

**Submission to the Queensland Parliamentary Inquiry on strategies to prevent and
reduce criminal activity in Queensland**

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Executive Summary

The aim of this submission is to highlight findings of recent research related to assaults on children aged 0 – 17 years, leading to significant social and economic impacts, published in an international peer-reviewed journal:

Irei, F., Lang, J., Kaultner, M., Le Brocque, R., & Kenardy, J. (2012). Effects of gender, indigenous status, and remoteness to health services on the occurrence of Assault-related Injuries in Children and Adolescents. Injury.43, 1873-1880.

Research findings were based on an analysis of data from 10,409 hospital admissions associated with injury in children aged 0-17 years collected through the Queensland Trauma Registry (QTR) between 2005 and 2008, providing reliable epidemiological information on assault-related injuries in children and adolescents residing in Queensland.

Assault-related injury is a devastating consequence of violence and/or abuse and has become a prominent cause of morbidity and mortality in children and adolescents. It accounts for not only loss of life but also psychosocial problems, loss of quality of life and disability in survivors with enormous economic burden.^{1,2} Addressing the incidence of violence against children and young people through prevention and intervention strategies has the potential to arrest the cycle of violence over time.

The analysis of the QTR data examined assault-related and accidental injury and indicates that assaults of a severity that require admission to hospital are occurring in children of all ages, and that the youngest children (aged 0-1 years) are experiencing assaults at similar rates

to older adolescents, but with much greater (2.8 times higher) severity of injury, and therefore with more profound and long-lasting impact.

Other key findings include:

- The most frequent assault-related injury in infants is a head and brain injury.
- The rate of serious injury arising from assault amongst indigenous children aged 12 or less is 12 times that of non-indigenous children.
- Indigenous female children have the highest rate of assault-related injury, being 15 times more likely to have an assault-related injury than non-indigenous females.
- Rate of assault-related injury in indigenous compared to non-indigenous children was highest outside major urban areas.
- In contrast, rate of assault-related injury in non-indigenous children was highest within major urban areas.
- Assault-related injuries were associated with significantly higher mortality and more frequent Intensive Care Unit admission than accident-related injuries in children.
- The majority of assault-related injury occurred at home for those aged less than 12 years (63.9%)
- Numerous factors are likely to contribute to the high level of assault-related injuries experienced by children and adolescents from an indigenous Australian background including intergenerational transmission of violence,³⁵ the high rate of young parents,³⁶ the high rate of crime, high levels of poverty, poor housing, increased substance abuse, high unemployment and socio-economic disadvantage.³⁷

These findings highlight important information on the impact of assault-related criminal activity on children in Queensland, and indicate possible social and economic contributors to assault-related crime. The findings also highlight the importance of inclusion of assault-

related crimes directed at children, particularly infants and younger children, within any prevention or early intervention response. Detailed findings and analysis to assist the inquiry, are provided in the following sections.

PREAMBLE

This detailed submission is made on the basis of the terms of reference for the Inquiry

- the trends and type of criminal activity in Queensland, having regard to available crime statistics and issues in relation to unreported crime;
- the social and economic contributors to crime;
- the impacts of this criminal activity on the community and individuals, including the social and economic impacts;

The Inquiry also stated its interest in

- “whether you have observed particular trends and type of criminal activity occurring in your particular region or across the State more generally;
- what you consider to be the key social and economic contributors to crime”

The results of our research are of relevance to the Inquiry because they address the impact of assaults on children in Queensland and indicate social and demographic factors that are associated with the pattern of assault prevalence in children.

INTRODUCTION

Assault-related injury, and potentially a portion of accidental injury, is a devastating consequence of violence and/or abuse and has become a prominent cause of morbidity and mortality in children and adolescents. It accounts for not only loss of life but also psychosocial problems, loss of quality of life and disability in survivors with enormous economic burden. Violence has been indicated to be a leading cause of death in those aged 10 to 19 years in US based studies,³ with very young children also reported to be at a high risk of assault-related injuries.²

Epidemiological studies in accidental injury suggest that children experience lower rates of injury than do young adults; as age increases, so does the occurrence of accidental injury and the proportion of serious injuries experienced.^{4,5} However, this pattern does not appear to hold when the focus is on injuries caused by assault. Previous research has found an increased incidence of assault in infants, followed by a lower level of assault in childhood, rising again during adolescence to a peak in young-mid adulthood.⁶

There has been little evidence addressing factors that affect the incidence and outcome of assault-related injuries in children and adolescents. We chose to examine four key factors, age, gender, indigenous status and geographic remoteness. Gender differences in injury research have been extensively documented, with an increased risk of injury to males compared to females, regardless of age, commonly reported.^{5,7} Disadvantage, inequality in health^{8,9,10} and increased burden of injury in indigenous populations^{11,12,13} have also been well recognized, with indigenous status often included in the description of burden of injury. Remoteness is also relevant. Regional disparities in health status and access to health care have been recognized in geographically large countries such as Australia and Canada.^{14,15,16} In Queensland, the minority of the population live outside the major cities¹⁷ and 20% of this non-metropolitan population is dispersed across small communities in rural and remote areas furthest from large population centres.¹⁸ People living in these rural and remote communities face health disadvantages due to poor resources and difficulties in accessing timely and optimal medical treatment.

Utilizing data from the state-wide trauma registry in Queensland, Australia between 2005 and 2008, we aimed to: 1) describe the demographic, injury-related and acute care characteristics of assault-related and accidental injuries in children and adolescents; 2) investigate the association between predisposing factors (i.e. age, gender, indigenous status and remoteness to health services) and the likelihood of sustaining an assault-related injury.

METHODS

Data and Variables

The study sample consisted of children and adolescents aged 17 years and younger who met the inclusion criteria for the Queensland Trauma Registry (QTR) and were admitted to hospital for 24 hours or more for the acute treatment of an accidental or assault-related injury between 1 January 2005 and 31 December 2008. With some exclusions (e.g. iatrogenic injuries, pathological fractures), patients were included on the QTR if they were directly admitted to, or transferred for admission to, a participating QTR hospital for 24 hours or more for the acute treatment of injury, or died after ED presentation (regardless of length of admission), and were coded as S00 to S99, T00 to T35, T63, T66 to T71, or T75 using the ICD-10-AM (the Australian modification of the International Statistical Classification of Diseases)²¹. Patients who die before reaching at QTR hospital are not included. Between 2005 and 2008, the QTR consistently collected information from 14 regional and tertiary public hospitals in Queensland. These 14 hospitals are the main public hospitals in the state where significant injuries are treated, and therefore the QTR is considered to include the majority of severely injured patients in Queensland²¹. Assault-related injuries were defined as an ICD-10-AM External Cause code between X85 – Y09 and Accidental injuries were defined as an ICD-10-AM External Cause code between V00 – X59. Patients with injuries that were self-inflicted (i.e. ICD-10-AM External Cause code = X60 – X84), or where intent was undetermined (i.e. ICD-10-AM External Cause code = Y10 – Y34), were not included in the analyses. Admissions as a result of poisoning, drowning, asphyxia or envenomation (n=220) were excluded from the analysis..

Residential postcode was used to specify the remoteness of residence using the Accessibility/Remoteness Index of Australia (ARIA+) classification.¹⁸ ARIA+ is a

geographical measure of remoteness based on the road distance from a locality to the nearest service centre and these values can be categorised into the five Australian Standard Geographical Classification (ASGC) Remoteness Areas: Major city, Inner regional, Outer regional, Remote and Very remote.

Ethical Considerations

The operation of the QTR has been approved by the Human Research Ethics Committees (HRECs) of all participating hospitals and The University of Queensland, and is recognized within the provisions of the Health Legislation Amendment Regulation (no.7) 2006 under the Health Services Act 1991 (Queensland) for the purpose of data collection. The release of data for this study was approved by the appropriate Human Research Ethics Committees of Queensland Health and The University of Queensland.

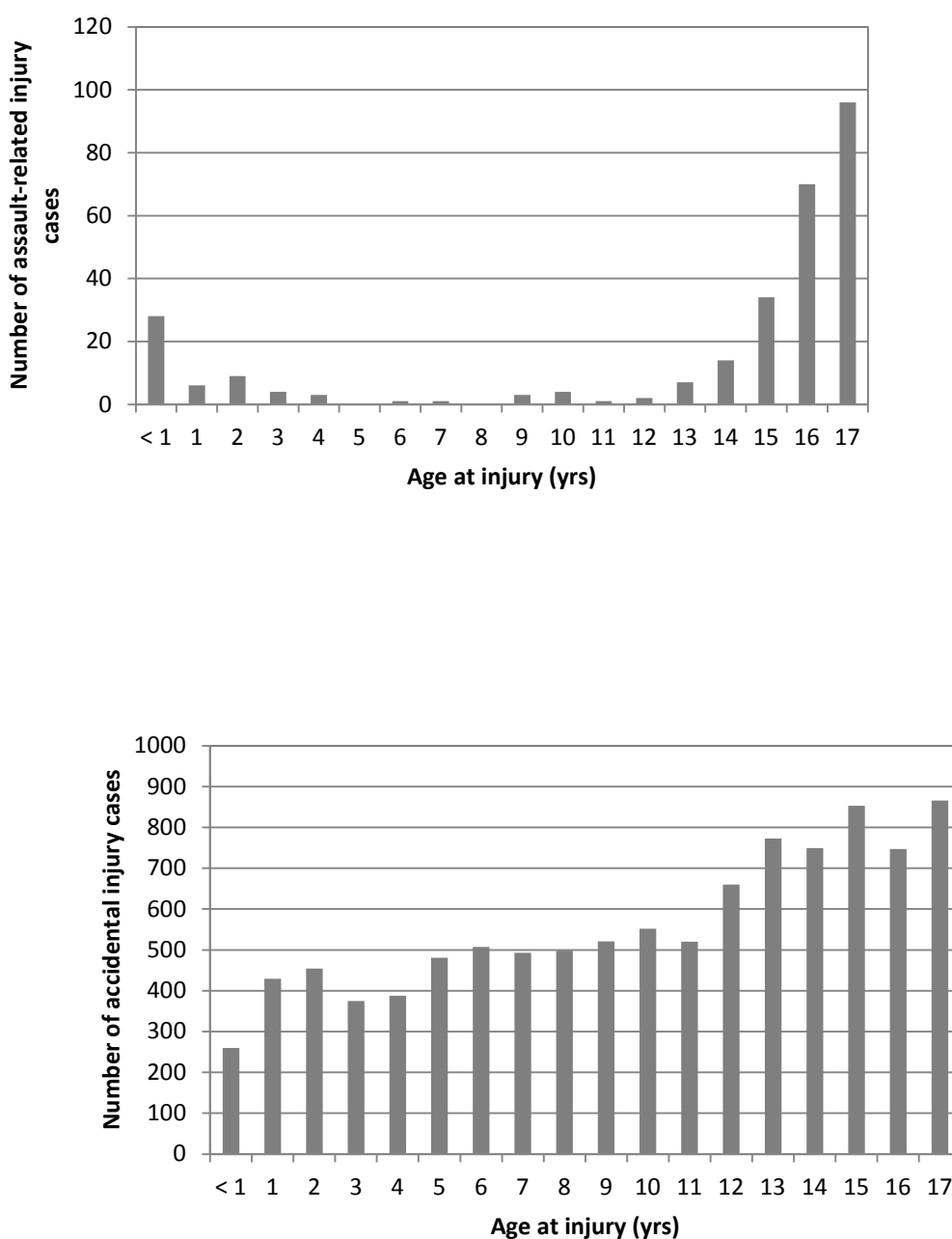
RESULTS

Age distribution for accidental and assault-related injury

A total of 66,119 admissions were recorded on the QTR over the four year study period (2005-2008). Of these admissions, 61,002 (92.3%) cases had intent of injury coded as accidental injury and 3,726 (5.6%) were coded as assault-related, with the remaining cases (2.2%) coded as self-harm or undetermined intent. Children and adolescents aged 17 years and under accounted for 16.0% of all injury admissions (10,583 cases). For children and adolescents, a total of 283 (2.7%) injury cases had intent of injury coded as assault-related, with 10,126 (95.7%) coded as accidental injury and the remaining cases (1.6%) coded as self-harm or undetermined intent. After excluding admissions as a result of poisoning, drowning, asphyxia or envenomation (n = 220), the final cohort consisted of 282 assault-related injury cases and 9,907 accidental injury cases.

Different patterns were clear when examining the age distribution for assault-related and accidental injury in this age group. A J-shaped pattern was observed in assault-related injuries, with a peak in those aged ≤ 1 year and another peak in those aged 14 to 17 years (Figure 1). In comparison, the number of accidental injury cases increased linearly age, peaking during the late teenage years.

Figure 1: Age distribution of children and adolescents aged 17 years and under who sustained an assault-related or accidental injury between 2005 and 2008



Demographic, injury and acute care characteristics by intent

Demographic, injury and acute care characteristics were examined by intent of injury (Table 1). Compared to young people experiencing accidental injuries, those admitted following assault-related injuries were significantly older, with 78.4% aged between 13 and 17 years compared to 40.0% for those presenting with accidental injury ($p < .001$). The majority were male in both intent groups, however, there was a significantly higher percentage of males admitted following assault-related injury (81.2%) compared to accidental injury (70.5%) ($p < .001$). There were a significantly higher percentage of children from an indigenous background with assault-related injuries (19.0%) compared to accidental injuries (7.7%) ($p < .001$), but there was no significant difference between the two intent groups in terms of remoteness to health services, with approximately half of all cases residing in major cities. A high percentage of assault-related injuries occurred to the face (40.4%) and head (22.3%), with over 80% of assault-related facial injuries being fractures. In comparison, a high percentage of accidental injuries occurred to the upper extremity (39.8%) and lower extremity (27.8%). The percentage of children admitted to the Intensive Care Unit was significantly higher for assault-related injury (11.3%) compared to accidental injury. A total of 58 deaths were recorded in the cohort, however the percentage of deaths following assault-related injury was significantly higher (2.5%) than the percentage following accidental injury (0.5%) ($p < .001$).

Table 1: Demographic, injury and outcome details for children and adolescents aged 17 years and under who sustained an assault-related or accidental injury between 2005 and 2008

Variable	Intent of injury		p value
	Accidental (N = 9,907)	Assault (N = 282)	
Age (years)	11 (6 – 14)	16 (14 – 17)	< 0.001
Age group (years)			< 0.001
≤ 1	638 (6.4)	34 (12.1)	
2 - 5	1,596 (16.1)	16 (5.7)	
6 - 12	3,710 (37.4)	11 (3.9)	
13 - 17	3,963 (40.0)	221 (78.4)	

Gender			< 0.001
Male	6,982 (70.5)	229 (81.2)	
Female	2,925 (29.5)	53 (18.8)	
Indigenous status[†]			< 0.001
Indigenous	741 (7.7)	51 (19.0)	
Non-indigenous	8,913 (92.3)	217 (81.0)	
Residential remoteness (ARIA+ category)			0.177
Major Cities	4,798 (48.4)	153 (54.3)	
Inner/outer Regional	4,282 (43.2)	108 (38.3)	
Remote/Very Remote	446 (4.5)	14 (5.0)	
Other [‡]	381 (3.8)	7 (2.5)	
Place of injury occurrence			0.094
Home	2,431 (24.5)	73 (25.9)	
School	810 (8.2)	13 (4.6)	
Other specified/Unspecified	6,666 (67.3)	196 (69.5)	
Nature of main injury			< 0.001
Fracture	5,715 (57.7)	134 (47.5)	
Intracranial injury	915 (9.2)	50 (17.7)	
Superficial/open wound	910 (9.2)	36 (12.8)	
Injury to internal organ	619 (6.2)	35 (12.4)	
Injury to nerve/vessel/muscle/tendon	723 (7.3)	16 (5.7)	
Burns	398 (4.0)	1 (0.4)	
Other	627 (6.3)	10 (3.5)	
Body region with most severe injury			< 0.001
Face	595 (6.0)	114 (40.4)	
Head	1,213 (12.2)	63 (22.3)	
Upper extremity	3,943 (39.8)	31 (11.0)	
Abdomen	546 (5.5)	30 (10.6)	
Thorax	195 (2.0)	19 (6.7)	
Lower extremity	2,754 (27.8)	18 (6.4)	
Neck	31 (0.3)	3 (1.1)	
Spine	214 (2.2)	2 (0.7)	
External/skin	418 (4.2)	2 (0.7)	
Injury Severity Score (ISS)	5.0 (4-9)	4.0 (2-10)	0.046
Injury Severity Score (ISS) group			< 0.001
ISS 1-8	5,128 (51.8)	190 (67.4)	
ISS 9-15	4,001 (40.4)	47 (16.7)	
ISS 16-24	465 (4.7)	19 (6.7)	
ISS 25+	313 (3.2)	26 (9.2)	
Operation performed			< 0.001
Yes	7,315 (73.8)	169 (59.9)	
No	2,592 (26.2)	113 (40.1)	
Admission to Intensive Care Unit			0.008
Yes	710 (7.2)	32 (11.3)	
No	9,197 (92.8)	250 (88.7)	
Length of acute hospital care (days)	2.0 (2-4)	2.0 (2-5)	0.395
Length of acute hospital care (days) group			0.467
1-2 days	5,526 (55.8)	147 (52.1)	
3-7 days	3,149 (31.8)	96 (34.0)	
8+ days	1,232 (12.4)	39 (13.8)	
Survived to discharge from acute care			< 0.001
Yes	9,856 (99.5)	275 (97.5)	

No – Died	51 (0.5)	7 (2.5)	
Repeated admission[§]			0.665
Yes	241 (2.4)	8 (2.8)	
No	9,666 (97.6)	274 (97.2)	

[number (%)] displayed for categorical variables and [median (interquartile range)] for scale variables. Scale variables are 'Age', 'ISS' and 'Length of acute hospital care (days)'. All other variables are categorical. Comparisons were conducted using Pearson's Chi-Square Test for categorical variables or Mann-Whitney U Test for scale variables

[†] Indigenous status not recorded for 268 cases

[‡] Includes all other Australian states/territories, overseas visitors and unknown/no fixed address

[§] Identifies cases with more than one admission meeting the QTR inclusion criteria over the study period

Age differences in assault-related injuries

Patterns of assault-related injury by age group are shown in Table 2. Females represented over half (55.9%) of all assault-related injury admissions in children aged \leq 1 year, however this pattern changed with increasing age. In the 2-5 years, 6-12 years and 13-17 years age groups, males accounted for a higher percentage of assault-related injury cases compared to females (68.8%, 81.8% and 87.8% respectively). Indigenous children represented about one third (34.5%) of all assault-related injuries up to the age of 12 years. The majority of assault-related injury occurred at home for those aged less than 12 years (63.9%), however by 13-17 years, only 15.4% occurred at home. Differences were observed in the type of main injury experienced by age group. A higher proportion of assault-related brain injury occurred in those aged less than 6 years (42.0%), while a higher proportion of assault-related facial injuries occurred in adolescents (47.5%). Injury severity (ISS) significantly decreased with increasing age ($z = -3.46$; $p = .001$), as did the length of time spent in acute hospital care ($z = -6.64$; $p < .001$). There were seven deaths in children and adolescents following assault-related injury.

Table 2: Demographic, injury and outcome details by age groups among assault-related injury cases aged 17 years and under between 2005 and 2008

Variable	≤ 1 years (N = 34)	2 – 5 years (N = 16)	6 – 12 years (N = 12)	13 – 17 years (N = 221)	<i>p</i> value
Gender					< 0.001

Male	15 (44.1)	11 (68.8)	9 (81.8)	194 (87.8)	
Female	19 (55.9)	5 (31.3)	2 (18.2)	27 (12.2)	
Indigenous status[†]					0.007
Indigenous	11 (35.5)	5 (31.3)	4 (36.4)	31 (14.8)	
Non-indigenous	20 (64.5)	11 (68.8)	7 (63.6)	179 (85.2)	
Residential remoteness (ARIA+ category)					0.785
Major Cities	16 (47.1)	8 (50.0)	5 (45.5)	124 (56.1)	
Inner/outer Regional	15 (44.1)	6 (37.5)	6 (54.5)	81 (36.7)	
Remote/Very Remote	2 (5.9)	2 (12.5)	-	10 (4.5)	
Other [‡]	1 (2.9)	-	-	6 (2.7)	
Place of injury occurrence					< 0.001
Home	22 (64.7)	11 (68.8)	6 (54.5)	34 (15.4)	
School	-	-	1 (9.1)	12 (5.4)	
Other specified/Unspecified	12 (35.3)	5 (31.3)	4 (36.4)	175 (79.2)	
Nature of main injury					0.002
Fracture	11 (32.4)	5 (31.3)	2 (18.2)	116 (52.5)	
Intracranial injury	13 (38.2)	5 (31.3)	3 (27.3)	29 (13.1)	
Other	10 (29.4)	6 (37.5)	6 (54.5)	76 (34.4)	
Body region with most severe injury					N/A
Head	14 (41.2)	7 (43.8)	3 (27.3)	39 (17.6)	
Face	4 (11.8)	-	5 (45.5)	105 (47.5)	
Abdomen/Thorax	5 (14.7)	4 (25.0)	3 (27.3)	37 (16.7)	
Extremities	9 (26.5)	5 (31.3)	-	35 (15.8)	
Other	2 (5.9)	-	-	5 (2.3)	
Injury Severity Score (ISS)	11 (4 – 25)	9 (4 – 24)	5 (2 – 9)	4 (2 – 9)	0.001
Injury Severity Score (ISS) groups					< 0.001
ISS 1-8	16 (47.1)	6 (37.5)	8 (72.7)	160 (72.4)	
ISS 9-15	4 (11.8)	5 (31.2)	1 (9.1)	37 (16.7)	
ISS 16-24	3 (8.8)	1 (6.3)	1 (9.1)	14 (6.3)	
ISS 25+	11 (32.4)	4 (25.0)	1 (9.1)	10 (4.5)	
Operation performed					< 0.001
Yes	8 (23.5)	9 (56.3)	2 (18.2)	150 (67.9)	
No	26 (76.5)	7 (43.8)	9 (81.8)	71 (32.1)	
Admission to Intensive Care Unit					< 0.001
Yes	9 (26.5)	7 (43.8)	1 (9.1)	15 (6.8)	
No	25 (73.5)	9 (56.3)	10 (90.9)	206 (93.2)	
Length of acute hospital care (days)	7 (3 – 16)	8 (3 – 20)	3 (1 – 5)	2 (2 – 4)	< 0.001
Length of acute hospital care (days) groups					< 0.001
1-2 days	7 (20.6)	2 (12.5)	5 (45.5)	133 (60.2)	
3-7 days	11 (32.4)	6 (37.5)	5 (45.5)	74 (33.5)	
8+ days	16 (47.1)	8 (50.0)	1 (9.1)	14 (6.3)	
Survived to discharge from acute care					0.231
Yes	32 (94.1)	15 (93.8)	11 (100)	217 (98.2)	
No - Died	2 (5.9)	1 (6.3)	-	4 (1.8)	
Repeated admission[§]					0.500
Yes	-	1 (6.3)	-	7 (3.2)	

No 34 (100) 15 (93.8) 11 (100) 214 (96.8)

[number (%)] displayed for categorical variables and [median (interquartile range)] for scale variables. Scale variables are 'ISS' and 'Length of acute hospital care (days)'. All other variable are categorical. Comparisons were conducted using Fisher's Exact Test for categorical variables or a non-parametric test for trend for scale variables (N/A indicates test statistic was not able to be calculated).

† Indigenous status not recorded for 14 cases

‡ Includes all other Australian states/territories, overseas visitors and unknown/no fixed address

§ Identifies cases with more than one admission meeting the QTR inclusion criteria over the study period

Variables associated with sustaining assault-related injuries

All predisposing factors (indigenous status, gender and remoteness to health services) and age were found to have a significant association with intent of injury. In addition, significant interactions were identified between gender and indigenous status, gender and age group, and indigenous status and remoteness to health services. The results were separated into three logistic regression models to manage the effect modification appropriately (Table 3).

Table 3: Association between predisposing factors (age, gender, indigenous status and remoteness to health services) and the likelihood of sustaining an assault-related injury, including associations for significant interaction effects (N = 9,222)

Regression Model	Adjusted Odds Ratio (95% CI)	p-value
Model 1*		
Female, Non-indigenous	1	
Male, Non-indigenous	2.82 (1.78-4.47)	< 0.001
Female, Indigenous	15.3 (8.17-28.6)	< 0.001
Male, Indigenous	6.55 (3.60-11.9)	< 0.001
Model 2†		
Female, ≤1 years	1	
Female, 2-5 years	0.13 (0.48-0.37)	< 0.001
Female, 6-12 years	0.03 (0.01-0.12)	< 0.001
Female, 13-17 years	0.52 (0.27-1.00)	0.051
Male, ≤1 years	0.69 (0.33-1.40)	0.313

Male, 2-5 years	0.19 (0.09-0.42)	< 0.001
Male, 6-12 years	0.06 (0.03-0.15)	< 0.001
Male, 13-17 years	1.09 (0.64-1.85)	0.759
Model 3[‡]		
Non-indigenous, major cities	1	
Non-indigenous, regional areas	0.59 (0.44-0.78)	<0.001
Non-indigenous, remote areas	0.3 (0.09-0.94)	0.039
Non-indigenous, other areas [§]	0.36 (0.13-0.99)	0.049
Indigenous, major cities	1.57 (0.67-3.69)	0.295
Indigenous, regional areas	2.82 (1.89-4.18)	<0.001
Indigenous, remote areas	3.01 (1.46-6.21)	0.003
Indigenous, other areas [§]	1.37 (0.18-10.5)	0.763

* Model 1 is adjusted for Age group and Residential remoteness; Hosmer-Lemeshow χ^2 (8) = 12.35 ($p = .14$)

† Model 2 is adjusted for Indigenous status and Residential remoteness; Hosmer-Lemeshow χ^2 (8) = 7.98 ($p = .44$)

‡ Model 3 is adjusted for Gender and Age group; Hosmer-Lemeshow χ^2 (8) = 10.00 ($p = .26$)

§ 'Other areas' include all other Australian states/territories, overseas visitors and unknown/no fixed address

Patients with an indigenous background were more likely to sustain an assault-related injury compared to those of a non-indigenous background, however this effect differed according to gender. Females with an indigenous background were at highest risk of sustaining assault-related injuries, followed by male indigenous, male non-indigenous and females with a non-indigenous background. Indigenous females were over 15 times more likely to have an assault-related injury compared to non-indigenous females, whereas indigenous males were 2.32 times more likely to have an assault-related injury compared to non-indigenous males (95% CI: 1.50 – 3.59; $p < .001$). When examining the effect of gender within indigenous status, non-indigenous males were 2.82 times more likely than non-indigenous females to have sustained an assault-related injury, however females were at higher risk than males among the indigenous group, with indigenous females being 2.34

times more likely to sustain an assault-related injury compared to indigenous males (95% CI: 1.29 – 4.24; $p < .01$).

Compared to those aged ≤ 1 year, the likelihood of females sustaining an assault-related injury was significantly lower in the 2-5 years age group by 87% and in the 6 – 12 years age group by 97%. There was no statistically significant difference between the likelihood of assault-related injury in females aged 13-17 years and those aged ≤ 1 year. A similar trend was identified in males; the likelihood of sustaining an assault-related injury was significantly lower in those aged 2-5 years (OR: 0.28; 95% CI: 0.13 – 0.61; $p = .001$) and those aged 6-12 years (OR: 0.09; 95% CI: 0.04 – 0.22; $p < .001$) compared to males aged ≤ 1 year. There was no statistically significant difference between the likelihood of assault-related injury in males aged 13-17 years and males aged ≤ 1 year. When examining the effect of gender within each age group, a statistically significant gender difference was only identified in adolescents, where males were 2.11 times more likely than females (95% CI: 1.34-3.31; $p = .001$) to sustain an assault-related injury.

The likelihood of assault-related injury was significantly lower outside of a major city for people of non-indigenous background, with those living in a major city being 1.69 times more likely to be assaulted than those living in a regional area (95% CI: 1.28-2.27; $p < .001$). The likelihood of assault-related injury for those of indigenous background did not differ significantly between those living in a major city and both those living in a regional area (OR: 1.79, $p = .208$) and those living in a remote area (OR: 1.91; $p = .245$). When examining the effect of indigenous status within residential remoteness area, there was no statistically significant difference in the likelihood of assault-related injury between those of indigenous and non-indigenous backgrounds residing in major cities, however within regional areas, indigenous people were 4.82 times more likely to sustain an assault-related injury than non-indigenous people (95% CI: 3.14-7.42; $p < .001$). Within remote areas, indigenous people

were 10.12 times more likely to sustain an assault-related injury than non-indigenous people (95% CI: 2.64-38.69; $p = .001$).

CONCLUSION

The current study described the demographic, injury-related and acute care characteristics of assault-related injuries in children and adolescents, including a comparison to accidental injuries, and a comparison of assault-related injury among different age groups. The study further examined the effect of gender, indigenous status and remoteness to health services on sustaining assault-related injuries. The results identified which groups were more susceptible to sustaining assault-related injury in young age.

The bimodal age distribution identified in the current study is consistent with patterns observed in previous studies.^{4,5,6} These patterns have been observed in studies examining child victimisation in the US, which have reported that children aged 2 to 5 years experienced physical assault causing injury at a higher rate than those aged 6 to 12 years, with a peak in assault-related injuries occurring in the 13 to 17 year age group.⁶ The likelihood of sustaining assault-related injury in the current study was approximately 90% less in both the 2-5 and 6-12 years age groups compared to those aged ≤ 1 year, and there was no statistically significant difference between those aged 13-17 years and those aged ≤ 1 year. This pattern was similar for both males and females. The exposure of adolescents to known violence risk factors such as alcohol use,²⁵ drug use,²⁶ mental health problems²⁵ and weapon carrying²⁷ are likely to increase the risk of assault-related injuries observed throughout adolescence. On the other hand, the risk of abuse in children aged 0-4 years has been reported to be more than double the risk of older children in Europe.²⁸

Importantly, a significant gender difference in the likelihood of sustaining assault-related injuries was only identified in the adolescent group in this population. In the current

study, males were 2.11 times more likely to sustain assault-related injuries than females in the 13-17 years age group, however there was no statistically significant gender difference in other age groups. These results are somewhat different from previous reports indicating an increased risk of injury to males compared to females regardless of age.^{5,7} For accidental injuries, parental behaviours and perception of risk have been suggested by previous authors to be at least in part responsible for these gender trends, with male children thought to receive less hazard-related supervision and less injury concern from parents than their female peers.²⁹ Child factors such as likelihood to approach injury risk hazards³⁰ and higher activity levels⁴ have been documented to be more prominent in boys from a young age, and are likely to account in part for the increased incidence of accidental injuries in this group. The factors described above may be less related to assault-related injury however, and even though examinations of child and youth injuries caused by assault have also demonstrated an increased risk of physical assault injuries in males,^{6,31} the mechanism underlying this over-representation is unclear.

In the current study, infants and toddlers with assault-related injuries were found to have experienced longer stays in acute hospital care and were admitted with injuries of higher severity than older children and adolescents. These findings support previous research which indicated that age is an important predictor of injury severity for those with assault-related injury, with infants aged less than 12 months reported to experience a higher proportion of severe (ISS > 16) assault-related injuries than older children and adolescents.²⁷ The high injury severity and associated length of acute hospital care observed in young children experiencing assault-related injuries is likely to be related to the increased physical vulnerability of young children and their inability to protect and remove themselves from situations of assault, relative to older children and adolescents. The findings from the current study support the assertion that child injury prevention and intervention measures may be

best directed at parents prior to childbirth in order to minimise assault-related injury risk in infancy.^{32,33}

The body region of main injury was found to vary between assault-related injuries and accidental injuries. The face and head were most commonly injured following an assault and the upper extremity and lower extremity were most commonly injured following an accidental cause. These findings support previous research which has highlighted that children experiencing an abusive injury are more likely to undergo computerised tomographic scans and suffer from severe injuries with higher fatality rates than their accidentally injured counterparts.³¹

Results from the current study identified that an indigenous background was significantly associated with increased risk of sustaining assault-related injuries. In Australia, people of indigenous background experience a well-documented increase in risk of injury compared to non-indigenous Australians, with the health burden caused by injury in indigenous Australians double the rate of the non-indigenous population.³⁴ Numerous factors are likely to contribute to the high level of assault-related injuries experienced by children and adolescents from an indigenous Australian background, including intergenerational transmission of violence,³⁵ the high rate of young parents,³⁶ the high rate of crime, high levels of poverty, poor housing, increased substance abuse, high unemployment and socio-economic disadvantage.³⁷ Importantly, a significant interaction was identified between gender and indigenous status in the current study. Within gender, the magnitude of the difference in likelihood between indigenous and non-indigenous people was greater in females than in males. Moreover, the interaction analyses revealed that when looking at the gender effect within indigenous status, females were at a higher risk than males in the indigenous population, whereas males were at higher risk than females in the non-indigenous population.

For implementing effective prevention programs, identifying geographical areas where the likelihood of assault-related injuries is high is also important. The current study identified that differences in the likelihood of assault-related injury in different geographical areas is influenced by indigenous status. Among non-indigenous people, living in a major city may be associated with a higher risk of sustaining assault-related injuries compared to those living in a regional area. There was no significant difference in the likelihood of assault-related injury over different geographical areas among indigenous people. A variety of social, community, familial, behavioural factors³ may be involved in the high rate of adolescent assault-related injuries in the metropolitan area. Specifically, alcohol/drug use, previous fight involvement have been known as risk factors of assault-related injuries in adolescents.^{3,38} The investigations if adolescents living in major cities have been more exposed to these risk factors will be needed in the further study. On the other hand, Indigenous background factor was significantly associated with increased risk of sustaining assault-related injuries compare to non-indigenous people outside of major cities. The greater distance a person lives from a major city, the greater the difference in the likelihood of assault-related injury between indigenous and non-indigenous people became. Compared to non-indigenous people, indigenous people were 4.8 times more likely in regional areas and 10.1 times more likely in remote areas to be admitted to hospital following assault-related injuries. These results may reflect the fact that the indigenous population becomes more prevalent in regional and remote areas, with 69% living in these areas (45% in regional areas and 24% in remote or very remote areas) and 31% living in major metropolitan areas.^{39,40} Overall, 78% of indigenous communities are located at a distance of 50 km or more from a hospital.⁴¹ People living in regional and remote Australia face significant health disadvantage.⁴² Higher prevalence of health risk factors are recognized in these communities^{17,43} where the access to health services and resources is difficult, which in turn may result in

losing timely and optimal treatment.¹⁷ The designated trauma system have been introduced to improve outcomes following trauma and have been shown to reduce the mortality rate of injured patients,⁴⁴ however, the most ideal system for the management of trauma remains inconclusive in the light of prehospital care and regionalisation of trauma-care delivery.⁴⁵ The need for assault-focused injury prevention measured to adequately engage indigenous young people is clear in light of our findings. Improved access to health services and development of an appropriate rural trauma system are important factors to address health disadvantage in rural and remote area communities especially for Indigenous Australians.⁴⁶

Previous reports based on hospital administrative databases have been demonstrated a significant undercount in assault coding,⁴⁷ or studies utilising mortality and child protection datasets alone which fail to incorporate the full span of injury cases. The strength of the current study is that the data were extracted from the QTR database, where data were entered following the review of the medical record by trained data collection staff. The identification of trauma patients who meet the QTR inclusion criteria is performed through a well-documented, rigid protocol as described in the method section. Moreover, the QTR maintains the highest standard of data quality by providing education and training to all QTR data collection staff, utilising database validation rules, and performing routine quality assurance checks. The results from the current study provided reliable epidemiological information on assault-related injuries in children and adolescents residing in Queensland, Australia.

A limitation of the current study is that data concerning patients who present to emergency department who were not admitted, or were admitted for less than 24 hours, are not included on the QTR. The data used in the current study also does not include children who died from their injuries before reaching hospital. In addition, there might have existed some parents who tend to avoid seeking medical treatment for their children, given the nature

of assault-related injuries, especially where the children are victims of domestic violence or abusive assault.^{48,49}

In conclusion, the current study described characteristics of assault-related injuries in children and adolescents, and provided evidence of interaction effects among the predisposing factors of gender, indigenous background and remoteness to health services on the increased risk of sustaining assault-related injuries in this age group. Identifying these predisposing factors and interactions is important for the development of effective preventive measures and trauma management plans focusing on high-risk groups who are most likely to sustain assault-related injuries in young age.

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