INJURY BULLETIN

Queensland Injury Surveillance Unit

No 100 March 2008

Injury in Primary School Children

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Summary:

- 20% of all injury for children aged 5 to 13 years occurs in a school setting
- Adolescent boys (13 years) are most likely to be injured at school with one quarter of all injuries in that age group occurring in a school setting.
- Of the serious school injuries, two thirds were due to a fall with one quarter having fallen greater than one metre.
- Approximately 20% of all serious injuries (TC 1 and 2) were associated with play equipment such as monkey bars, climbing frames, forts, slides and swings.
- Assaults/ bullying represented only 3% of all school injuries but 80% occurred in males.

Injury in Primary school children

Injury is a leading cause of death and disability in children. Children spend many of their waking hours at school, and many school communities have attempted to reduce the number and severity of injuries occurring at school through a variety of measures. This issue of the bulletin examines injuries occurring in primary schools in Queensland.

Methods

The QISU database was searched for the eight year period 1999 to 2006 for injuries occurring in primary schools, for children aged between 5 and 13 years. Injuries occurring outside of standard school hours were included, as some of these represent organised out of hours school activities (after school care, sports practice and weekend sports). Children outside the age group were excluded as they were less likely to be participating in an organised school activity.

QISU data is collected from participating Queensland emergency departments representing approximately one quarter of the state population with an ascertainment level of approximately 80%. Death data was sourced from the CCYPCG Annual Report Deaths of Children and Young People 2006-7. [1]

QISU collects and analyses data from emergency department injury presentations on behalf of Queensland Health. Participating hospitals represent three distinct areas of Queensland.

QISU publications and data are available on request for research, prevention and education activities.

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Results:

Deaths

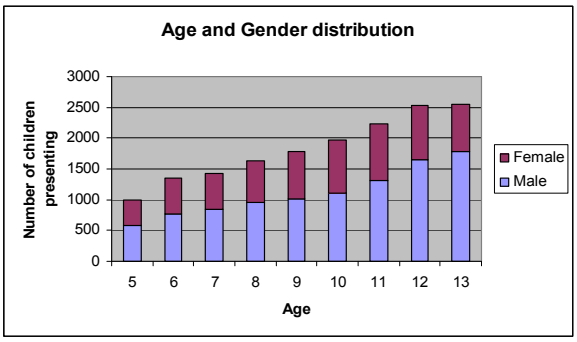
Of eight child pedestrian fatalities in QLD in 2006-7, 3 occurred in a school setting and involved children aged 10 to 14 years. It is not clear from the report whether these deaths occurred in a primary school or high school.

Two deaths occurred when children disembarked from a school bus and attempted to cross the road in front of

the bus. One child was struck by the bus as it moved off and the other child was struck by a car. A third child was struck by a car involved in a high speed police chase as she was crossing a pedestrian crossing linking two sides of her school.

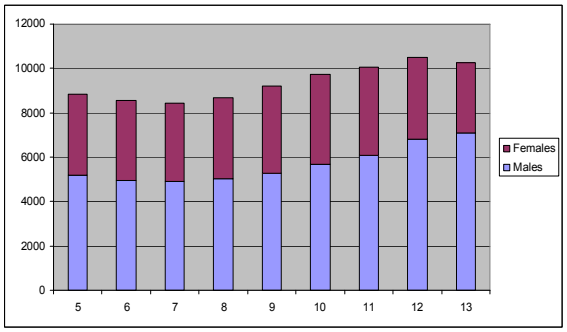
QISU data:

During the study period, 16496 children presented following an injury that was sustained at a primary school. This represents 20% of all injury presentations in the 5 to 13 year age group over the study period. The majority of children were male, with an overall male female ratio of 1.5:1. The male/female distribution was 1.4:1 form 5-11 years of age, rose sharply to 1.9:1 at 12 years and 2.3:1 at 13 years. The peak age of presentation was 13 years of age with an almost linear increase in the number of presentations from 5 years of age.



Graph 1: Age vs. number of primary school injury presentations (male and female)

This is in contrast to the age distribution for all injuries in this age group. *Graph 2* demonstrates a bimodal distribution of injury presentations with a peak at 12 years and a lower peak at 5 years.



Graph 2: Age vs. number of all injury presentations (male and female)

Location of injury

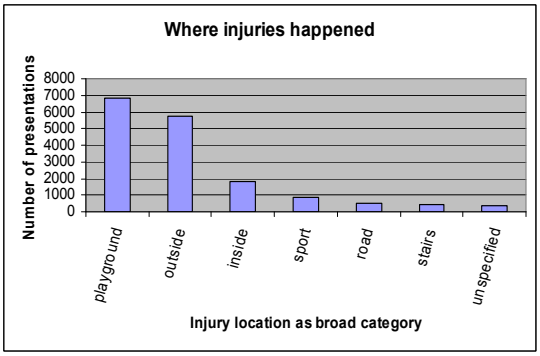
The majority of injuries (6811 or 41%) occurred in the playground. Eleven percent of playground injuries (1831) were specifically related to play equipment. Roughly one third (5736) of all injuries occurred "outside" but not in the playground or on the sports ground.

Relatively few injuries (1792 or 11%) occurred inside with nearly two thirds of inside injury occurring in the classroom proper (1128 or 7% of all injuries).

Road injuries accounted for only 3% (513) of all school injuries.

Whilst five percent of all school injuries occurred in a designated sports area (indoor and outdoor sports areas), many other school sporting injuries occurred in general outdoor/ playground areas.

Three percent of school injuries (444) were related to stairs.



Graph 3: Number of injury presentations according to school location

Activity

Twenty three percent of children (3805) were engaged in specific sporting activities at the time of injury.

One third of children (5634) were playing. A further 22% (3556) were engaged in formal education at the time. The remainder (3501 or 21%) were engaged in other unspecified activities.

Of those engaged in specific sporting activities, the most frequent presentations were due to injuries associated with football including Australian Rules, league and union (1036 or 6%). Soccer accounted for 913 injuries (5%).

Mechanism of injury

Nearly half of all school injuries (7745 or 47%) were due to a fall. The majority of falls were due to stumbling/ slipping or tripping on the same level (3391, 44% of school fall injuries or 21% of all school injuries). Other fall related injuries were due to stairs (444 or 0.5% of fall injuries), fall/ jump from less than one metre (1052 or 6%), fall or jump greater than one metre (1320 or 8%) or other unspecified falls 38 or 9%).

Play equipment accounted for 1559 or 20% of all falls. Of these, 1024 were high falls greater than 1 metre representing 13% of all falls and 78% of high falls.

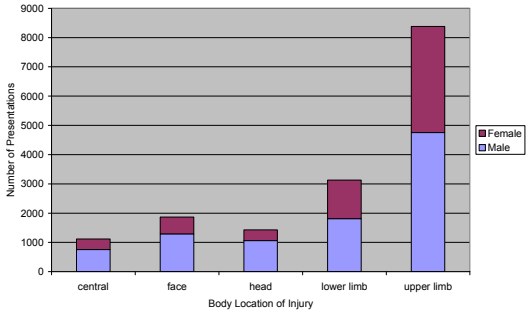
Contact with another person accounted for 2317 injuries (14% of all school injuries), but only 86 or 4% of these injury presentations were associated with specific sporting activities. Almost all of these injuries occurred outside the classroom, with 1018 (44%) outside and 955 (41%) in the playground.

Contact with a static object accounted for 1442 injuries (9% of all school injuries), 222 occurred inside, 516 outside, 553 in the playground, 56 on the road, 50 at a sports area, and 21 on stairs.

Contact with a moving object accounted for 1690 injury presentations (10% of all school injuries), with 167 occurring inside, 736 outside, 558 in the playground, 41 on the road, and 168 at a sports area.

Nature of injury

Upper limb injuries were most common (8335 or 50% of all school related injuries), followed by lower limb (3126 or 19%), head and facial injuries (3225 combined or 20%). Head and facial injuries were proportionally more common in males than females.



Graph 4: Number of injury presentations (male and female) according to body location

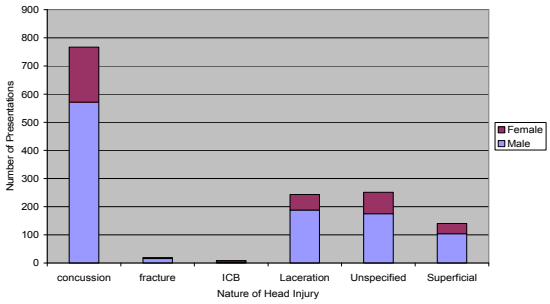
The majority of injuries were fractures followed by sprains then superficial injuries. There were 5493 fractures representing 33% of all school injuries with two thirds occurring in males (3326).

The majority of fractures were to the upper limb (4493 or 82% of fractures) with 585 (11%) lower limb fractures. There were 133 fractures of the skull or face (2%), 255 clavicle fractures (5%) and 13 spinal fractures (<1%).

There were 1428 head injuries (9% of all school injuries) with three quarters of these occurring in males (1057). The majority of injuries were concussion injuries (767 or 54%). Most head injuries occurred when children were engaged in general play (561 or 40%).

Eight children presented with intracerebral bleeds (ICB) and nineteen with skull fractures.

The mechanism of injury in these cases was a fall (both high and same level/ low falls) or blow to the head from a static or moving object.



Graph 5: Number of presentations according to nature of head injury

There were 399 eye injuries (2% of all injuries). The majority (114/399 or 29%) of eye injuries were due to foreign bodies blown/ thrown into the eye (grit, sand, bark). There were 5 metal foreign bodies associated with grinding/ drilling metal in a metalwork class.

Other eye injuries included being struck by or poked by a moving object (96 or 24%) or missile (89 or 22%). A large proportion of missiles were balls (cricket/ tennis balls) followed by rocks.

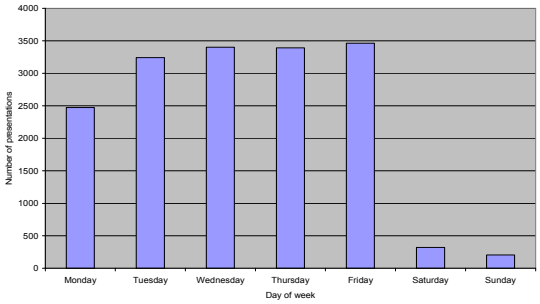
There were 42 chemical related eye injuries (11%). Sixteen were chemical burns related to acid/ alkali splashing in the eye and 13 presentations due to chlorine irritation post swimming.

There were 57 burn related injuries (<1% of all school related injuries). The majority involved chemical burns to the eye (16) or face (5).

There were 4 electrocutions and 15 inhalational burns/ chemical injuries. The majority of these injuries occurred in the classroom (33).

Day and time of injury:

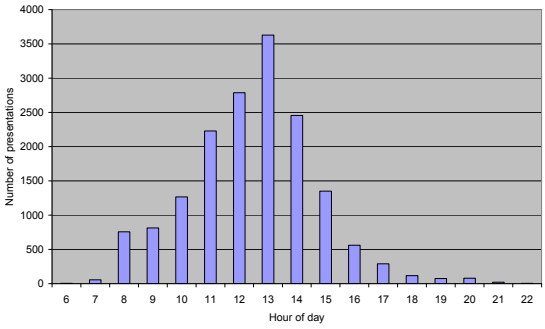
There was a slight increase in the number of injury presentations from Wednesday to Friday. Only 321 and 205 presentations occurred on a Saturday and Sunday respectively, representing 3% of all primary school injury presentations during the study period. The majority of weekend presentations were associated with sporting activities (176/526 or 33%). A further 172 children were said to be playing at the time of injury. Fourteen percent (72/526) were said to be involved in formal education at the time of injury.



Graph 6: Number of presentations by day of the week.

Peak time of day for injuries to occur was at 1300 hours corresponding with the school lunch break.

Five percent of injuries (817) occurred prior to regular school commencement time of 0900h. Seven percent of injuries (1149) occurred after 1600h. Of the combined injuries that occurred out of school hours, forty percent of children (772/ 1966) were said to have been playing at the time. Nineteen percent (368/ 1966) were engaged in formal education and the 23% (456/1966) were playing sport.



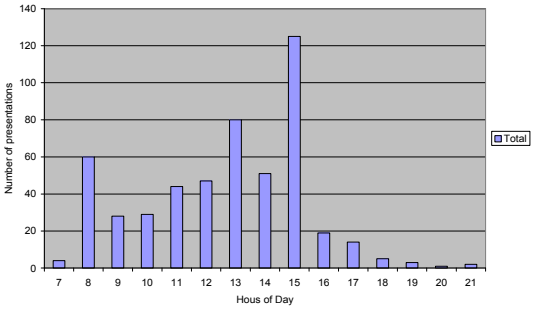
Graph 7: Number of injury presentations by injury time.

Road Injuries:

Road injuries (including injuries on the footpath, bicycle path and in car parks) accounted for 512 injury presentations (3% of all school injuries) during t he study period.

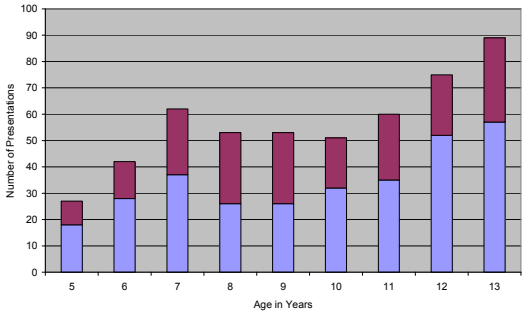
The peak times for road injury were at 0800 and 1500h corresponding to increased flow of students entering or leaving the school.

There was also a peak at 1300h corresponding to the school lunch break.



Graph 8: Number of road injury presentations by injury time

The age distribution of school road injuries showed a steady increase in the number of presentations as age increased, with peaks at 7 and 13 years. Males were more frequently injured with a ratio of 1.5:1.



Graph 9: Age distribution of road related injury presentations

Of the 512 road related injuries, 33 were cyclists, 26 were pedestrians involved in a collision with a car / bike and 3 were car or bus passengers involved in a collision. The majority of road related injuries were falls (285 or 56%). Seven percent (38/512) of road related school injuries presented as triage category 2. There were no triage category 1 presentations. The remainder were TC 3 (133), TC4 (311) and TC5 (30). There were 66 head injuries in this group, and 6 neck injuries.

Playground Equipment

Playground equipment (fixed structures such as slides, climbing structures and swings) was associated with 1831 school injuries (11%). The peak number of presentations associated with play equipment occurred in 6 year olds, with a significant decline after 8 years of age.

Monkey bar injuries accounted for 1121 presentations (61% of all play equipment injuries) and flying foxes accounted for 168 (9%).

The predominant mechanism of injury was a fall from play equipment accounting for 1559 presentations or 85% of all play equipment injuries.

Nearly two thirds (924) of these falls were classified as high falls greater than one metre. Playground equipment accounted for 1098 fractures (20% of all school fractures) and 61 head injuries (one intracerebral bleed) (4% of all school head injury presentations).

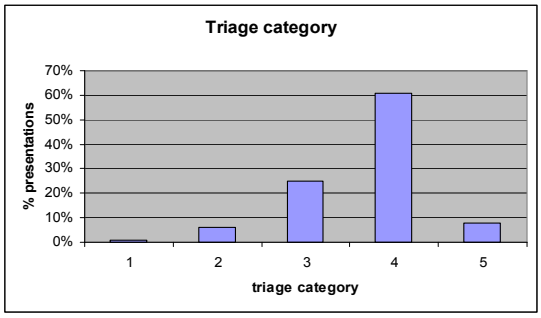
Assaults and bullying

There were 246 primary school injuries that were coded as being the result of an intentional assault. A further 233 were coded as intent unclear, but were the result of pushing other children, pulling chairs out from under etc. In combination, these injuries represent three percent of all school related injuries. The majority of these injuries occurred in males (381/479 or 80%). The majority were head or facial injuries (83 face, 13 eye and 80 head injuries. Only 38 of these injuries occurred outside of normal school hours (0900 to 1600). The peak time for these injuries to occur was 1200 to1300 hours.

There were no TC 1 presentations in this group. Of the 34 TC 2 presentations, the injury mechanism was varied and included 2 ingestions of unidentified tablets sold by another student, one presentation with facial burns associated with a lit aerosol can, a penetrating eye injury due to a thrown rock and various injuries associated with being pushed off furniture/ equipment or direct physical assault. There were two alleged sexual assaults.

Severity:

Severity of injury is best represented by triage category.



Graph 10: Percentage of injury presentations by triage category

Around a quarter of all presentations were TC 3, and almost three quarters were of low acuity (TC4 and 5). Only 27 children presented with severe injury, as TC 1 and 994 as TC 2 accounting for 6% (1021) of all school injury presentations. The majority of children (14,021 or 85%) were discharged home.

Ten percent (1645) required admission to hospital and a small proportion were discharged against medical advice.

Of the 1021 TC 1 and 2 presentations, the predominant injury was a fracture accounting for 529 injuries. A further 62 sustained head injuries, 27 sustained eye injuries, 37 sustained facial injuries and 101 sustained spinal injuries.

Nearly two thirds (679) were the result of a fall, with 259 having fallen greater than one metre. Falls from monkey bars were associated with 156 presentations and other play equipment 39.

Injury related to sporting activity accounted for 240 TC1 or TC2 presentations (24%) with football (Australian rules, rugby union and league) accounting for 96 TC 1 or 2 presentations and soccer accounting for a further 52.

Motor vehicle injuries accounted for 15 TC 1 or 2 presentations. There were 21 ingestions, flying foxes were associated with 18 presentations, goal posts 2, snakes 5 and spider bites a further 5.

There were 2 cases of near drowning.

Discussion:

This bulletin describes injuries occurring in children attending primary schools in QLD. It does not include all injuries occurring en route to school as this is unlikely to be identified as a school related injury in the database. Injury prevention programmes directed at children of primary school age have focussed on injuries occurring within the school grounds and on injuries responsible for paediatric deaths in that age group (MVA/ pedestrian injuries, bike related injuries, drowning, fire). [2, 3, 4] Worldwide, priorities for ensuring a safe school environment vary according to school location, and range from prevention of fire arms on campus through metal detector screening to prevention of sun or cold exposure. [5, 6]

The data in this series shows that although injury at school accounts for a significant proportion of all injuries in children aged between 5 and 13 years, the proportion of all injury sustained at school increases with age. This is particularly significant for males. School injury in 5 year old females accounts for only 10% of all emergency department injury presentations at that age compared to 25% for 13 year old males. Despite the range of sporting and educational activities pursued, the majority of injuries occur in times of informal play, and are associated with stumbling on surfaces, running into objects and running into or being struck by other people or moving objects. This suggests that increasingly boisterous play by adolescent males may contribute significantly to primary school injury patterns.

Of the serious injuries, the predominant mechanism of injury was a fall with 25% having fallen greater than one metre. Approximately 20% of all serious injuries (TC 1 and 2) were associated with play equipment such as monkey bars, climbing frames, forts, slides and swings.

Prevention

Injuries in schools can be addressed by considering the public health model of engineering, education and enforcement.

Engineering

Audits of the school building, grounds and surrounds can identify potential problems:

Playgrounds: assess entrapment hazards in playground equipment, fall heights, drop zones, playground surfacing and shade

Buildings: assess stair and balustrade safety, glass hazards, furniture and equipment hazards

Drop off zones: Ensure that appropriate school safety zones apply (40km/h), assess traffic flow and speed at drop off sites

Audits need to be acted on and ongoing in order to make a difference and schools may be limited by available resources and finances in addressing issues that are raised.

Safe design needs to be maintained. For example, there are various alternatives for safe drop zones around play equipment (sand, bark or soft fall). Sand requires regular raking to prevent compaction and firming of the fall surface. Bark requires regular replacement to maintain sufficient depth as it composts and is easily dispersed. [7]

Safe design can also impact on other prevention strategies. Designing or restructuring classrooms, play areas and entrance/ drop off areas to maximise visibility of students allows for improved supervision.

Education

Whilst various studies have shown that delivering short term education modules may improve student knowledge about an injury topic or appropriate safe behaviour, few studies demonstrate that this translates into behavioural change [2, 3, 4, 8]

There are many reasons for this. “Knowing” is not necessarily “doing”, particularly where peer pressure, social influences and adolescence impact on a child’s behaviour. Behavioural learning is heavily influenced by social patterning, and the school is only one social setting that the child is exposed to. Any injury prevention/ safety module that is delivered needs to be part of the greater school culture for there to be a chance of changing behavioural outcomes, particularly if it is at odds with the home social environment. Acquisition of knowledge after an intervention is relatively simple to assess. Studying more meaningful outcomes such as change in behaviour or change in injury rate require greater resources and more complex assessment tools.

Developmental age may also impact on the ability of a child to translate knowledge into action. Studies looking at the skills needed for safe road crossing including perceptual skills (visual scanning, judging car speed), attention skills (distractibility and impulse control) and a sense of responsibility, suggest that children acquire these skills over many years [8] Children (particularly boys) may not be proficient in all skills until their late teens.

Enforcement

Enforcement of safety principles within schools requires clear and consistent policy from the education department down. Policy should contain general principles of safety and create a framework to deliver this through staff modelled behaviour, adequate resources for supervision and an appropriate management plan to address unsafe behaviours and manage acute life threatening events.

Most school policy addresses this with topics ranging from sun safe school attire (“No hat, no play” policy), to policy on bullying, warm up and cool down protocols for sport and requirements for student staff ratios for various activities/ excursions.

From an education perspective, this policy then needs to be **regularly and consistently** reinforced amongst the school staff and to the parents and students in order to develop a sustainable safety culture within the school.

Communities who have adopted the WHO Safe Communities and Safe Schools programs are well positioned to address all these issues as part of their core business in helping to make their communities a safer place to live, work, travel and play.

Conclusion:

Young children spend many waking hours at primary school and consequently, injury within the school setting is a frequent occurrence. Serious injury however, represents only 6% of all primary school related injury. Strategies to address school injury require identification of high risk groups, potential safety hazards and unsafe behaviours. Solutions require a range of interventions through physical modifications to cultural and policy shifts. It is hoped that this bulletin will inform this process.

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Additional websites:
www.safecommunitiesqld.org
http://www.safeschoolciap.org/
www.thinkfirst.org/