and remote learning

At the time of writing, COVID-19 has had a major impact on everyone's day to day lives, particularly on school-aged children and their adaption to remote learning during the various stages of pandemic-related restrictions in Victoria. These circumstances are unprecedented and the potential effects on children returning to school from a period of remote learning need to be closely monitored. Future studies on primary school injury during this period need to take changes in regular school activities into consideration. Most schools cancelled activities involving large group gatherings such as camping activities, athletics carnivals, inter-school sports, swimming lessons and carnivals, to name a few. By not participating in these activities, children's level of injury risk may be lower compared to previous years, due to reduced exposure. However, free play during recess and lunch as well as physical education classes resume once on-site learning has resumed: in particular, trends in injuries during this transition from remote learning to on-site learning needs to be carefully monitored. It is yet to be established how an extensive period of home-learning and lockdown affects risk taking and other behaviours in primary school-aged children.

## Limitations

This edition of Hazard, focussing on child primary school injuries, has limitations. Some key limitations are outlined below, as well as their impact on the reliability and generalisability of the findings.

### Limited data sources

The results presented in Hazard do not capture all child primary school injuries in Victoria, but are limited to those that were recorded and coded in the hospital admissions data and Emergency Department data. Child primary school injuries that were presented to the General Practitioner only, or that did not require medical attention are not captured in this report. The results, therefore, are an underestimate of *all child primary school injuries* in Victoria, and provide a subset of relatively severe injuries, i.e. those requiring hospital treatment.

### Limitations using the selection criteria

Case selection was based on *place of injury* coding in both the VEMD and VAED ('School, day care centre or public administration area' and 'School, public buildings', respectively). Coding of the place of injury is not always complete and accurate, which is, arguably, the main limitation in terms of complete data capture of hospital-treated school injuries in this edition of Hazard. In the 'school cohort' (primary school-aged children, 2016/17 – 2018/19), 16% of ED presentations and 42% of hospital admissions were coded as place of injury 'unspecified'. The current sample is therefore likely to underestimate the total number of hospital-treated primary school injuries in Victoria. Furthermore, this method may lead to underestimates of school-related injuries that occur outside of school grounds. This includes school sports that take place in athletics areas or swimming pools, if the place of injury is coded as 'sports and athletics areas'.

This also applies to injuries that occur on school buses, on school camp sites and during excursions: in the current edition of Hazard, these cases are only included if coded as place of injury is school, or if school is mentioned specifically in the narrative information (ED presentations only). Narrative searches in the VEMD were

used to expand the data selection for a more inclusive approach, and to select cases for specific interest areas. Although a valuable method for improving case selection and addressing specific focus areas, narrative analysis is limited by the data quality of the narrative data in the VEMD. Narrative data quality can vary per hospital and can also vary over time: the narrative data presented in this Hazard should therefore be considered to provide context rather than a complete quantitative analysis.

The school cohort was based on date of birth relative to Victorian enrolment dates. These were determined year-by-year, as were the school terms and public holidays. Although care was taken to provide an accurate sample of injuries most likely related to primary school attendance, there are several scenarios which could lead to misclassification of school injury cases. These include: (1) school children who were 'held back', i.e. their school start is delayed by one year, relative to the earliest opportunity for starting school based on the cut-off dates. The effect of this is that the selected cohort is relatively younger than the actual Victorian school cohort ('skipping' a grade is much less common than delaying school start) and overall underrepresentation of cases. (2) Injuries may have been presented to hospital one or more days after the injury date. As admissions and presentations on weekends, public holidays and school holidays have been excluded, this potentially leads to underrepresentation of non-urgent injuries in particular. (3) Similarly, school injuries that took place on weekends, for example in the context of school camps, school sports and extracurricular activities, were not captured. These limitations need to be considered when interpreting the findings presented in this edition in Hazard: in summary, data selection methods and data sources used result in an underrepresentation of cases and in particular an underrepresentation of non-severe and non-urgent cases.



# RECOMMENDATIONS

The findings presented in this report indicate that increased attention needs to be given to reducing unintentional injury in primary schools, particularly for falls involving playground equipment, and injuries occurring during sports, physical education (PE) and free-play outdoor activities. This requires a coordinated strategy at the state-wide, regional and local school levels.

The following recommendations are made to relevant child school safety and public health agencies in light of the findings from the current study and cited previously published research.

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## Government policies, guidelines, interventions and curriculum

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1.

It is recommended that the Department of Education and Training (DET) develops learning programmes around children's safety skills, safety behaviours and safety knowledge for schools to implement. This can include assigning a 'safety captain' role for older primary school students to actively involve students in potential injury hazard and injury incident reporting, and promoting safe practices.

2.

It is recommended that DET develop sports injury prevention programmes, if not already part of the curriculum, for older children (school Years 4-6) to not only reduce primary school sports injury rates but also to set up healthy practices for safe sports participation in high school and beyond. Schools may also wish to provide further sport and injury prevention programs as part of their health and physical activity unit.

3.

Increased awareness and adherence in primary schools to the DET *Physical and Sport Education – Safety policy* and resources for sport-specific precautionary safety measures and requirements is recommended (Department of Education and Training (Victoria), 2020d).

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## Local School Level Measures

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4.

It is recommended that schools implement/upgrade and maintain a system for reporting and documenting all injuries, including hazards and near misses, using simplified data collection protocols and promote the regular review of this information to address school-specific safety issues. Injury reporting should be transparent with aggregate or summary data included in school newsletters or annual reports.

5.

Establish and adhere to a playground safety management system and review on a regular basis as per Australian Standard (AS 4685.0: 2017).

6.

Younger children are most likely to suffer injuries due to falls from playground equipment and these are most likely to occur early in the year: therefore, a playground safety induction for children in Prep and Year 1 is recommended to help reduce playground falls. Staggering recess times for younger children in the first few weeks of school may help prevent them from mimicking older children or competing for access to play equipment. Staggered recess times may coincide with "COVID normal" school restrictions.

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7.

Increased supervision of children using playground equipment during recess and lunch breaks is recommended, in particular for younger children.

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8.

It is recommended that primary schools review the management of key transition times such as the 3-4pm period when children leave formal school teacher supervision to go to parents/carers supervision and/or after school care workers supervision. It is also recommended that schools review the out of hours access to school grounds and advise the school community of supervision responsibilities when allowing children to access school playgrounds out of hours (or alternatively, ban access).

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## Physical School Environment and Equipment

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9.

All playground equipment should conform to the current Australian Standards with consideration given to reducing the fall height of any new equipment to 1.5m. Innovative landscaping (mounding and excavation) can be used to reduce fall height of slides and climbing equipment.

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10.

All playground equipment should be inspected regularly for wear and tear. Faults should be repaired promptly and unsafe equipment removed.

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11.

Loose-fill surfacing should be maintained to at least 30cm depth in all fall zones around and under play equipment by raking each day, and loose-fill in playgrounds should be replenished twice a term (a depth marker of 30cm should be painted on leg supports of equipment and used, along with a marked probe as a guide).

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12.

Children using playground equipment should be closely supervised at all times to prevent overcrowding and unsafe practices.

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13.

Regular safety inspection and maintenance of school playground equipment and surfacing is recommended to help address unsafe playground equipment and environment.

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## Primary School Injury Research

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14.

Additional primary school injury data could be collected through existing child health surveys conducted by the Department of Education and Training (DET) by including questions (to parents) on child school injuries. This can provide additional information on the cause, circumstances involved, potential supervision issues and equipment issues. The results can be included in the annual *State of Victoria's Children Report*.

15.

It is recommended that aggregate injury incident data at the state and/or school regional level is published on the Department of Education website or in annual reports; this information can be used to inform primary school injury prevention policy and practice.

16.

It is recommended that playground observational studies are conducted, focused on outdoor play areas and areas containing fixed playground equipment and structures. In particular, observation of the use of these during morning and afternoon (lunch) recesses will help to obtain a better understanding of common precipitating injury scenarios and mechanisms.

17.

Qualitative studies of the school community (principals, level leaders, teachers, support staff, school first-aiders, students, parents) in the form of surveys and/or focus groups can be conducted to gather insight into varying perspectives and approaches to school injury prevention that has been successful and share this knowledge.

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## ED and Hospital Admission Injury Surveillance and Research

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18.

Additional descriptive data collected through VEMD free-text fields could lead to improved identification of primary school child injury causes and hazardous circumstances. This would include improvements to the recording of location of the injury event and the activity undertaken at the time of injury. This recommendation can be achieved through the current, ongoing in-depth injury surveillance data quality project of ED data in Victoria.

19.

Continued monitoring of trends in primary school child injury hospital admissions is recommended, to determine time trends including the impact of the pandemic and return to school after episodes of remote learning.

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## Additional resources:

Child Safety Good Practice Guide – Good investments in unintentional child injury prevention and safety promotion – NSW, Australian Edition (lots of topic-specific interventions, reference already in Endnote)

[https://www.schn.health.nsw.gov.au/files/attachments/net3243\\_good\\_practice\\_guide\\_a4\\_fa2-web.pdf](https://www.schn.health.nsw.gov.au/files/attachments/net3243_good_practice_guide_a4_fa2-web.pdf)

State of Victoria's Children Report

<https://www.education.vic.gov.au/about/research/pages/reportdatachildren.aspx>





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A photograph of a swing set in a park. The swing seat is black plastic and hangs from two metal chains. The background is a blurred view of a park with green grass, a paved path, and other playground equipment. A solid blue rectangular box is positioned in the top right corner of the image, containing the word 'APPENDIX:' in white, serif, all-caps font.

## APPENDIX:

# APPENDIX A: DATA SOURCES AND CASE SELECTION

*The scope of this Hazard is limited to primary school aged cohort of children<sup>1</sup> for each calendar year of available data. Injury cases are restricted to weekdays (Monday to Friday) during school terms (excluding school holidays, public holidays and weekends).*

## OVERALL CASE SELECTION

It is important that injury records are extracted from each data set using the same criteria to ensure consistency in obtaining comparable subsets. Specific criteria are:

1. Children aged 4 years 9 months to 12 years (using a year-by-year cohort approach)
2. All causes (all intents)
3. Location: School and other educational institution
4. Injuries occurring Monday-Friday during school terms (excluding school holidays, public holidays and weekends)

## HOSPITAL ADMISSIONS

Hospital admissions data were extracted from the Victorian Admitted Episodes Dataset (VAED), which records all admissions to public and private hospitals in the state of Victoria. The VAED includes demographic, clinical and administrative details for every admitted episode of care. The coding in the VAED conforms to the definitions in the National Health Data Dictionary (NHDD) (Australian Institute of Health and Welfare (AIHW), 2015).

The clinical details include forty diagnosis codes that include injury and external cause information coded according to the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM). Hospital admissions between July 2009 and June 2019 were selected.

Hospital admissions between July 2009 and June 2019 were selected and were limited to community injuries (i.e. first diagnosis code in the ICD-10-AM code range of S00-T75 or T79). All human intent categories were included. Transfers within and between hospitals were excluded to avoid over-counting the incidence, but were included when providing estimates of direct hospital costs and number of hospital bed-days as their inclusion provides a more accurate estimate of the burden of injury. Specific selection criteria were:

- Primary school aged cohort (4 years 9 months - 12 years)<sup>2</sup>
- Incident injury (exclude transfers within & between hospitals, readmissions, and statistical admissions for frequency reporting)
- Years: financial years from 2009/10-2018/19
- Principal diagnosis in ICD-10-AM injury range S00-T75 or T79
- Cause codes: all causes and intents
- Location codes: Y92.21 - school and other educational institutions
- Activity codes: all unless otherwise determined by preliminary analysis

---

<sup>1</sup>Including children who turned five years old by 30 April of the year they started school.

<sup>2</sup>For example, for the 2009 calendar year, those born between 1 May 1997 and 30 April 2004 were included in the school cohort for hospital-treated injuries in 2009. School year levels were also allocated according to year of birth: those born between 1 May 2003 and 30 April 2004 were considered most likely to be in Prep class in 2009, etc.). Injuries presenting during school holidays and public holidays were excluded: this was based on the (retrospective) year-by-year term dates for public schools in Victoria.

## Cost of injury

The Service and Funding Projects Branch of the Victorian Department of Health and Human Services (DHHS) supplied VISU with costs data sourced from the Victorian Cost Data Collection (VCDC). DH conducts an annual collection of cost data via the VCDC and this data forms the basis for the cost data which is submitted to the National Hospital Cost Data Collection (NHCDC) and managed by the Independent Hospital Pricing Authority (IHPA).

Cost data collected through the VCDC can be broken by cost bucket components to understand resource consumption across health service areas (e.g. allied health, Emergency Department, critical care unit, intensive care unit, imaging, medical and surgical supplied, nursing, pathology, pharmacy, theatre).

## EMERGENCY DEPARTMENT PRESENTATIONS

Emergency Department presentations data were extracted from the Victorian Emergency Minimum Dataset (VEMD), which records all presentations to Victorian public hospitals with 24-hour emergency departments (currently 38 hospitals). The VEMD records cases that are treated and discharged from the ED, and cases that are assessed in the ED and admitted to a ward for treatment.

An 'emergency department (ED) presentation for injury' is an injury or poisoning that results in a person presenting to a hospital emergency department for treatment who is triaged (assessed for urgency), including those patients who leave before treatment commences.

ED presentations between July 2016 and June 2019 were selected. They were limited to community injuries (i.e., with the first diagnosis code in the ICD-10-AM code range of S00-T75 or T79) and incidence (i.e., return and pre-arranged visits excluded to avoid over counting). All human intent categories were included. Specific selection criteria were:

- Primary school aged cohort (4 years 9 months - 12 years)<sup>3</sup>
- Incident injury, exclude return and pre-arranged visits
- Years: financial years from 2016/17-2018/19
- Cause codes: all causes and intents
- Location codes: "S" which represents School, day care centre, public administration area combined with narrative search for school-related terms to exclude non-school locations (day care centre, libraries, etc. that fall under the "S" location code).
- Activity codes: all unless otherwise determined by preliminary analysis
- Narrative analysis describing special interest groups and their features

### VEMD case selection based on text searches

These were selected if the 'Description of injury event' variable in the VEMD, which is a short narrative of the incident, mentioned terms relevant to primary school injuries, and their variations and derivatives. Cases selected with this method were checked manually for relevance.

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<sup>3</sup> See footnote (2)

# APPENDIX B: STATISTICAL ANALYSIS

Rates for hospital admissions per 100,000 primary school enrolments, by year-level (grade), gender and calendar year were calculated using enrolment data sourced from the Australian Bureau of Statistics (ABS). The school enrolment data captures government, Catholic and independent schools. Only full-time enrolments are included in the analysis for this edition of Hazard. Enrolment data classified to 'ungraded primary' year-level are not included.

Trend analysis: changes in the rates of hospital admissions per number of primary school enrolments were modelled using Poisson models, as trends in the annual number of events, with the log of Victorian enrolments as offset. All models contained calendar year (time indicator) and were adjusted for year-level (grade) and gender, where possible (i.e. unless the analysis was limited to a single year-level or gender). The percentage change per year was calculated as:  $[e^{\alpha} - 1] \times 100$ , where  $\alpha$  is the model-estimated rate of increase or decrease. The analyses were conducted using the PROC GENMOD procedure in SAS V9.4.

# APPENDIX C: OVERNIGHT STAY HOSPITAL ADMISSION TRENDS

Nine-year Trends in Primary School Child Injury, in Terms of Overnight (Non-same Day) Hospital Admissions (2010 to 2018, calendar years) in Victoria

Overnight Hospital Admissions, 2010 to 2018			
	Freq, Total (n)	Annual rate (per 100,000 FTE)*	Change in rate, annually (%)†
<b>Overall</b>	5801	129.2	-2.2 [-3.4, -1.1]‡
<b>Males</b>			
Prep, Year 1	1154	169	-2.8 [-5.5, -0.1]‡
Year 2, 3, 4	1471	150	-1.8 [-3.5, 0.0]‡
Year 5, 6	763	121	-2.7 [-5.1, -0.1]‡
All males	3388	148	-2.3 [-3.6, -1.1]‡
<b>Females</b>			
Prep, Year 1	968	149	-0.8 [-4.0, +2.5]‡
Year 2, 3, 4	1003	107	-3.5 [-6.2, -0.7]‡
Year 5, 6	442	73	-1.6 [-4.9, +1.7]
All females	2413	110	-2.1 [-3.8, -0.3]‡

\*Rates are calculated per 100,000 full-time equivalents (FTE), as per Victorian school enrolment data. †Poisson modelling, adjusted for year level and gender. ‡Statistically significant changes in rate

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**VAED includes all Victorian public and private hospitals**

**VEMD Participating hospitals**

***From October 1995***

Austin & Repatriation Medical Centre  
Ballarat Base Hospital  
The Bendigo Hospital Campus  
Box Hill Hospital  
Echuca Base Hospital  
The Geelong Hospital  
Goulburn Valley Base Hospital  
Maroondah Hospital  
Mildura Base Hospital  
The Northern Hospital  
Royal Children's Hospital  
St Vincent's Public Hospital  
Wangaratta Base Hospital  
Warrnambool & District Base Hospital  
Western Hospital - Footscray  
Western Hospital - Sunshine Williamstown Hospital  
Wimmera Base Hospital

***From November 1995***

Dandenong Hospital

***From December 1995***

Royal Victorian Eye & Ear Hospital  
Frankston Hospital

***From January 1996***

Latrobe Regional Hospital

***From July 1996***

Alfred Hospital  
Monash Medical Centre

***From September 1996***

Angliss Hospital

***From January 1997***

Royal Melbourne Hospital

***From January 1999***

Werribee Mercy Hospital

***From December 2000***

Rosebud Hospital

***From January 2004***

Bairnsdale Hospital  
Central Gippsland Health Service (Sale)  
Hamilton Base Hospital  
Royal Women's Hospital  
Sandringham & District Hospital  
Swan Hill Hospital  
West Gippsland Hospital (Warragul)  
Wodonga Regional Health Group

***From January 2005***

Mercy Hospital for Women

***From April 2005***

Casey Hospital

***From July 2011***

Bass Coast Regional Health



## How to Access VISU Data

VISU collects and analyses information on injury problems to underpin the development of prevention strategies and their implementation. VISU analyses are publicly available for teaching, research and prevention purposes. Requests for information can be lodged via the data request form on the VISU website or by contacting the VISU office by phone.

## Injury Atlas of Victoria

The *Injury Atlas of Victoria* is a new web-based tool that allows the exploration of hospital-treated unintentional injury in Victoria and further enhances the services that VISU provides. It was developed by VISU at Monash University and presents de-identified hospital-treated unintentional injury data supplied by the Department of Health and Human Services Victoria. This can be used by government departments and agencies of all levels, health and injury prevention organisations, media, business and industry, education institutions, research groups and the community.

The *Injury Atlas of Victoria* can be accessed at this address: [vicinjuryatlas.org.au](https://vicinjuryatlas.org.au)

## VISU Staff

Director: Associate Professor Janneke Berecki-Gisolf  
 Senior Research Fellow: Dr Di Sheppard  
 Senior Research Officer: Voula Z. Stathakis  
 Research Fellow: Dr Tharanga Fernando  
 Data Analyst: Dr Jane Hayman  
 Data Analyst: Ehsan Rezaei-Darzi  
 Data Analyst: Thi (Le) Pham  
 Research Officer: Dr Himalaya Singh  
 Statistical Advisor: Dr Angelo D'Elia  
 Administration Officer: Samantha Bailey

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**Contact VISU at:**

MUARC - Monash University Accident Research Centre  
Building 70, 21 Alliance Lane  
Monash University  
Clayton Campus  
Victoria, 3800  
Phone: (03) 9905 1805  
Email: [visu.enquire@monash.edu](mailto:visu.enquire@monash.edu)

All issues of Hazard and other information and publications of the Monash University Accident Research Centre can be found on our internet home page:

[www.monash.edu/muarc/visu](http://www.monash.edu/muarc/visu)



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