Analysis of Paediatric Hospital Admissions for Unintentional Injury in Taranaki 2012-2014

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ABSTRACT

Unintentional injury causes significant mortality and morbidity for children less than 15 years of age in New Zealand. This study is a retrospective audit of hospital admissions for unintentional injury from 1st January 2012 to 31st December 2014. A total of 557 patients where admitted during the study period, a rate of 808.4 per 100,000, this rate is comparable to overall New Zealand data and has been steadily declining since 1996 along with global trends. Rates were higher for boys and non-Maori. Those from more deprived areas a had greater of admissions than the least deprived areas.

0-4 year olds were most commonly admitted due to injuries sustained in falls, usually occurring in the home. 5-9 year olds showed a pattern of falling from playground equipment while 10-14 year olds sustained their injuries also through falls, often from skateboards, roller skates and scooters. Transport and road injuries were becoming more common in the older age group. Further injury prevention strategies will need to focus on these areas.

Kidsafe Taranaki, a local child focused injury prevention trust, have been implementing injury prevention strategies to families of young people in Taranaki and this information will help guide future initiatives.

INTRODUCTION

Unintentional injury is a major cause of mortality and morbidity for children aged 0 to 14 years in New Zealand. Between 2012 and 2014 21,897 children were admitted to hospital in New Zealand, an average of 7,299 each year[1]. Between 2010 and 2014 206 children died from unintentional injury, an average of 41 per year[2].

Minor childhood injuries occur every day, however those serious enough to warrant admission to hospital can have significant consequences[3] which are preventable.

The Kidsafe Taranaki Trust is an inter-sectorial child injury prevention group, formed in 1994, which has the overall goal of preventing unintentional injury to Taranaki children. The Trust designs, implements and evaluates projects and programmes centered around priority injury issues. In order to achieve a reduction in paediatric unintentional injuries, evidence based data is required.

The aim of this report is to:

- Collect and describe the recent data specific to the Taranaki region (hospital admissions for unintentional injury 2012-2014)
- Highlight the leading causes of unintentional injury in children and identify the highest priority populations.
- Monitor trends over time.
- This local data can then be used to tailor initiatives and strategies for injury prevention to the Taranaki population.

This report follows on from previous studies that have analysed paediatric hospital admissions from the period of 1996 – 2011[4-8]. Each previous report has analysed a three year period, and this report continues this. An analysis was not performed on data from 1999 and this continues to be absent from the ongoing analysis.

The project was carried out by accessing the raw data collected by Taranaki District Health Board, then processing the data into a useful format for analysis. The data is based on the International Classification of Disease, which in currently on Volume 10 (ICD-10). This system undergoes minor updating on a yearly basis. Therefore some of the categories may change over time.

In line with previous reports the data was analysed by ‘Mechanism of injury’, ‘Gender’, ‘Ethnicity’, ‘Age group’, ‘Location’ and ‘Activity’. Following this, the two major mechanisms of injury for each age group were identified and further analysed. The discussion provides a brief summary of each section of the report. Following this some recommendations are provided to guide programme development for the Trust and other interested parties.

METHOD

A retrospective audit was undertaken on behalf of the Kidsafe Taranaki trust of all children admitted to hospital for unintentional injury at Taranaki Base Hospital, New Plymouth New Zealand.

This audit included all children aged under 15 years who were admitted to the children's ward at Taranaki Base Hospital, New Plymouth, New Zealand between 1 January 2012 and 31 December 2014 for unintentional injury. For each child the following data was collected: age, gender, ethnicity, decile of residence, mechanism of injury, location where injury occurred and activity being undertaken when injury occurred. As this was an internal audit, no ethical consent was required. Participant confidentiality was maintained throughout.

Data was accessed from the Medical Information Unit at Taranaki Base Hospital. All children aged 0-14 who had received an unintentional injury code when admitted to hospital in period from the January 1st 2012 to December 31st 2014 where included in the audit. The raw data was recorded as an E-code under the ICD-10 classification system. Data was omitted from children who, on further investigation, had not suffered an unintentional injury. Children admitted due to an intentional injury were not included. No data was omitted due to lack of necessary information, if the necessary information was not available, then "unspecified" was entered into the field.

For the purposes of this audit, certain codes are combined to create the categories used throughout. The decision regarding which codes are combined is at the discretion of the individuals involved in the analysis. This potential variant may explain the discrepancies seen between the results found in this report and that of other organisations, although this will not affect the overall results. Difficulties in tracing how the previous studies have grouped codes could also result in differences between reports. A description of the codes, under the ICD-10 version 2010 classification, that have been combined for this report can be viewed in Appendix B.

The raw data was analysed firstly across all age groups (0-14 years) in the categories of 'Gender', 'Ethnicity', 'Deprivation, 'Mechanism of injury', 'Location', and 'Activity'. The data was then divided into three separate age groups, 0-4 years, 5-9 years and 10-14 years and further analysed, including an exploration of the top two mechanisms of injury in each age group. Age specific rates were calculated using Census data from Statistics New Zealand, based on the actual Taranaki population in each age group[9]. Data from this source was also used to investigate Residency.

Trends over time were analysed where possible, including data from previous Kidsafe Taranaki reports from 1998 – 2011. The Taranaki data was compare to New Zealand data and known international data.

RESULTS

DEMOGRAPHICS

The total number of paediatric admissions for unintentional injury in Taranaki over the three year period 2012-2014 was 557, an average of 185.7 per year. The patient characteristics are shown in Table 1. Age specific rates where 808.4 per 100,000 over the whole group, 746.9 per 100,000 for the 0-4 year old age group, 885.8 per 100,000 for the 5-9 year age group and 798.3 per 100,000 for the 10-14 year age group.

The New Plymouth district includes the city of New Plymouth, the only city in Taranaki. This therefore reflects the most urban group. The Stratford and South Taranaki districts are predominately rural, consisting of farming areas and small towns. New Plymouth has a slightly higher rate of admissions than the two more rural districts

Table 1: Patient Demographics

Characteristics	Number	Rate per 100,000
Total Admissions	557	808.4
Gender		
Male	361 (64.8%)	1018.3
Female	196 (35.2%)	576.9
Age Group		
0-4 years	167 (30.0%)	746.9
5-9 years	201 (36.1%)	885.8
10-14 years	189 (33.9%)	798.3
Ethnicity		
Maori	148 (26.6%)	765.6
Non-Maori	409 (73.4%)	816.6
District		
New Plymouth	349 (62.7%)	769.9
Stratford	130 (23.3%)	741.9
South Taranaki	44 (7.9%)	713.0
Non-Taranaki	34 (6.1%)	

MECHANISM OF INJURY

Table 2 shows the total number, percentage and rate per 100,000 age specific population of paediatric admissions by mechanism, or cause of the injury. 'Fall' was the mechanism of injury in over half the cases, with 288 of the 557 admissions (51.7%, rate 418.7). The second largest category is 'Transport/Road Injuries (14.2%, rate 114.5), followed by 'Struck by/Against' (6.5%, rate 52.1) and 'Foreign Body' (5.4% rate 43.4).

Table 2: Numbers, percentage and rates per 100,000 by mechanism of injury

Mechanism	Total	%	Rate
Fall	288	51.7%	418.1
Transport/Road Injury	79	14.2%	114.5
Struck by/Against	36	6.5%	52.1
Foreign Body	30	5.4%	43.4
Cut/Pierce	29	5.2%	42.1
Caught/Crushed/Jammed	29	5.2%	42.2
Poisoning	17	3.1%	24.7
Animal bite/Insect Sting	15	2.7%	21.7
Heat/Hot Substances	14	2.5%	20.3
Overexertion	9	1.6%	13.0
Knives/Swords/Daggers	4	0.7%	5.9
Unspecified	2	0.4%	2.9
Drowning and Submersion	2	0.4%	2.9
Electric shock	1	0.2%	1.5
Strangulation	1	0.2%	1.4
Diving or jumping	1	0.2%	1.5
Grand Total	**557**	**100.0%**	**808.4**

GENDER

The table below (Table 3) shows mechanism by gender across all age groups spanning the 3-year period. This table clearly shows that boys are consistently more likely than girls to incur an unintentional injury. In total, boys account for 64.8% of all admissions. The age specific rates in where nearly double for

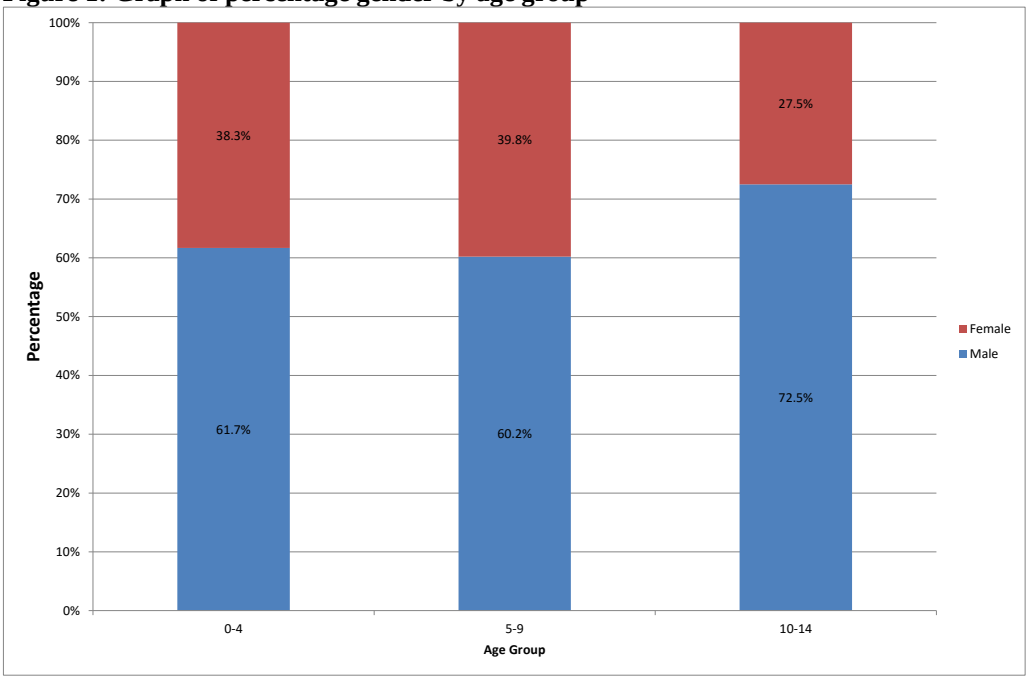
boys compared to girls with boys having a rate of 1018.3 per 100,000 age specific population and girls 576.9 per 100,000 age specific population. The only exceptions where 'Heat/Hot Substances' and 'Overexertion' however the differences in numbers was small. 'Fall' and 'Transport/Road injury' are the top two mechanisms of injury for both boys and girls.

Table 3: Table of mechanism by gender – numbers, percentage and rate per 100,000

	Female			Male			Total		
Mechanism	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
Fall	121	61.7%	356.1	167	46.3%	471.1	288	51.7%	418.1
Transport/Road Injury	18	9.2%	53.0	61	16.9%	172.1	79	14.2%	114.5
Struck by/Against	6	3.1%	17.7	30	8.3%	84.6	36	6.5%	52.1
Foreign Body	9	4.6%	26.5	21	5.8%	59.2	30	5.4%	43.4
Cut/Pierce	7	3.6%	20.6	22	6.1%	62.1	29	5.2%	42.1
Caught/Crushed/Jammed	10	5.1%	29.4	19	5.3%	53.6	29	5.2%	42.2
Poisoning	6	3.1%	17.7	11	3.1%	31.0	17	3.1%	24.7
Animal bite/Insect Sting	4	2.0%	11.8	11	3.1%	31.0	15	2.7%	21.7
Heat/Hot Substances	8	4.1%	23.5	6	1.7%	16.9	14	2.5%	20.3
Overexertion	5	26%	14.7	4	1.1%	11.3	9	1.6%	13.0
Knives/Swords/Daggers	1	0.5%	2.9	3	0.8%	8.5	4	0.7%	5.9
Unspecified	1	0.5%	2.9	1	0.3%	2.8	2	0.4%	2.9
Drowning and Submersion		0.0%		2	0.6%	5.6	2	0.4%	2.9
Electric shock		0.0%		1	0.3%	2.8	1	0.2%	1.5
Strangulation		0.0%		1	0.3%	2.8	1	0.2%	1.4
Diving or jumping		0.0%		1	0.3%	2.8	1	0.2%	1.5
Grand Total	**196**	**100.0%**	**576.9**	**361**	**100.0%**	**1018.3**	**557**	**100.0%**	**808.4**

As seen in Figure 1, the gender difference is even more marked in the older 10-14 year age group with boys accounting for 72.5% of admissions.

Figure 1: Graph of percentage gender by age group



ETHNICITY

Ethnicity data collected in the 2013 Census allows for more than one ethnicity group to be selected for each individual whereas the ICD-10 codes do not, therefore the numbers cannot be directly compared for each ethnic group. A comparison has been made using those who indicate Maori in the census, whether alone or combined with other ethnicities versus those who did not indicate Maori on the census.

This gives a 'Maori' group and a 'Non-Maori' group. This allows a comparison with the 2012-2014 data, again grouped into 'Maori' and 'Non Maori'

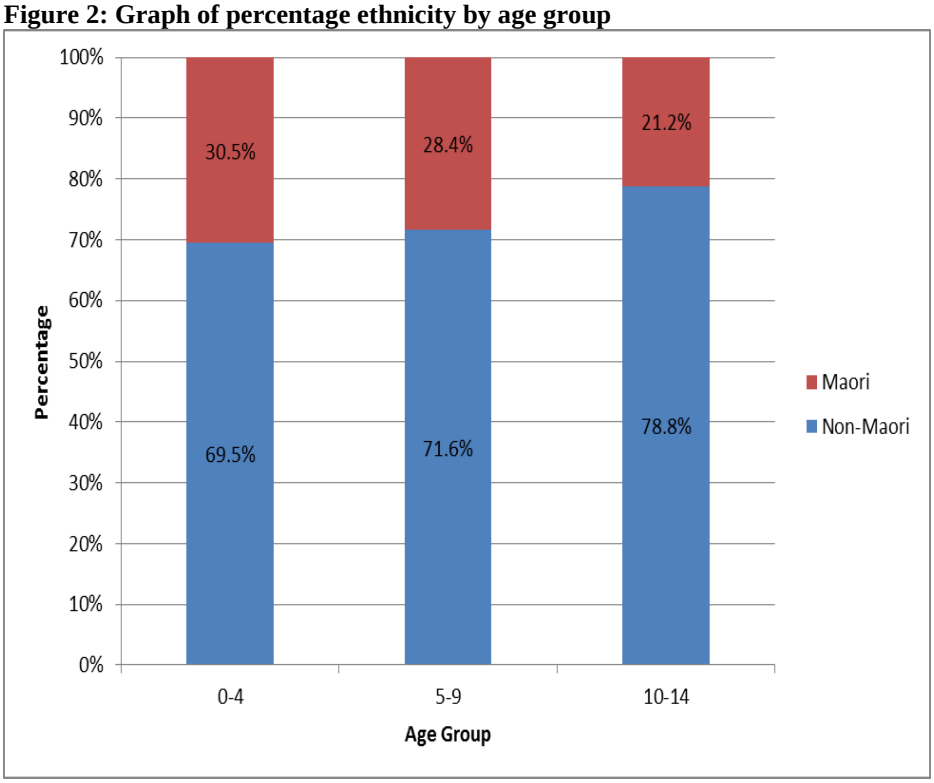
The table (Table 4) below shows the total number and percentage of paediatric unintentional injury admissions by mechanism and ethnicity. The majority of admissions are children in the 'Non-Maori' with 409 (73.4% of all admissions). There were 148 admissions for 'Maori' (26.6% of admissions). When looking at the rate per 100,000 'Non-Maori' had a higher rate at 816.6 compared with 'Maori' at 765.6. Injury mechanism is similar for both ethnicity groups. 'Fall' and 'Transport/Road Injury' are the top two mechanism of injury for both groups.

Table 4: Table of mechanism for ethnicity – numbers, percentage and rate per 100,000

	Maori			Non Maori			Total		
Mechanism	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
Fall	76	51.4%	393.1	212	51.8%	423.3	288	51.7%	418.1
Transport/Road Injury	18	12.2%	93.1	61	14.9%	121.8	79	14.2%	114.5
Struck by/Against	8	5.4%	41.4	28	6.8%	55.9	36	6.5%	52.1
Foreign Body	9	6.1%	46.6	21	5.1%	41.9	30	5.4%	43.4
Cut/Pierce	8	5.4%	41.4	21	5.1%	41.9	29	5.2%	42.1
Caught/Crushed/Jammed	9	6.1%	46.6	20	4.9%	39.9	29	5.2%	42.2
Poisoning	4	2.7%	20.7	13	3.2%	26.0	17	3.1%	24.7
Animal bite/Insect Sting	8	5.4%	41.4	7	1.7%	14.0	15	2.7%	21.7
Heat/Hot Substances	4	2.7%	20.7	10	2.4%	20.0	14	2.5%	20.3
Overexertion	1	0.7%	5.2	8	2.0%	16.0	9	1.6%	13.0
Knives/Swords/Daggers		0.0%	0.0	4	1.0%	8.0	4	0.7%	5.9
Unspecified	1	0.7%	5.2	1	0.2%	2.0	2	0.4%	2.9
Drowning and Submersion	1	0.7%	5.2	1	0.2%	2.0	2	0.4%	2.9
Electric shock		0.0%	0.0	1	0.2%	2.0	1	0.2%	1.5
Strangulation		0.0%	0.0	1	0.2%	2.0	1	0.2%	1.4
Diving or jumping	1	0.7%	5.2		0.0%	0.0	1	0.2%	1.5
Grand Total	**148**	**100.0%**	**765.6**	**409**	**100.0%**	**816.6**	**557**	**100.0%**	**808.4**

As seen in Figure 2 there is a slightly higher proportion of 'Non Maori' in the 10-14 year olds.

Figure 2: Graph of percentage ethnicity by age group



DEPREVATION

The New Zealand deprivation index[10] divides each area of New Zealand into 10 deciles as an index of socioeconomic deprivation. This is based on census data relating to income, home ownership, employment, qualifications, family structure, housing, access to transport and communications. Decile 1 is the least deprived area and decile 10 is the most deprived area. The decile assigned to each patient is based on the decile of their residential address. It is important to note that the decile therefore relates to the deprivation of an area and not necessarily to the individual. Table 5 shows the number of admissions for each decile for the different age groups. Only those patients living in Taranaki where analysed.

Table 5: Decile vs age group, number of admissions

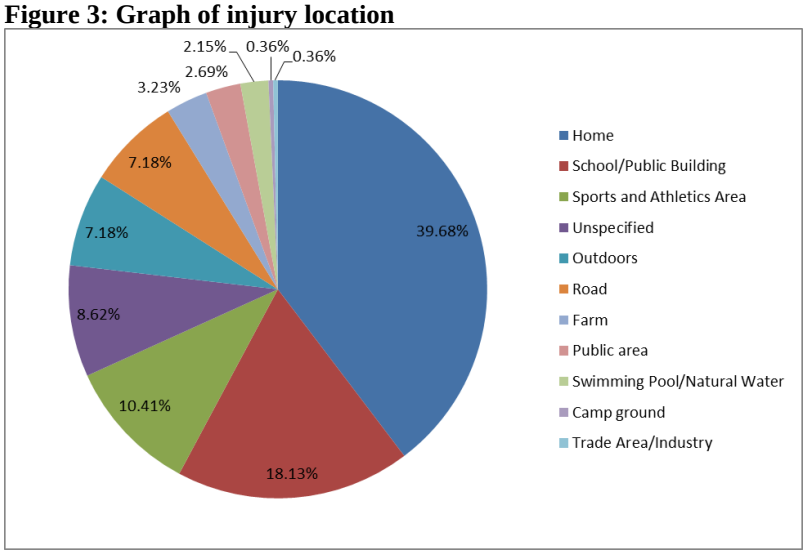
	Age Group			
Decile	**0-4**	**5-9**	**10-14**	**Total**
1	6	15	11	32
2	15	15	14	44
3	7	4	4	15
4	9	11	15	35
5	22	22	24	68
6	36	45	24	105
7	14	17	17	48
8	21	29	30	80
9	16	18	22	56
10	13	14	13	40
Residence outside Taranaki	8	11	15	34
Grand Total	**167**	**201**	**189**	**557**

Analysis of this data does not show a statistically significant correlation between decile and number of admissions for unintentional injury (p values: 0-4 years 0.321, 5-9 years 0.415, 10-14 years 0.137, total 0.264), however there is nearly twice the number of admissions from the most deprived three deciles 8-10 (176/523) compared with the least deprived three deciles 1-3 (91/523). This pattern is seen across all three age groups.

LOCATION

The home is the most common site for serious unintentional injuries to occur. During the three-year-period a total of 221 children aged from 0-14 years of age were admitted for injuries that occurred in the home, which accounts for 39.8% of the total admissions. 'School/Public Buildings' in the second most common location for injuries to occur with 101 admissions, representing 18.2% of total admissions. 'Sports and Athletics Areas' rate third with 58 admissions, which is 10.4% of admissions.

Figure 3: Graph of injury location



This reflects the main areas that children spend their time. Within the 0-4 age group the home is the most common setting for injuries to occur. 'School/Public Building' and 'Sports and athletics area' feature highly in both the 5-9 and 10-14 year age groups. This would be an expected result given the shift in activity focus for children of these ages.

ACTIVITY

Information surrounding the 'Activity' was generally either poorly collected, or poorly coded, and is therefore difficult to compare and analyse. Information regarding activity has been analysed with reference to the common mechanisms for injury for each age group and is included later in this report under the appropriate section for each age group.

This data emphasises how poorly coded 'Activity' is, with 167 of the 557 (30%) admissions receiving the 'Unspecified activity' code, or being classified as 'Other specified' activity.

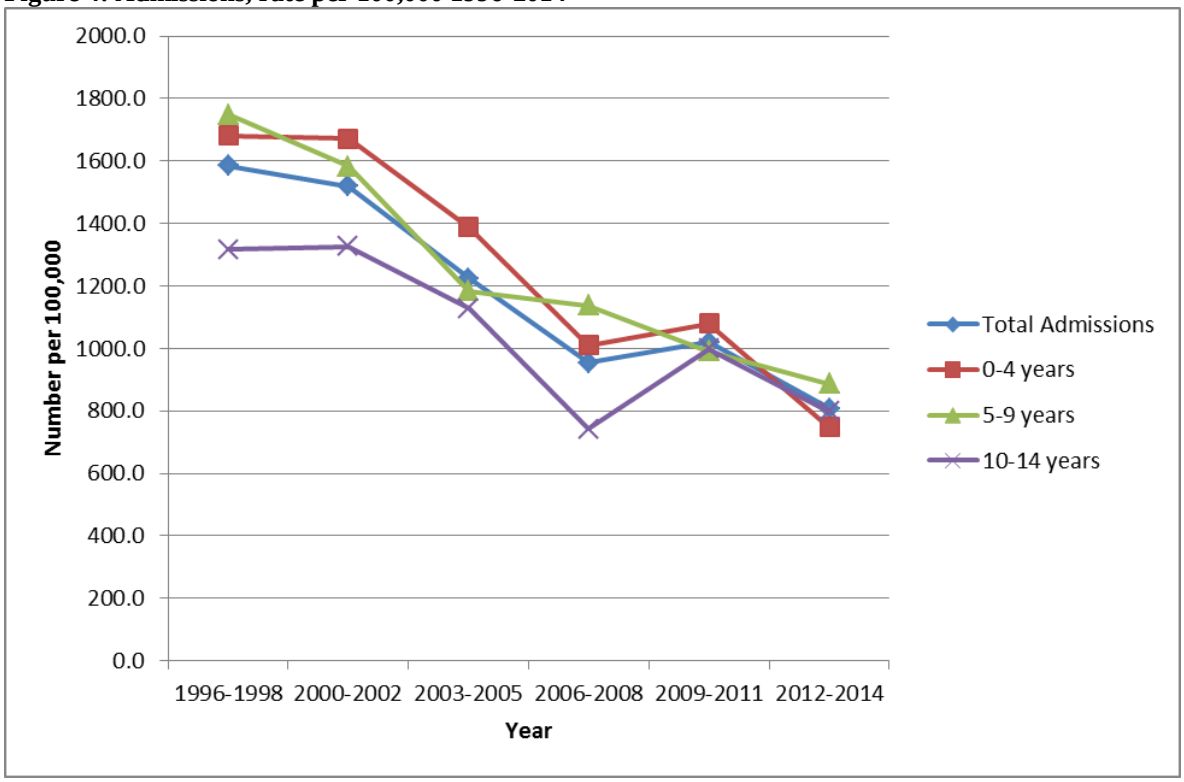
Table 6: Table of Activity 2012-2014

Activity	Number	%
Unspecified	158	28.4%
Playground Equipment	103	18.5%
Playing	80	14.4%
Sports	39	7.0%
Cycling	36	6.5%
Motorcycling/Motor Sport	31	5.6%
Skate/Scooter	31	5.6%
Climbing Tree	10	1.8%
While resting/sleeping/eating or engaged in other vital activities	10	1.8%
Passenger	10	1.8%
Other specified activity	9	1.6%
While engaged in other types of work	9	1.6%
Being carried	8	1.4%
Horse Riding	8	1.4%
Swimming/Water Sports	8	1.4%
Pedestrian	5	0.9%
Cooking	1	0.2%
Receiving Medication	1	0.2%
Grand Total	**557**	**100.0%**

CHANGE OVER TIME

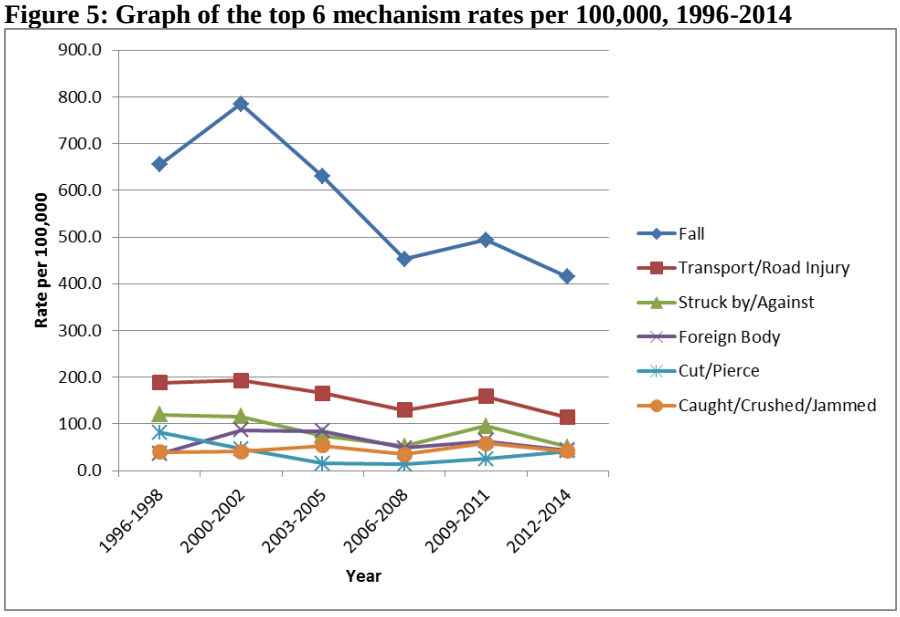
Admission rates per 100,000 age specific population have steadily declined from a peak of 1584.2 per 100,000 in 1996-8 to the lowest rate documented of 808.4 per 100,000 age specific population in 2012-14 as seen in Figure 4. This shows a significant reduction across all of the age groups, total population p valve 0.003, 0-4 year olds p value 0.003, 5-9 year olds p value 0.001 and 10-14 year olds p value 0.036.

Figure 4: Admissions, rate per 100,000 1996-2014



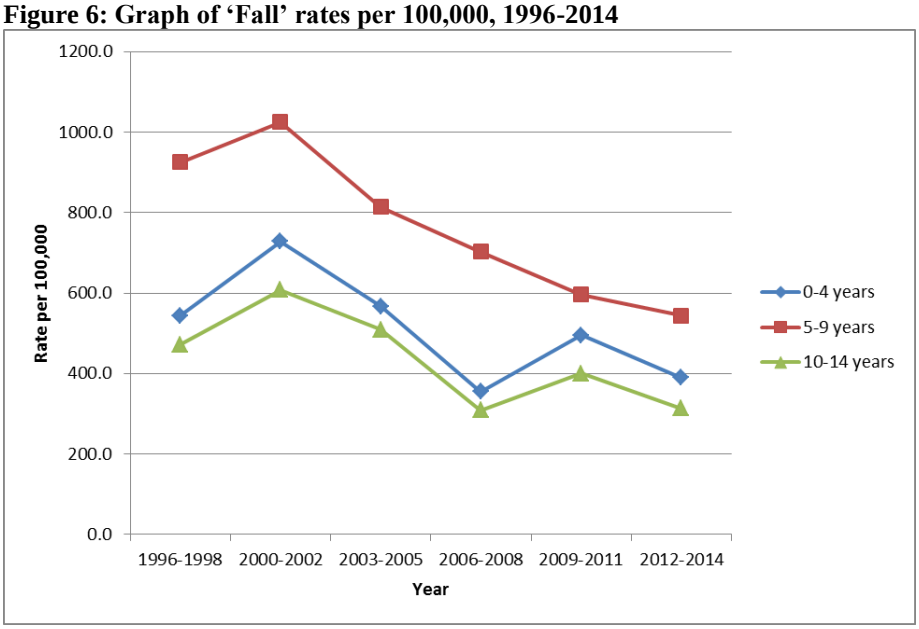
As with previous reports, 'Fall' is consistently well above the other mechanisms of injury, as shown byFigure 5. The 'Fall' rate per 100,000 age specific population has declined significantly from a peak of 784.2 per 100,000 age specific population in 2000-2002 to 414.8 per 100,000 age specific population in 2012-2014 (p value 0.041). The rates for 'Transport/Road Injury' have also declined significantly over this period (p value 0.028). The rate for 'Struck by/Against' has also declined but does not reach clinical significance (p value 0.081). The other main mechanisms of injury have not shown a statistically significant decline over this period ('Foreign Body' p value 0.8, 'Cut/Pierce' p value 0.222, 'Caught/Crushed/Jammed' p value 0.588).

Figure 5: Graph of the top 6 mechanism rates per 100,000, 1996-2014



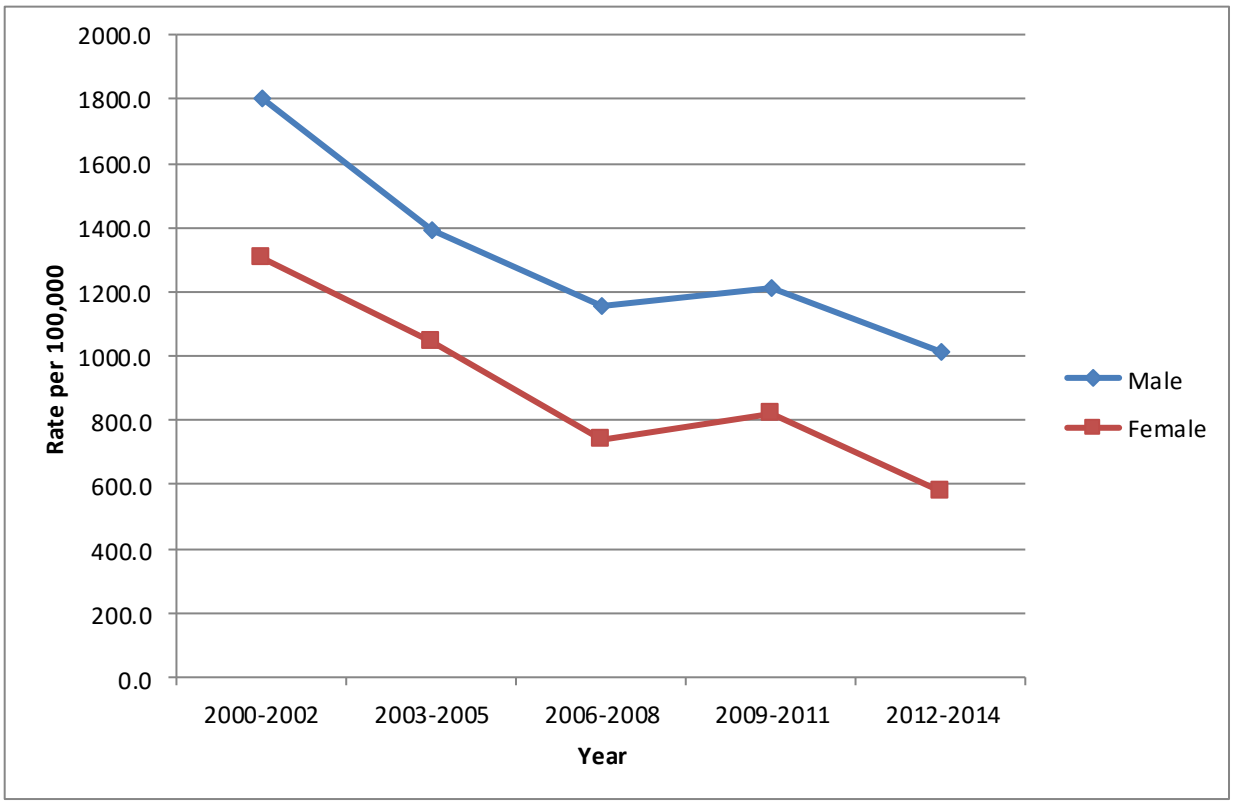
The 'Fall' rate per 100,000 age specific population has declined for all age groups over the period from 1996 to 2014 but only reaches statistical significance for the 5-9 year age group (5-9 years p value 0.009, 0-4 years p value 0.167, 10-14 years p value 0.111).

Figure 6: Graph of 'Fall' rates per 100,000, 1996-2014



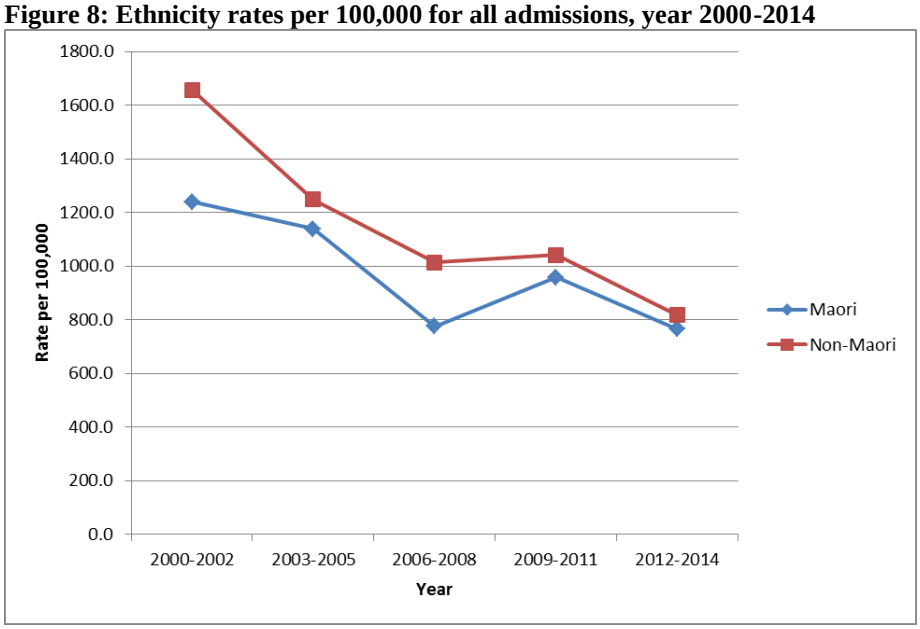
Data is available for age specific rates for gender from 2000-2002 as seen in Figure 7. The rates per 100,000 age specific population have shown a statistically significant reduction for boys (p value 0.031) and girls (p value 0.018) since 2000-2002.

Figure 7: Gender rates per 100,000, year 2000-1014



Age specific rates have been calculated for 'Maori' and 'Non-Maori'. The rate per 100,000 age specific population in 2012-2014 was 765.6 for 'Maori' and 816.6 for 'Non-Maori'. That rate for 'Maori' is therefore lower than the rate for 'Non Maori', this has been true since 2000-2002 (Figure 8). Rates for both groups have declined since 2000-2002, the reduction reached statistical significance for 'Non Maori' (p value 0.02) but did not quite reach statistical significance for 'Maori' (p value 0.075).

Figure 8: Ethnicity rates per 100,000 for all admissions, year 2000-2014



COMPARISON TO NEW ZEALAND DATA

In December Safekids Aotearoa produced a report on child unintentional injuries for New Zealand[11]. The data in this report covered the years 2008-2012. The Taranaki Data compares favourably to this report, as seen below in Table 7. Taranaki had a slightly lower rate (808.4) compared with the overall for all of New Zealand (826.3). The area with the greatest difference between Taranaki and New Zealand data was in the 0-4 year old age group, for females and for Maori – for all of which Taranaki had lower rates of admission than the overall New Zealand rates. Taranaki had a higher rate for Non-Maori, although direct comparison is difficult as rate per 100,000 data was not available for the difference ethnicities in the Taranaki data.

Table 7: Comparison of Taranaki Data with NZ data

Rates per 100,000	Safekids Aotearoa[11]	Taranaki Data
Total	826.3	808.4
0-4 years	865.3	746.9
5-9 years	884.6	885.8
10-14 years	807.4	798.3
Male	1015.2	1018.3
Female	688.0	576.9
Maori	945.8	765.6
Non-Maori	NZ European – 654.2 Pacific Islanders – 792.2 Asian – 415.9	Non-Maori – 816.6

COMPARISON TO INTERNATIONAL DATA

Data is available for unintentional injury rates for the United States of America[12]. Rates for patients 0-14 years old hospitalized or transferred from the emergency department were 282.8 per 100,000 for 2012, 268.4 per 100,000 for 2013 and 247.7 per 100,000 for 2014. When compared to this Taranaki children have a much higher rate of admission to hospital at 808.4 per 100,000.

0-4 YEAR OLDS

SUMMARY

Children aged 0-4 years accounted for 30.0% of all paediatric admissions in Taranaki for unintentional injury for the 2012-2014 period.

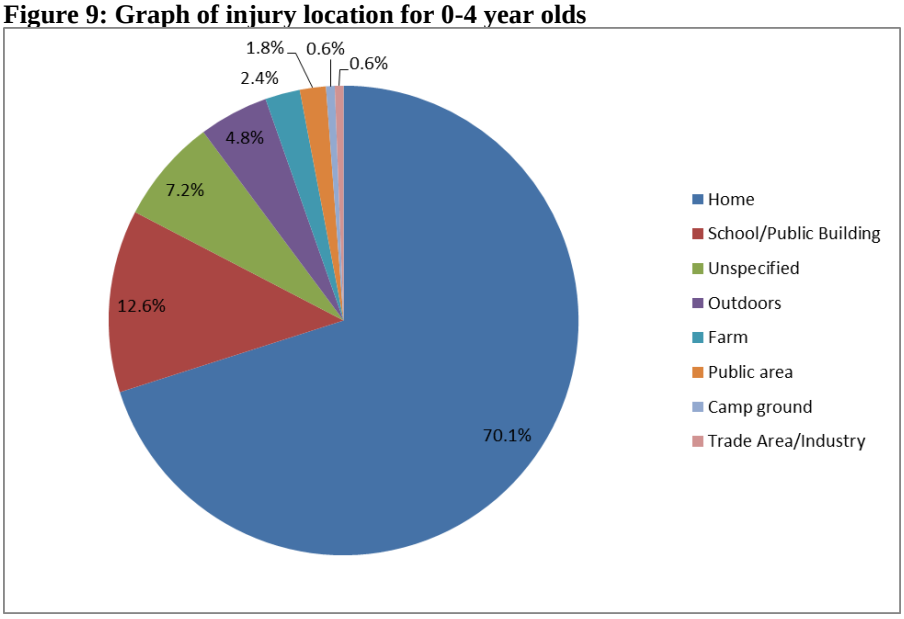
Table 8 shows that the most common mechanism implicated for children aged 0-4 were 'Fall' (55.1%), 'Caught/Crushed/Jammed' (9.6%) 'Poisoning' (8.4%), and 'Foreign Body' (8.4%). 'Fall' stands out as the leading cause for injury for 0-4 year olds accounting for over half of the admissions for unintentional injury.

Table 8: Table of mechanism by year for 0-4 year olds

Mechanism	Total	%
Fall	92	55.1%
Caught/Crushed/Jammed	16	9.6%
Poisoning	14	8.4%
Foreign Body	14	8.4%
Heat/Hot Substances	10	6.0%
Animal bite/Insect Sting	7	4.2%
Cut/Pierce	4	2.4%
Transport/Road Injury	4	2.4%
Struck by/Against	3	1.8%
Overexertion	2	1.2%
Drowning and Submersion	1	0.6%
Grand Total	**167**	**100%**

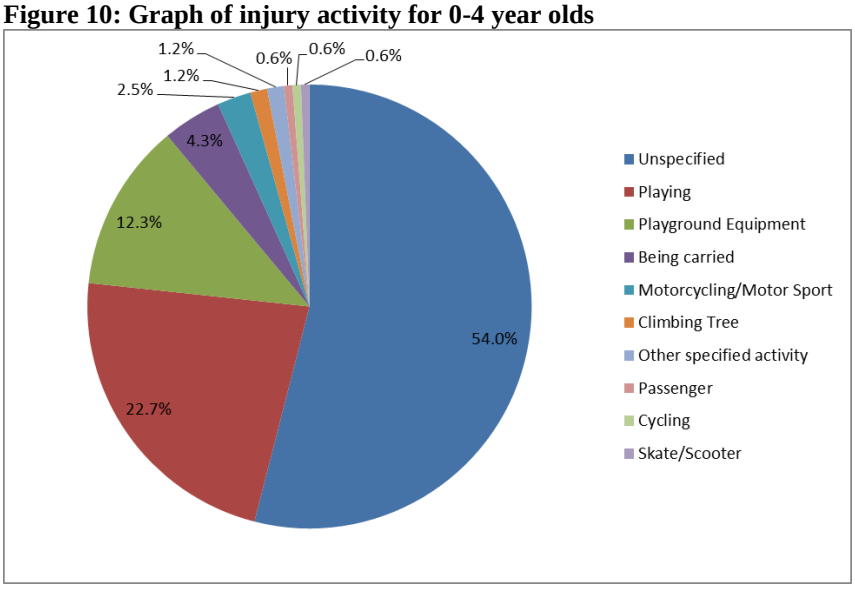
Figure 9 indicates the location of injuries occurring in the 0-4 age group. It is immediately evident that the 'Home' is the predominant location (70.1%) for injuries in this age group. This is consistent with the notion that children aged 0-4 would spend the majority of their time at home. 'School/Public Buildings' is the second most common location with 12.6% of admissions. In this age group this category refers to preschools and day-cares. The 'Unspecified' category was the third most commonly stated location at 7.2%. Often the location of where the injury occurred is not recorded in the medical records, either not enquired into or not supplied.

Figure 9: Graph of injury location for 0-4 year olds



As seen in Figure 10 the activity the child was doing at the time the unintentional injury was sustained was not well documented with 'Unspecified' accounting for over half (54%) of the admissions. The most common specific activities where playing (22.7%) or playing on playground equipment (12.3%). However more information has been gained by analysing the activities with regard to the common mechanisms of injury as below.

Figure 10: Graph of injury activity for 0-4 year olds



FALLS

0-4 YEARS

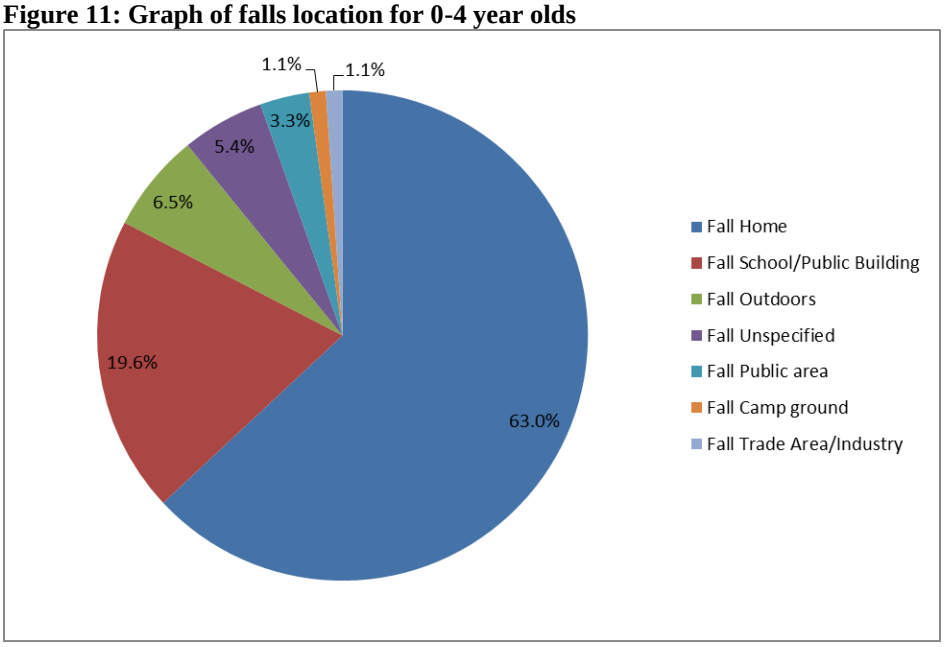
Falls accounted for 55.1% of hospital admissions for unintentional injury in the 0-4 age group. As seen in Table 9 most falls in the 0-4 year old age group involve falls from furniture. The most common pieces of furniture involved are beds, couches or chairs, which together account for 78% of falls from furniture. The second most common mechanism of falls is falls from playground equipment, with most falls being from trampolines or slides. Falls involving stairs resulted in 7 admissions during the 2012-1014 period, as did falls involving infants being dropped while carried by another person.

The following graph (Figure 11) shows the location of 'Fall', which unsurprisingly indicates that the majority (63.0%) of these injuries occur in the home for the 0-4 age group. The second most common location was 'School/Public Building' with 19.6%. This matches the locations for all injuries in the 0-4 year old age group.

Table 9: Table of falls description for 0-4 year olds

Falls	Total	%
Furniture	**32**	**34.8%**
Bed	9	
Couch	8	
Chair	8	
Bench	2	
Table	2	
Box	2	
Shelf	1	
Playground Equipment	**18**	**19.6%**
Trampoline	5	
Slide	4	
Other playground equipment	3	
Jungle gym	3	
Swing	2	
Seesaw	1	
Structure	**14**	**15.2%**
Stairs	7	
Building	3	
Stationary vehicle	2	
Fence/Wall	2	
Tripped/Slipped	**11**	**12.0%**
Playing	5	
Unspecified	4	
Other specified activity	2	
Being carried	**7**	**7.6%**
Unwitnessed	**4**	**4.3%**
Climbing Tree	**2**	**2.2%**
Unspecified	**1**	**1.1%**
Other	**1**	**1.1%**
Supermarket trolley	**1**	**1.1%**
Skate/Scooter	**1**	**1.1%**
Grand Total	**92**	**100.0%**

Figure 11: Graph of falls location for 0-4 year olds



CAUGHT / CRUSHED / JAMMED *0-4 YEARS*

'Caught/Crushed/Jammed' was the second leading cause of hospital admission for unintentional injury in the 0-4 age group, accounting for 16 (9.6%) of admissions. The majority of these injuries involved fingers being caught in doors (75%). Other objects were involved in the remaining 4 (25%) of injuries.

Table 10: Table of caught/crushed/jammed by year for 0-4 year olds

Caught/Crushed/Jammed	Total	%
Door	12	75.0%
Playground Equipment	1	6.3%
Motorcycling/Motor Sport	1	6.3%
Car Door	1	6.3%
Bicycle	1	6.3%
Grand Total	**16**	**100.0%**

5-9 YEAR OLDS

SUMMARY

Children aged 5-9 years accounted for the largest percentage, 36.1% of all paediatric hospital admissions in Taranaki for unintentional injury in the 2012-2014 period.

Table 11 shows that the most common mechanism implicated for children aged 5-9 years were 'Fall' (61.7%), 'Transport/Road Injury' (11.4%), 'Cut/Pierce' (6.0%), and 'Caught/Crushed/Jammed' (6.0%).

Table 11: Table of mechanism by year for 5-9 year olds

Mechanism	Total	%
Fall	124	61.7%
Transport/Road Injury	23	11.4%
Cut/Pierce	12	6.0%
Caught/Crushed/Jammed	12	6.0%
Foreign Body	9	4.5%
Animal bite/Insect Sting	5	2.5%
Struck by/Against	5	2.5%
Overexertion	3	1.5%
Unspecified	2	1.0%
Knives/Swords/Daggers	2	1.0%
Heat/Hot Substances	2	1.0%
Drowning and Submersion	1	0.5%
Poisoning	1	0.5%
Grand Total	**201**	**100.0%**

Figure 13 indicates the location of injuries occurring in the 5-9 year old age group. The majority of injuries occur in the 'Home' (32.8%), closely followed by 'School/Public Building' (26.4%). 'Sports and athletics area' are also more frequently represented in children aged 5-9 than in children in the 0-4 year old age group. This is in fitting with a shift of activity focus for children once they reach school age.

Figure 13: Graph of injury location for 5-9 year olds

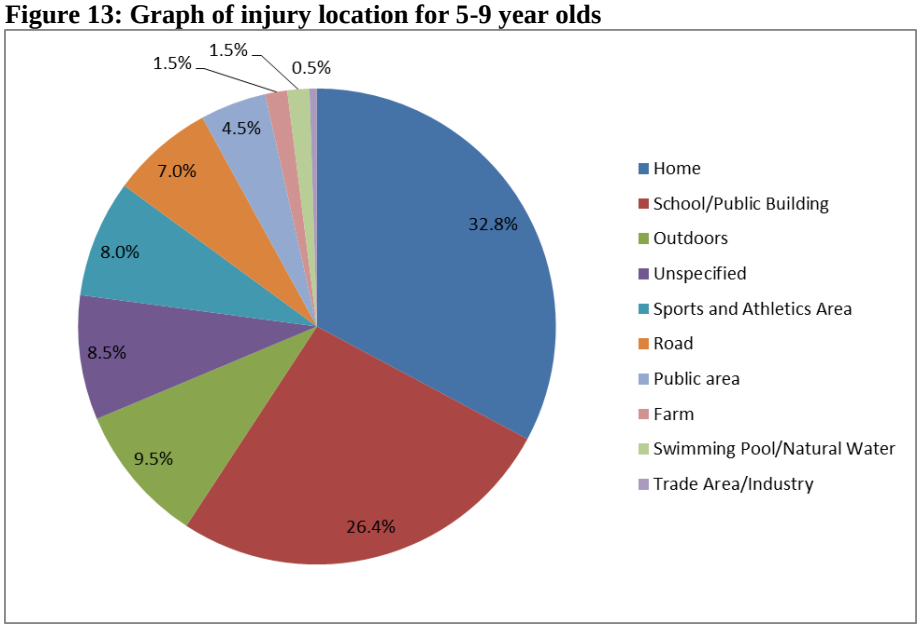
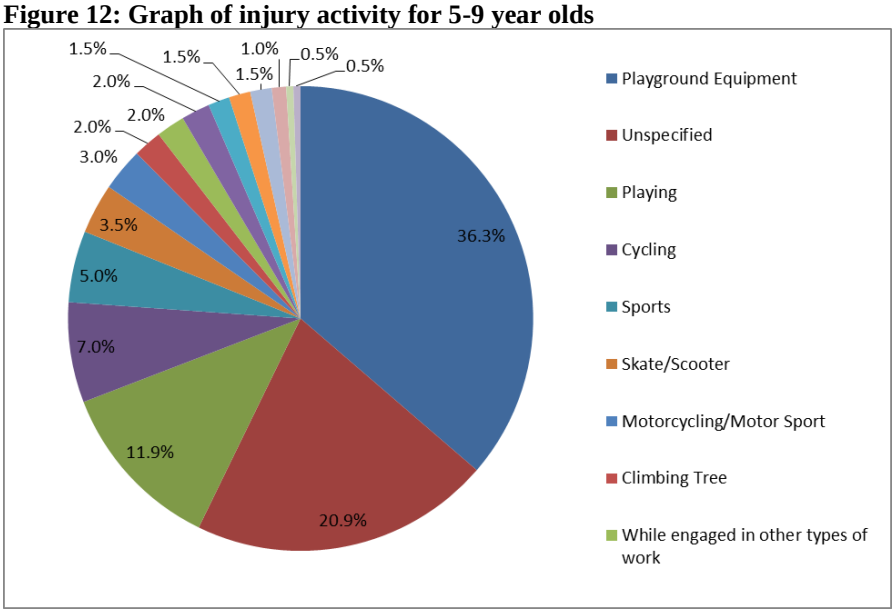


Figure 12 shows the activity the child was doing at the time the unintentional injury was sustained. The majority of injuries involved 'Playground Equipment' (36.3%). Unspecified is again a large category with 20.9%. The next most common activity is playing (11.9%).

Figure 12: Graph of injury activity for 5-9 year olds



FALLS

5-9 YEARS

As for the 0-4 age group, 'Fall' accounted for the vast majority of Paediatric admissions for unintentional injury in the 5-9 age group over the three years. 'Fall' accounted for 124 (61.7%) of admissions in the 5-9 year old age group.

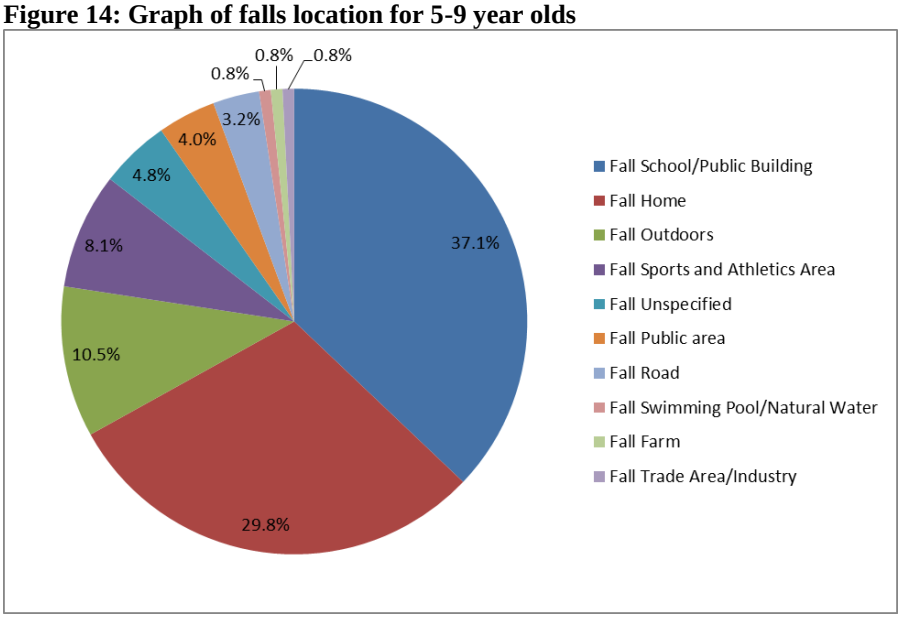
Table 12 shows that falls involving 'Playground Equipment' are the most common cause of a 'Fall' type injury requiring hospital admission in the 5-9 age group. Predominantly these falls are from 'Jungle Gyms' (51.4% of falls from 'Playground Equipment') followed by falls from 'Trampolines' (21.4% of falls from 'Playground Equipment'). The next largest group of falls was falls involving tripping or slipping which comprised 10.5%. Falls from furniture (mainly falls from beds) was involved in 8.9% of falls.

The following graph (Figure 14) shows the location of 'Fall'. These where occurring mostly at 'School/Public Building' (37.1%) or at 'Home' (29.8%). This is the reverse of the location for total unintentional injuries for 5-9 year olds, where 'Home' was more common than 'School/Public Building'. However this is to be expected as most playgrounds for children are at schools.

Table 12: Table of falls description by year for 5-9 year olds

Fall	Total	%
Playground Equipment	**70**	**56.5%**
Jungle gym	36	
Trampoline	15	
Flying fox	6	
Swing	4	
Slide	4	
Other playground equipment	3	
Merry go round	1	
Seesaw	1	
Tripped/Slipped	**13**	**10.5%**
Playing	6	
Unspecified	3	
While Engaged in Other Types of Work	2	
Sports		
Gymnastics	1	
Swimming/Water Sports		
Swimming	1	
Furniture	**11**	**8.9%**
Bed	9	
Shelf	1	
Bench	1	
Structure	**8**	**6.5%**
Fence/Wall	4	
Stairs	2	
Stationary vehicle	1	
Building	1	
Skate/Scooter	**7**	**5.6%**
Scootering	4	
Roller Skating	2	
Skateboarding	1	
Climbing Tree	**4**	**3.2%**
Sports aparatus	**3**	**2.4%**
Sports		
Gymnastics	3	
Horse Riding	**3**	**2.4%**
Other	**2**	**1.6%**
Being carried	**1**	**0.8%**
Unspecified	**1**	**0.8%**
Knocked over	**1**	**0.8%**
Grand Total	**124**	**100.0%**

Figure 14: Graph of falls location for 5-9 year olds



TRANSPORT/ROAD INJURY

5-9 YEARS

'Transport/Road' injuries accounted for 11.4% of paediatric hospital admissions for unintentional injury in the 5-9 age group. Table 13 shows that the majority of injuries were sustained when the child was a cyclist (56.5%). There were a surprising number of 'Motorcycling' injuries for such young children.

Table 13: Table of transport/road injury by year for 5-9 year olds

Transport/Road Injury	Total	%
Cycling	**13**	**56.5%**
Motorcycling/Motor Sport	**6**	**26.1%**
Motorcycling	6	
Passenger	**4**	**17.4%**
Grand Total	**23**	**100.0%**

10-14 YEAR OLDS

SUMMARY

Children in the 10-14 year old age group accounted for 33.9% of paediatric hospital admissions for unintentional injury in the 2012-2014 period.

Table 14 shows that the most common causes of hospital admission due to unintentional injury in the 10-14 age group was 'Fall' (38.1%). 'Transport/Road Injury' was the second largest indicated cause (27.5%), followed by 'Struck By/Against' (14.8%) and 'Cut/Pierce' (6.9%).

Table 14: Table of mechanism by year for 10-14 year olds

Mechanism	Total	%
Fall	72	38.1%
Transport/Road Injury	52	27.5%
Struck by/Against	28	14.8%
Cut/Pierce	13	6.9%
Foreign Body	7	3.7%
Overexertion	4	2.1%
Animal bite/Insect Sting	3	1.6%
Knives/Swords/Daggers	2	1.1%
Poisoning	2	1.1%
Heat/Hot Substances	2	1.1%
Strangulation	1	0.5%
Diving or jumping	1	0.5%
Electric shock	1	0.5%
Caught/Crushed/Jammed	1	0.5%
Grand Total	**189**	**100.0%**

Figure 15: Graph of injury location for 10-14 year olds

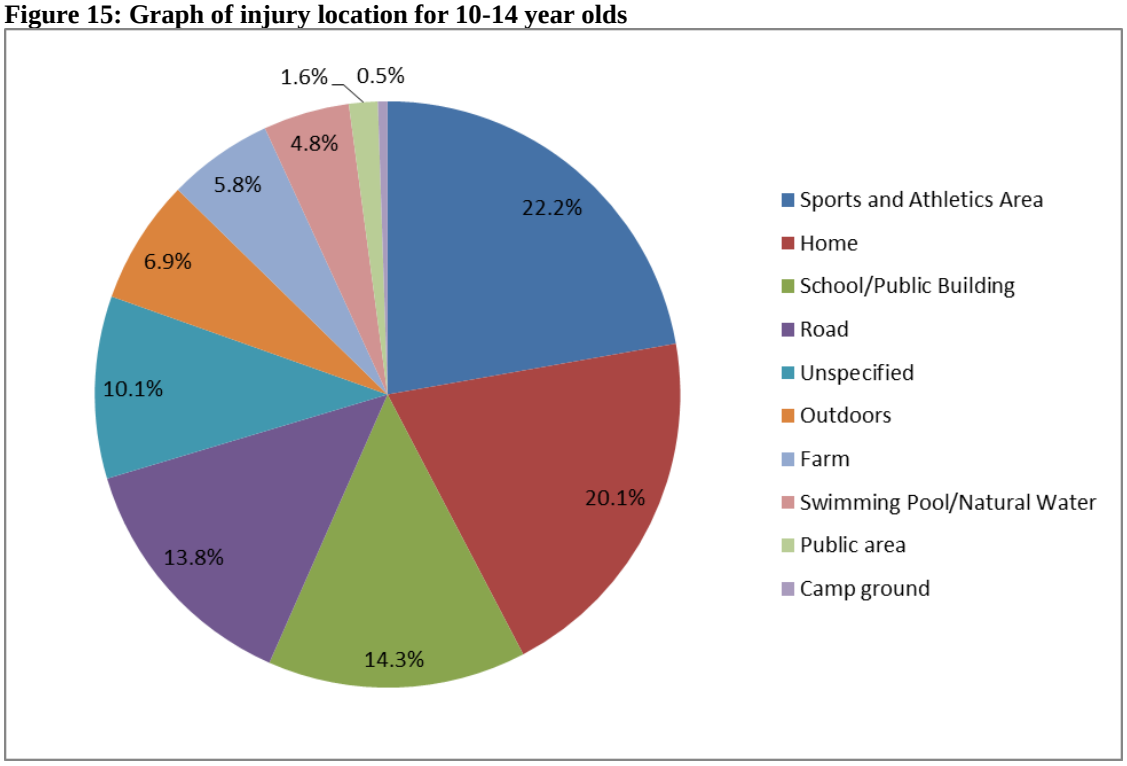
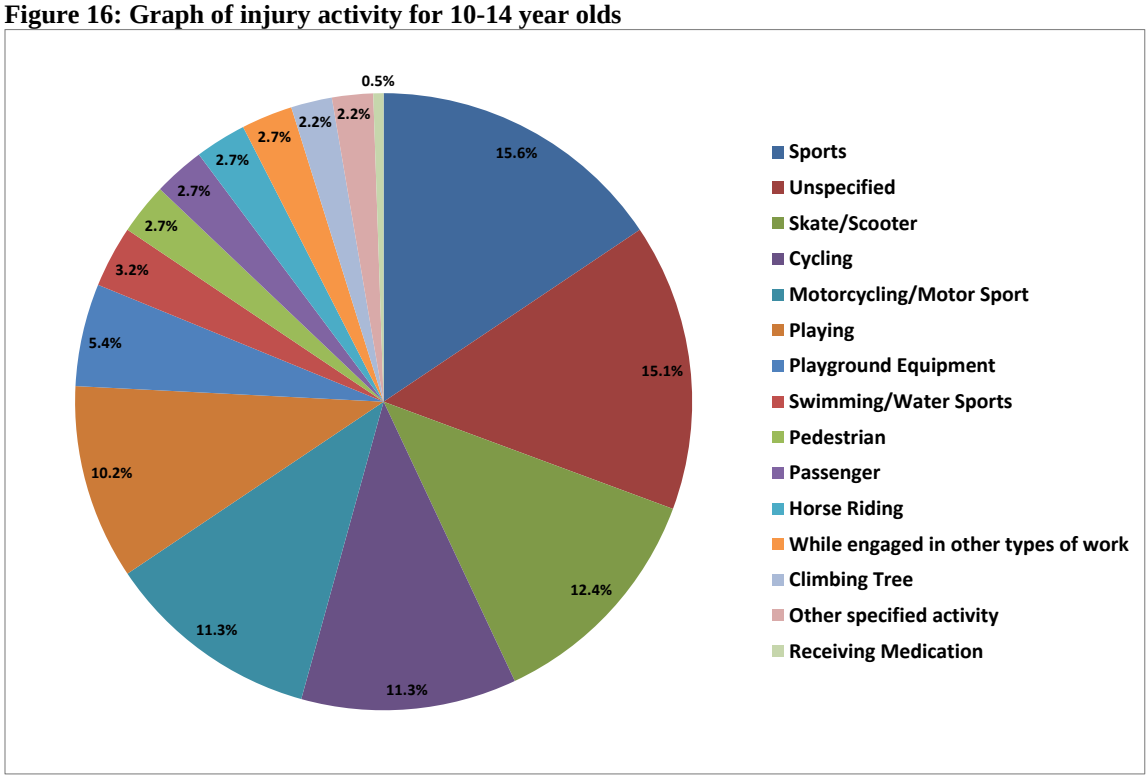


Figure 15 indicates where injuries occurred in the 10-14 year old age group. One can see that for 10-14 year olds 'Sports/Athletics Areas' (22.2%) has overtaken 'Home' (21.1%) and 'School/Public Building' (14.3%) as the most common location. 'Road' is also more prominent in the 10-14 year old age group at 13.8%.

As seen in Figure 16 unintentional injuries to 10-14 year olds are caused by a greater range of activities than younger children, and are more likely to involve a specified activity rather than 'Unspecified' or 'Playing' (Combined 25.3% for 10-14 year olds, 32.8% for 5-9 year olds and 76.7% for 0-4 year olds). The most common activity is 'Sports' (15.6%), followed by 'Unspecified' (15.1%), 'Skate/Scooter' (12.4%) and 'Cycling' (11.3%).

Figure 16: Graph of injury activity for 10-14 year olds



FALLS

10-14 YEARS

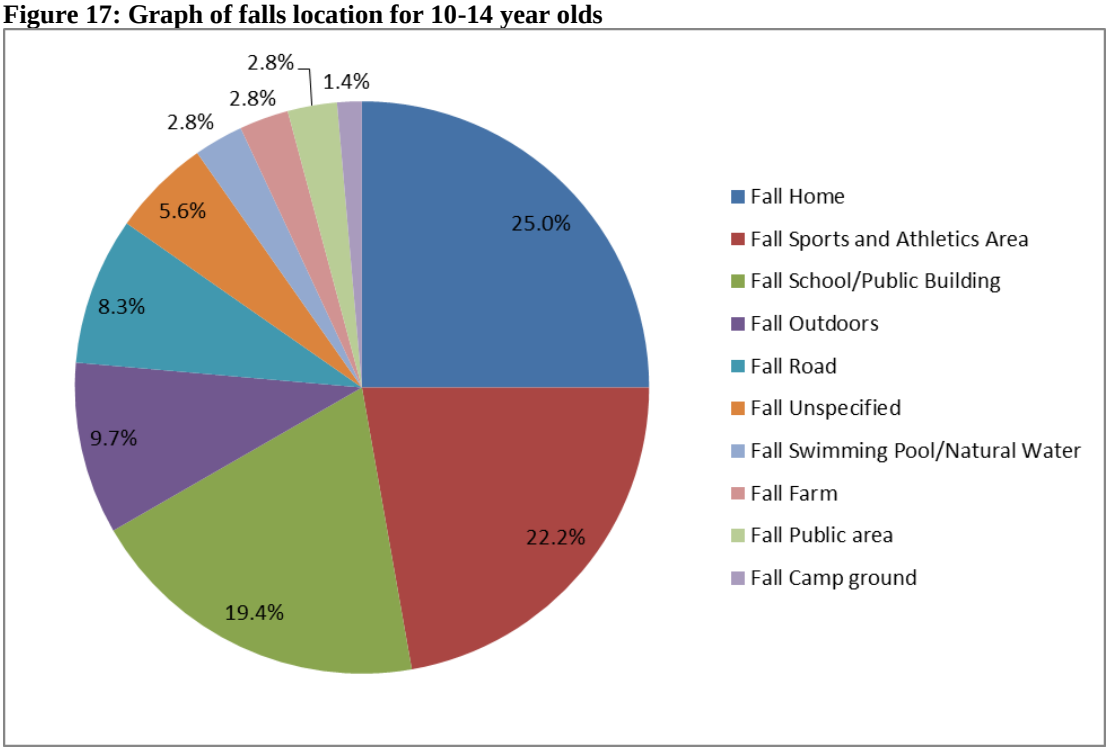
Falls accounted for 38.1% of paediatric admissions for unintentional injury in the 10-14 age group. Table 15shows that falls involving 'Skate/Scooter' are the most common cause of a 'Fall' injury requiring hospital admission in the 10-14 age group with 23 admissions (31.9% of 'Fall'). Of these 10 involved skateboards, 7 involved scooters and 6 involved roller skates. The second most common cause for falls was 'Tripped/Slipped' with 9 admissions (12.5%) and 'Playground Equipment' also with 9 admissions (12.5%). Falls from playground equipment where most commonly from 'Trampolines' and 'Jungle Gyms', these were also the two most implicated pieces of equipment in the 5-9 year old age group.

Figure 17 shows the location of 'Fall'. This shows that most falls occur at 'Home' (25%) closely followed by 'Sports/Athletics Areas' (22.2%) and 'School/Public Buildings' (19.4%). More outdoors areas are involved than with younger children with 'Outdoors', 'Road', 'Farm' and 'Public Area' combined totalling 23.6%.

Table 15: Table of falls by year for 10-14 year olds

Fall	Total	%
Skate/Scooter	**23**	**31.9%**
Skateboarding	10	
Scootering	7	
Roller Skating	6	
Tripped/Slipped	**9**	**12.5%**
Playing	3	
Unspecified	3	
Sports		
Basketball	1	
Soccer	1	
Rugby League	1	
Playground Equipment	**9**	**12.5%**
Trampoline	4	
Jungle gym	3	
Other playground equipment	1	
Merry go round	1	
Structure	**7**	**9.7%**
Stairs	2	
Ladder	2	
Building	2	
Fence/Wall	1	
Horse Riding	**5**	**6.9%**
Furniture	**5**	**6.9%**
Bed	4	
Rubbish bin	1	
Knocked over	**4**	**5.6%**
Sports		
Rugby	4	
Unspecified	**4**	**5.6%**
Unspecified	3	
Sports		
Rugby	1	
Climbing Tree	**4**	**5.6%**
Sports apparatus	**2**	**2.8%**
Swimming/Water Sports		
Surfing	1	
Sports		
Basketball	1	
Grand Total	**72**	**100.0%**

Figure 17: Graph of falls location for 10-14 year olds



TRANSPORT/ROAD INJURY

10-14 YEARS

Table 16 shows the admissions for 'Transport/Road Injuries'. 'Transport/Road injury' was the second most common cause of paediatric admission in the 10-14 age group, accounting for 27.5% of admissions. 'Cyclist' was the most common mechanism description encountered with 21 admissions (40.4%), this was equal with 'Motorcycling/Motor Sport'.

Table 16: Table of transport/road injury by year for 10-14 year olds

Transport/Road Injury	Total	%
Cycling	**21**	**40.4%**
Motorcycling/Motor Sport	**21**	**40.4%**
Motorcycling	20	
Motor car racing	1	
Pedestrian	**5**	**9.6%**
Passenger	**5**	**9.6%**
Grand Total	**52**	**100.0%**

DISCUSSION

This audit provides a 'snapshot' of the statistics surrounding the rates of serious unintentional injury for children in Taranaki. It is important to identify local information and trends within the Taranaki population, as this information can then be used to plan and implement prevention strategies for Taranaki children. It is also a major strength that data exists for Taranaki children from 1996, allowing for the trends to be evaluated overtime and the results of any prevention strategies to be ascertained. This data provides a unique view of serious childhood unintentional injury in provincial New Zealand and can be used to direct injury prevention policy.

'Fall' and 'Transport/Road Injury' are the two leading causes overall of admission for unintentional injury. Together these two categories account for 66% of all admissions, with 'Fall' alone accounting for >50% of admissions. Any prevention strategies will need to focus on these two areas to maximise the benefit for the young people of Taranaki.

Males are over represented compared with females, at nearly double the rate of admissions. This is especially true for the 10-14 year old age group. This may indicate that boys indulge in more risk taking behaviours than girls, or may show that the injuries they sustain are more likely to be serious enough to require hospitalisation. However it is encouraging to see that the rates per 100,000 have been declining for both males and females.

Interestingly the ethnicity data indicated that Maori had a lower rate of admission that non-Maori, which appears to be at odds to the New Zealand Data[11], although the two categories are not directly comparable. Rates for Maori and non-Maori have declined since 2000-2002 but did not reach significance for Maori. The reason why Maori have a lower rate of admissions could be due to a number of possibilities. Maori may be sustaining less injuries, when injures they may be less likely to present to their GP or the emergency department, or once assessed by a doctor they may be less likely to be referred for admission. This audit did not address these questions.

Children admitted for unintentional injury are more likely to come from the more deprived deciles than the least deprived deciles. This is true for all three age groups. This is another area of inequality which needs to be included as a focus when designing and implementing injury prevention programmes.
The more urban district of New Plymouth had a slightly higher rate than the two more rural districts. This may reflect the fact that Taranaki Base Hospital is the only hospital in Taranaki which admits children and in situated in New Plymouth.

Most injuries occur either at home or in school. This reflects where one would expect children to be spending most of their time. For the older children in the 10-14 year age group sports and athletics area become the most common place of injury. These children are more likely to be engaged in formal sporting activities and playing contact sports. Playing on playground equipment was the leading specified activity involved in unintentional injury. Safety programmes in schools need to be built around this knowledge, all school playgrounds should be compliant with the New Zealand Standard 5828:2004: Playground equipment and surfacing (Standards New Zealand Website) and adequate supervision needs to be in place.

There has been a reduction in admissions for injuries since 1996-1998. This reduction is seen across all age groups, genders, ethnicities and mechanism for injury and reflects trends seen in New Zealand and worldwide[11,13,14]. Taranaki now compares favourably with the overall New Zealand data[10], being comparable in most areas and appears slightly better for the 0-4 year old age group, females and Maori.

Compared to the United Stated of America Taranaki fairs poorly with three times the rate of admissions to hospital for unintentional injury for children aged 0-14 years[12]. OECD data from 2012 places New Zealand 23rd out of 30 countries for hospital discharges for Injury, poisoning and other consequences of external causes for all age groups[15]. Data is readily available to compare countries death rates for unintentional injury. A report published by UNICEF in 2001[14] ranks OECD countries by number of deaths for unintentional injury per 100,000 for the years 1991-1995. New Zealand ranked 22nd of 26 OECD nations with a rate of 13.7 per 100,000 for children aged 1 to 14 years. More recent estimates indicate that New Zealand continues to perform poorly compared to other wealthy nations. A 2007 UNICEF report placed New Zealand last among OCED countries for deaths from accidents and injuries in children under 19 years of age[16].

When looking at the 0-4 year old age group, most injures requiring admission to hospital are sustained in the home and involve a fall. Commonly a fall from furniture, in particular falls from beds, couches and chairs. The second most common mechanism of injury was fingers being caught in doors.

5-9 year olds are mostly commonly hospitalised due to falls from playground equipment, mainly jungle gyms and trampolines. This occurs both at school and at home. Transport /Road injuries are the second most common mechanism of injury, mainly injuries involving bicycling but also injuries involving motorcycling.

The pattern of injuries for 10-14 year olds showed less of a predominance for falls as the mechanism of injury, although falls remains well out in front as the main cause of injury. Injuries occur either in sports or athletics areas, the home, or at schools. Falls are related to skateboarding, scootering or roller skating. There are also a large number of transport/road injuries with equal numbers of bicycle injuries and motorcycle injuries.

There were some limitations and challenges that must be considered when looking at the results of this audit. This report relies on the accuracy of medical records, which must pass from the clinician taking the history of a patient's injury and documenting in the notes, through the coders in Medical Records to the data retrieval staff of the Medical Information Unit before they can be statistically analysed. There are, therefore, multiple sites along this chain of information for inter-individual variation and human error to affect the records. Where there seemed to be anomalies within the data, the original medical records were reviewed to in an effort to ensure correct information.

When looking at ethnicity, complications arose as the census data uses one set of categories to collect demographics and the ICD-10 uses another. In the census it was possible to identify with more than one ethnicity, this flexibility does not exist in the ICD-10. Also, it is unclear whether the ethnicity recorded in the medical records is that which the clinician has entered, which may not necessarily be the ethnicity that an individual primarily identifies with, or that which the patient has self-identified. Furthermore, in an interaction

with a medical-practitioner some people may be differently inclined to identify with certain ethnic groups than when filling out a census form. Consequently, making meaningful conclusions about ethnicity was difficult.

The 'Unspecified' category was large with regards to determining the location where the injury occurred and the activity that the individual was partaking in at the time of injury. This indicates that either inadequate levels of information were being recorded at the patient-clinician interaction level, or what was recorded was unable to be coded by the Medical Records department. This may have led to an under representation of some categories in the results, or even to some important information being missed as it lay unidentified. This problem limits the accuracy and therefore usefulness of the information in this report with regards to injury location and activity.

Kidsafe Taranaki have been running a number of prevention programmes aimed at reducing the numbers of admissions for unintentional injury. These include education sessions for new parents and a safety gate loan scheme. Cochrane reviews have shown that home safety education and provision of safety equipment may reduce injury rates[17] but more studies where required, while parenting interventions are effective at reducing unintentional injury in children[18].

The Tamariki Maori Falls Prevention Project has been run since 2002. This consists of one on one sessions delivered in the home by workers from Tui Ora Ltd to parents and whanau with children under 5 years of age. Tui Ora Ltd is a Taranaki based health and social services provider. They provide services to all age groups and populations including Maori and non-Maori with a focus to support cultural ways of doing things. The information provided is specific to the age and developmental stage of the child. Some safety devices are also supplied and there is follow up to reinforce the safety message.

The Child Falls Prevention Project has also been delivered since 2002. This consists of one hour group sessions for caregivers/parents of young children delivered by a trained educator. The programme covers the key issues of childhood unintentional injury, risks and methods for prevention. It is accessed via established groups such at Plunket, Tui Ora, Playcentre, Kindergartens and Parent's Centre.

The Kidsafe Safety Gate Scheme was started in 2011. Family with children less than 5 years old with a community services card are loaned safety gates which can be put up in their home to prevent falls.

CONCLUSION

This audit identifies the main factors involved in unintentional injury requiring hospitalisation. For 0-4 year olds the main mechanism is falls, mainly occurring in the home, especially falls from furniture. For 5-9 year olds falls are still the main mechanism for injury but these falls occur either at home or at school and involve falls from playground equipment, especially from jungle gyms and trampolines. For 10-14 year olds falls are related to skate boards, scooters and roller skates and occur at home, at school or in sports and athletics areas. Transport/road injuries become common in the 5-9 and 10-14 year old age groups and involve bicycles and motor bikes. Prevention strategies need to target these areas and respect the differing activities and locations where injuries occur for each age group.

Injury prevention strategies therefore need to target

- Falls in the home for under 5 year olds
    - Continue to educate new parents on normal childhood development and behaviour and the need for supervision of young children.
    - Raise awareness of common hazards around the home, especially furniture
    - Use restraints for high chairs and increase high chair stability
    - Never leave babies alone on furniture
    - Place infants on the floor
    - Lower the mattress in cots so infants cannot climb over the railings as they become more developmentally capable
    - Do not allow infants to use upper bunks
    - Use of safety gates, window guards and toughened glass
- Falls from playground equipment for school, age children
    - Ensure all playgrounds meet approved safety ratings
    - Have soft surfaces under jungle gyms and climbing frames
    - Install guard rails on high platforms
    - Remove tripping hazards
    - Only one child at a time on trampolines
    - Ensure all trampolines have safety nets and pads
- Skateboard/scooter/roller skate injuries for 10-14 year olds
    - Ensure children wear helmets, wrist guards, knee pads and elbow pads
    - Ensure roller skates fit properly
    - Schools should provide skate and scooter skills sessions regularly
    - Never use skateboards, skates or scooters in traffic
- Bicycle and motorcycle injuries for school age children.
    - Schools should provide regular bike skills sessions and teach children the road rules
    - Ensure helmets are worn and that they are fitted and worn correctly
    - Councils should continue to develop bicycle lanes and paths

Further audits should be carried out to continue to monitor for changes and trends over time, to develop priority areas for intervention and to assess the impact of injury prevention strategies. An audit of presentations to the emergency department or to GPs for unintentional injury can be combined with known injury death data to gain a more complete understanding of all the factors involved in childhood injury.

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APPENDIX A

GLOSSARY OF TERMS

MECHANISM:

Fall: excludes assault, fall from a burning building, into fire, into water, machinery and transport vehicle.

Transport/Road Injury: incident involving a device deigned primarily for conveying persons or goods from one place to another.

Struck by/Against: exposure to mechanical forces. Struck by thrown, projected or falling object including sports equipment or accidental contact with another person.

Foreign body: includes edge of stiff paper, nail, splinter and tin-can lid but excludes objects such as hand tools which have been specified in a separate category.

Cut/Pierce: this includes sharp metal, glass and plant spine or thorn

Caught/Crushed/Jammed: includes caught/crushed/jammed between moving objects, stationary and moving objects or in an object.

Poisoning: poisoning and exposure to noxious substances. Includes accidental overdose, wrong drug given and a drug taken inadvertently.

Animal bite/Insect Sting: exposure to animate mechanical forces.

Heat/Hot substances: includes hot objects, scalds, exposure to excessive natural heat and fire and flames.

Overexertion: sprains and strains from physical activity

Knives/Swords/Daggers: excludes those that are powered.

Unspecified: no description of event in recorded notes

Drowning and submersion: accidental drowning and submersion, but excludes water transport accident.

Electric shock: exposure to electric current

Strangulation: accidental threat to breathing.

Diving or jumping: the consequence of a deliberate jump from height without the intention for personal injury

LOCATION:

Home: usual place of residence, apartment, and caravan etc. and includes driveway to home.

School/Public Building: includes schools, preschools, shops/malls

Sports and athletics area: includes baseball field, basketball court, cricket ground, football field, golf course, gymnasium, hockey field, riding school, skating rink, squash court, stadium, swimming pool, public tennis court, motorcycle dirt track

Outdoors: outside areas not better fitting under another category

Road: includes freeway, motorway, pavement, road and sidewalk

Farm: Farmland, including farm buildings and driveways, but excluding farm houses

Public area: outdoors public areas such as parks

Swimming Pool/Natural water: includes indoor and outdoor swimming pools, rivers, streams and the ocean; both in the water and on bank/surrounding area.

Camp ground: injuries within camp grounds

Trade Area/Industry: Factories and manufacturing areas, includes injuries sustained in hospital

ACTIVITY
Playground equipment: excludes recreational machinery.
Playing: general childhood leisure activities not better explained by another description
Sports: organized sporting activities including rugby, league, soccer, baseball, basketball, cricket, dodgeball, gymnastics, netball, athletics
Cycling: bicycling, excludes motorcycling
Motorcycling/Motor Sport: includes moped, motor scooter, motorcycle with side car or motorised bicycle, but excludes 3-wheeled vehicle and all-terrain vehicles.
Skate/Scooter: included roller skating, inline skates, scooters and skateboards
Climbing Tree:
Passenger: passenger in a motor vehicle driven by another person
While resting/sleeping/eating or engaged in other vital activities: includes eating, sleeping washing, bathing, excludes cooking.
While engaged in other types of work: includes school work and paid employment
Other specified activity: other activities not better described elsewhere
Swimming/Water Sports: swimming in pools and natural water, includes jumping into water and running around the periphery
Being carried: child being carried by another person
Horse Riding: animal rider or occupant of animal-drawn vehicle injured in a transport accident
Pedestrian: person on foot and struck by a motor vehicle
Cooking: includes preparing food
Receiving Medication: given medication by another person
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APPENDIX B

CODING SYSTEM

The following table indicates how the ICD-10 version 2010 codes were combined and grouped for the purposes of creating categories for this audit which were aligned to those used in previous reports

ICD-10 CODE GROUPINGS	MECHANISM NAME
V01-V99 excluding V80	**Transport/ Road Injury**
V80	**Horse Riding**
W00-W19 excluding W16	**Fall**
W16	**Diving or jumping**
W20-W22, W51	**Struck by/Against**
W23	**Caught/Crushed/Jammed**
W25 and W60	**Cut/Pierce**
W26	**Knives/Swords/Daggers**
W28-W29	**Hand tools**
W30-W31	**Machinery**
W32-W34	**Firearms**
W35-W43	**Explosions/Fireworks**
W44-W45	**Foreign body**
W49	**Other**
W50-W64 and X20-X29 excluding W60, W51	**Animal bite/Insect Sting**
W65-W74	**Drowning/submersion**
W75-W84	**Strangulation**
W85-W87	**Electric shock**
X00-X19	**Heat/Hot substances**
X40-X49	**Poisoning**
X50	**Overexertion**

Reference:
ICD Version:2010, found online at
http://apps.who.int/classifications/icd10/browse/2010/en