Scootering on: an investigation of children's use of scooters for transport and recreation

Trish Wolfaardt

Dr Maxine Campbell

Societies and Cultures
School of Social Sciences
The University of Waikato

2013

This report was funded by the Child Injury Prevention Foundation of New Zealand 2012/13 Summer Research Scholarship, awarded to Trish Wolfaardt

Project concept and Research Design

Trish Wolfaardt[1] and Maxine Campbell[2]

Research

Trish Wolfaardt

Report Text

Trish Wolfaardt with Maxine Campbell

Supervision

Dr Maxine Campbell

Cover image courtesy of
C M Keats and Nixon, Hamilton

The authors may be contacted via
Dr Maxine Campbell
School of Social Sciences
University of Waikato
Private Bag 3105, Hamilton
New Zealand
Email: maxine@waikato.ac.nz

[1] Undergraduate Student, Department of Psychology, Faculty of Arts and Social Sciences, University of Waikato
[2] Senior Lecturer, Societies and Cultures, School of Social Sciences, University of Waikato

Acknowledgements

The authors would like to acknowledge the following persons and organisations for their contribution to the production of this report. We thank the University of Waikato, particularly the Societies and Cultures unit, Faculty of Arts and Social Sciences, for providing support and access to resources.

We would like to acknowledge the various retailers who assisted with product and market information; we respect their decision to remain anonymous and do not consider that this in any way compromises the integrity of the information they supplied.

The statistical data used in this research were generously made available by the Midland Regional Trauma Registry, courtesy of its Director, Mr Grant Christey and staff from the Waikato District Health Board. Grant's assistance and expert advice was invaluable, as was the assistance provided by his colleagues.

We acknowledge the support of the Child Injury Prevention Foundation of New Zealand through their Summer Research Scholarships, without which this project would not have been possible.

Trish and Maxine

Table of contents

Executive summary

Non-motorised scooters have increased significantly in popularity over the last few years in New Zealand, following similar trends in the US, Australia, Canada and Europe. Non-motorised scooters are an important source of recreation, transport and exercise and children of all ages enjoy riding them to and from school and in skate parks.

Along with the increase in popularity and use of the scooters, New Zealand is also experiencing a considerable increase in the numbers of injuries to children, with a notable spike in ACC claims in the 2011-12 year. Whilst most of the injuries are moderate – dislocations, fractures, lacerations and soft-tissue injuries – an increase in the number of severe injuries, and at times, even fatalities is also evident. Boys tend to be injured more frequently than girls and the median age for injury is nine years. Most injuries occur at home, with public roads the next most likely location.

International literature shows similar trends world-wide. Numbers of scooter injuries are escalating and an intervention to minimise harm and reduce risk is considered imperative in all regions. The evidence shows that children are not wearing protective equipment (such as helmets) when travelling on a non-motorised scooter and there is no legal requirement for them to do so. Elbow and knee pads – and even footwear – were conspicuously absent amongst children observed in fieldwork undertaken for this project.

Children routinely use basic scooters for activities unsuited to their design and on terrain that poses further risks. It was also evident that children scootering to school were not subject to the same regulations as those cycling to school and there appears to be a general lack of awareness of the risks associated with scootering. We therefore propose the following recommendations as means by which we might minimise the risks and reduce harm to children:

- Amend the current cycle helmet legislation to include the riders of all wheeled recreational devices, irrespective of the age of the rider;
- Introduce school policies requiring that helmets and footwear are worn when scootering to and from school;
- Implement a minimum age for scootering to and from school;
- Extend the coverage of existing school training programmes on road safety in general and safe scootering in particular;
- Require compulsory distribution of point-of-sale information packs on the risks of scooters and the protective equipment options available;
- Ensure continued funding of current community resources and training initiatives
- Further research on scooter accidents and associated risk factors

Introduction

Unintentional injuries in childhood are a significant health cost for NZ society, and can often lead to morbidity and disability (Burrows, 2004). Non-motorized scooters (NMS) are increasingly becoming more popular as part of an urban fashion trend involving alternative forms of transport, and as a recreational choice for children. This increase in popularity is evident in an increase in the sales of scooters, but along with this increase in sales, there has also been an increase in the numbers of children under 15 years presenting to hospital emergency departments with injuries sustained while riding the scooters.

Non-motorised scooters were initially marketed for recreational use by older children (late teens to early 20s), but they now appeal to much younger children. A wide range of scooters is available from retailers, and different types of scooters are manufactured with their specific use determined by their design, construction, method of manufacture, component materials and overall level of quality.

This report provides an overview of the different types of non-motorised scooters and considers how children and adolescents are using these scooters for recreational and transport purposes. Scooter accidents within NZ will be studied in the light of international literature, which indicates that similar accident and injury trends are currently being experienced world-wide. Data gathered through the observation of children using non-motorised scooters for transportation to and from school, and for recreational purposes within skateparks will be analysed and compared with regard to the international evidence as well as ACC and Waikato District Health Board Trauma Services data. The implications of these data will be discussed and the current available educational and preventative information are evaluated.

Types of non- motorised scooters

Initially a folding version of a classic scooter designed by Wim Quboter (1997, cited in Simonian, 2010) was copied, and an aluminum version began to be mass produced for marketing in Japan, Europe and the United States. The most famous producers of push scooters at present include Micro, Razor and MPG, but these companies mainly target children and young adults interested in urban trends. Other

models are specifically designed for utility purposes. Their construction allows them to move faster and some can even accommodate off road conditions.

NMS's are generally classified into three different groups aimed at distinct age groups, rider ability and requirements. For the purpose of this report these groups will be categorised as mini, basic and advanced NMS's. The mini NMS is optimal for children under the age of 5, and is a three-wheeled vehicle (two in front, and one at the rear) which provides extra stability. The steering mechanism prevents abrupt turns and also helps maintain balance. Critics have noted that the double front wheels can make the scooter tip forward. Mini NMS are designed to be ridden on smooth paved areas.

The basic foldaway scooter is lightweight and manufactured for children over the age of 5 years, up to a maximum weight of 143 pounds (65 kgs). The basic NMS is suitable for children who enjoy scootering around the neighbourhood on smooth surfaces and is not recommended for performing stunts or travelling long distances on uneven ground.

The advanced category of NMS has features such as a reinforced head clamp, extra thick foam grips, and an additional down-tube that is welded to the deck (providing greater strength); they also have wider handlebars and upgraded wheel bearings that make them more durable for stunts and tricks. The scooter does not foldaway and can accommodate weight up to 220 pounds (100kgs). The advanced NMS is recommended for ages 8 and older, and for children above 5 feet 4 inches tall who enjoy doing tricks and stunts, and everyday riding (Consumersearch, 2012).

Cheaper scooters are generally more basic and manufactured for travel on a smooth surface only. They do not have the strength or durability for individuals to perform tricks, and are not designed for travelling distances on uneven public roads. More expensive and advanced scooters are stronger and manufactured for this purpose (Consumersearch, 2012). Scooters are mass-produced in order to keep prices low, and even though quality does not ensure safety, it does reduce the risk.

Types of accidents and injuries

The increase in the popularity of scooters, reflected through the increase in sales, has resutled in an increase in the number of children injured whilst riding a NMS. The number of injuries in New Zealand has increased 5-fold over the last five years

(Figure 1), though most of the increase occurred in the last twelve months. This, in turn, has increased the cost to ACC from <$10,000 a year to nearly $70,000 per year. International literature shows evidence of similar trends (ACC, 2012).

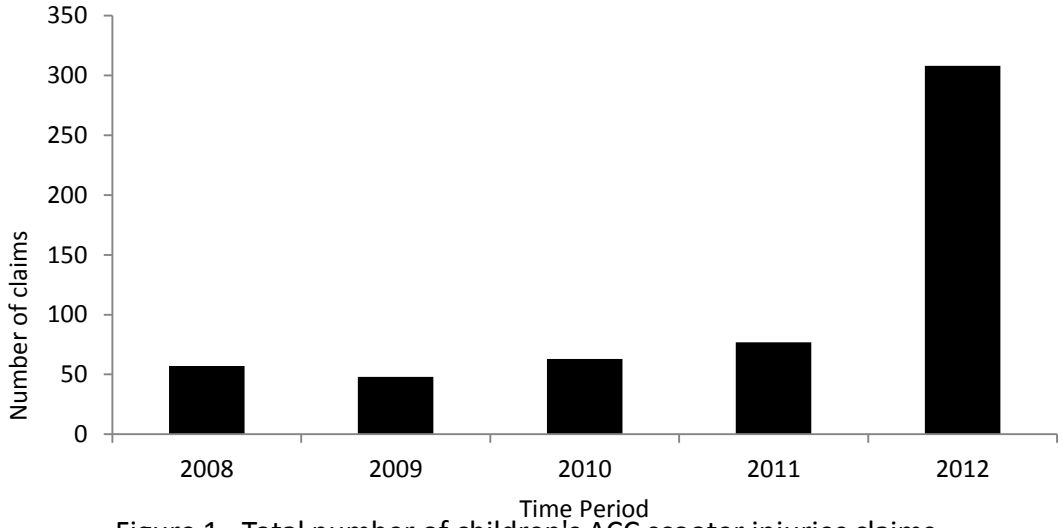

Figure 1. Total number of children's ACC scooter injuries claims over a five year period

As the numbers of injuries increase and more children use their scooters for a range of activities, an awareness of the risk for injury becomes more urgent. Despite the promotion of the use of safety equipment whilst riding, international literature notes a common failure amongst riders to the use protective clothing to minimise the risk of injury. This research therefore seeks to investigate whether the failure to use protective clothing is replicated amongst New Zealand riders.

Ultimately, this report contributes to the international body of knowledge currently available but also further extends the literature to include observational data regarding the behaviours and practices of children under 15 years of age who are engaging in scooter activity both on public footpaths (and often the adjoining roads) and in recreational park settings in Tauranga, New Zealand. Their use of safety or protective gear is also documented. Observational data are compared to ACC statistics and the District Health Board Trauma data, to attempt to establish current patterns in the types of risky behaviours observed and the prevailing patterns of injury. The importance of the use of protective and safety gear is discussed and current educational and informational

resources are canvassed, culminating in recommendations aimed at enhancing safety and minimising risk.

Methodology

Literature and resource review

We begin this project with a review of existing international literature on scootering and its associated risks and harms. Reports and articles from America, Canada, Australia and Europe all contribute to our understanding of the New Zealand situation. This is augmented with an audit of current legislation, with a view to determining whether scooters are regulated and if not, how they might be. We also explore what school and community-based resources and programmes currently exist and seek to evaluate the efficacy of current preventative and educational literature.

Observational study

The observational dimension of this project was two-fold, with children being observed using scooters as a means of transport to and from school, and for leisure at recreational skate parks. Structured observational sheets were completed, with data coded at the time of observation according to a pre-determined coding framework. Children and adolescents between the ages of 0 to 14 years were categorised into four distinct age groups; less than five years, five to nine years, nine to11 years, 11 to 14 years. As the children and adolescents were not approached or interviewed, the researcher estimated the age of the children during observations. The participants represented a mixed demographic sample as data were collected at different locations across the city (reflecting different socio-economic circumstances) for each of the two types of settings. Children's use of protective gear was categorised and coded at the time of observation through a range from no protective gear at all, through to children wearing shoes, a helmet, knee pads, elbow pads and finally, wrist pads. If a child had more than one type of protective gear on, more than one code was applied. Types of NMS were coded as either basic (B) or advanced (A) scooters.

Scootering to and from school

Observational data on children commuting to and from school was collected over a six week period in three different morning and afternoon observation periods. Each period was composed of a forty minute block between the hours of 8:10 am and 8:50am, and 3pm and 3:40pm. The number of children riding NMS's during each observational period varied noticeably, often affected by the weather, with more children riding a NMS on a sunny day. Children from three different primary schools and two intermediate schools were observed, incorporating a broad range of socio-economic circumstances covering deciles 2, 4, 7, 8 and 10.

Skateparks

Observations were also completed at three different recreational parks in three distinct demographic areas determined through socioeconomic statuses recorded by Statistics New Zealand (2006) Census Data (cited in Parliamentary Library, 2009). Each observation was conducted for an hour at a time, across various times within the morning and afternoon during the summer school holiday break, when the skateparks were more likely to be occupied. The project gained ethical approval from the FASS Human Research Ethics Committee of the University of Waikato and the Waikato District Health Board, Institutional Ethics Board.

Data sets

Datasets of trauma information were obtained from the Midland Regional Trauma Registry for acute admissions of children under 15 years of age through the Emergency department at Waikato Hospital. The data did not include children treated within the Emergency department and then discharged. The Waikato dataset covered the period from the 1 April 2006 to the 30 September 2011. A further limitation that needs to be noted is that the datasets do not include injuries treated within local Accident and Emergency Health Centres or General Practitioners, and therefore cannot be regarded as full representation of scooter injuries sustained by children over the period under review. It is reasonable to assume that any serious injuries presented to General Practitioners or Accident and Emergency Centres would ultimately have been referred to Waikato Hospital and would be recorded in that dataset.

ACC data have been obtained from the ACC Statistical Inquiry Index online. Data have been collated annually from July 2007 to June 2012, and this has provided details of both the number of new injury claims and active (ongoing) claims each year, along with the total cost to ACC for each year. The data covered individuals aged up to fourteen years, and included information on gender, diagnosis (e.g. fracture, concussion, laceration), part of the body injured, cause of the injury (e.g. fall or collision) and place at which the accident occurred (home, road, park etc).

Literature review

United States of America

Rutherford and Ingle's (2000) report for the US Consumer Product Safety Commission (CPSC) reported on the number of injuries sustained by people riding a NMS between January and October 2000. Emergency department care was required by 27,600 people, of whom 85% were children younger than 15 years and 23% were younger than eight years old. Fractures and dislocations accounted for the largest number of injuries, with most (70%) affecting the arm or hand. Other injuries noted included the head and face, and leg and foot. One child, a 6 year boy was killed when he rode into traffic and was struck by a car.

In 2003, Powell conducted a retrospective review of injuries for children up to 19 years of age for the National Electronic Injury Surveillance System of the US Consumer Product Safety Commission for 1997-2002. Powell found that of the 190,878 scooter-related injuries that were treated in an US emergency department, and 90% of those were children 15 years and younger. Forearm fracture injuries were most commonly sustained (74%), though five percent of the children received a severe injury, usually a closed head injury or skull fracture. Powell noted that these results were very similar to the type of injuries children acquired when riding a skateboard or in-line skates.

As a result, the CPSC recommended that scooter users should avoid streets, surfaces with water, sand, gravel, or dirt and promoted the use of safety gear, such as helmets, and knee and elbow pads to minimise the risk and rate of injury. The CPSC also emphasised the importance of public education about the injury potential associated with scooter use and advocated for children under 8 years old not to ride scooters without parental supervision.

Australia

Chapman, Webber and O'Meara (2001) found similar results in their Australian study. They examined the causes, patterns of injury and the use of safety equipment by children who presented to the Emergency Department as a result of scooter injury over a 24 month period, October 1998 to September 2000. Families were telephoned for interviews following the patient's discharge. The results concluded that the highest rate of injury was in children within the 10-14 years age bracket. Of this group, 60 % were

male. Fracture of the arm was the most common injury type (42%) and 11% required admission to hospital. Uneven ground was noted as the most common cause of accidents, with the highest rate occurring on the footpath, followed by the park. Data was also collected on the family perspective of the need to wear and the availability of safety equipment. A low perception of the need to wear safety gear was recorded, with families stating that low levels of awareness, due to the lack of the manufacturer's advice and infrequent recommendations by retail sales staff contributed to their perceptions that wearing safety gear was not required. Only 3% of children used safety equipment, despite 86% of the children owning suitable safety gear. The authors therefore concluded that manufacturers, retailers, parents and safety organisations need to ensure that children are educated about safe riding practices with scooters.

Fong and Hood (2004) examined whether the number of accidental injuries had changed since the 2000 study. No significant change in the data was evident, nor did the use of protective gear increase. A total of 62 participants were recruited over an 18 month period. Scooter injuries accounted for 1.3% of all paediatric presentations, with upper limb fracture the most common injury (42%) and closed head injury at 8% of all scooter injuries. Children tended to be primary school aged, with a median age of 9 years. The authors also noted that even though most of the injuries occurred at a low speed and due to uneven ground, NMS's lightweight and small-wheeled design affects their stability. Children younger than eight should therefore not ride NMS's, and if they do, require supervision and technique/skill training.

Austria

In 2003 Schalamon, Sarkola and Nietosvaara examined the injuries in children associated with the use of non-motorised scooters in Austria. The purpose of this population-based study was to compare scooter injuries with skateboard injuries. One hundred and thirteen patients presented with scooter injuries (mean age 10.2 years) compared to 72 (mean age 12.5 years) patients who injured themselves whilst riding a skateboard. Males presented at a higher rate, with most injuries sustained as a result of riding on uneven ground. By contrast, most skateboard injuries resulted from trick manoeuvres, though the pattern of injuries between the two was similar. Protective gear was seldom used.

Switzerland

In Switzerland, Kubiak and Slongo (2003) also examined the injuries sustained by children and adolescents, under 16 years, presenting to the Emergency Departments. The aim of the study was to establish a demographic profile, and collate injury characterstics in order to suggest preventative measures. Thirty-six children with 53 injuries participated, with a mean age of 8.8 years. Females outnumbered males 1.4:1, which contrasts sharply with the results of other research reviewed for this project. While noting the disparity, the authors offer no explanation for the gender difference and we are similarly puzzled by it. We also note, however, that their sample was small (n=36). In their study, they found that the face and chin were the most injured areas (44%, inclusive of dental trauma). Head injury followed closely. Only one child wore proctective gear, a helmet. An interesting trend that was noted was that the number of head injuries did decrease with an increase in age, while the number of extremity injuries increased with age. With this in mind, the authors advocated for the use of protective gear to reduce the number of injuries.

Canada

Mankovsky, Mendoza-Sagaon, Cardinaux, Hohlfeld and Reinberg (2002) similarly reviewed the injuries of children presenting to Emergency Departments in Canada, and their results showed very similar trends to those of the Australian research. A more recent article by Whelan (2007) however, noted that incorporating the PEACE philosophy (praxis, education, awareness, cooperation and evolvement) together with targeted legislation can assist in reducing the number of injuries. Whelan draws on data that confirmed a 25% reduction of the number of head injuries to cyclists following the introduction of legislation requiring cyclists to use helmets. Whelan argues that more people are likely to wear helmets when the law requires it.

Indeed, there is a clear indication in literature of the need for children and adolescents to use protective gear to reduce harm and minimise risks associated with non-motorised scooter injury. The implications of not wearing protective gear are substantial, for both those who ride the scooters (children and adolescents) and those who care for them in various capacities (parents, families/whanau and health workers). The increasing numbers of injuries are inevitably costly. In 2002, the American

Academy of Paediatrics Committee on Injury and Poison Prevention provided the following recommendations:

- children younger than 8 years do not ride scooters without adult supervision
- all riders use helmets, knee pads and elbow pads
- children should not ride scooters on roads, on uneven surfaces, or at night

The Committee's recommendations were based on the developmental ability of children, but research on the effectiveness of the recommendations has not been completed to date. While the CPSC states that children under 8 years of age are at greater risk of injury, the review of the literature shows a higher number of injuries for children around 9 years of age (Cunningham & Hockey, 2002; Kubiak & Slongo, 2003; Chapman, Webber & O'Meara, 2001; Fong & Hood, 2004) The disparity, though not great, requires some comment. Younger children are at greater *risk* of injuries due to their limited developmental ability, whereas by the age of nine, more children are participating in scootering and therefore *higher numbers* of injuries are likely in children nine years and older.

Current New Zealand legislation and community-based resources

Legislation

Legislation is relevant on two levels in regard to scooters – manufacture/sale of the devices and operation of the devices. Retailers and manufacturers are required to comply with product safety standards when selling NMS's to the public in order to prevent and reduce the risk of injury. Product safety standards ensure that products and their performance are satisfactorily tested, and any risk, warnings or instructions for use are attached to the product (ConsumerSearch, 2012). We note however, that there is no requirement for retailers to promote and/or even mention the use of protective gear when making a sale.

In New Zealand, the Land Transport Road User Rule (2004) establishes the rules to which all traffic must adhere in order to use the road network and footpaths. Overall, the purpose of the traffic law described in the rule is to resolve conflict, prescribe behaviour, prohibit detrimental behaviour, and define the meaning of traffic control devices. The objective of this rule was to stipulate how traffic must operate on road

networks and includes all road users; drivers, riders, passengers, pedestrians or persons leading animals. Child cyclists are expected to be familiar with basic road rules and have a right to use the road network. The legislation includes the category of *wheeled recreational device* and spells out the obligations of riders of the devices. A recent (2009) amendment to the rule has seen NMS's included under this category:

> "This rule … includes vehicles such as scooters, skateboards, in-line roller skates within a category of traffic called a *wheeled recreational device*, defined as a wheeled conveyance, other than a cycle that has a wheel diameter exceeding 355 mm, and that is propelled by human power or gravity." (Schedule 1, 5 [2])

Riders of wheeled recreational devices do not have the right to use the road network and are subject to the same regulations as pedestrians (Part 11). It is worth noting that the amendment still includes the words "when being used by an adult" (Schedule 1, 5 [1]) in relation to the clause relating to wheeled recreational devices. Its application to children riding NMS's is not documented, despite such a large percentage of riders of scooters, skates etc. being children. By contrast, the legislation requires all cyclists, including children, to wear a helmet when travelling on a bicycle, even if they are a passenger. The anomaly needs to be addressed.

Community-based resources

Many New Zealand primary schools encourage children to be more active through walking, bicycling, scootering and skateboarding to school. *Feet First* is a national programme developed by the New Zealand Transport Association (NZTA) to assist local authorities and schools to develop programmes encouraging students to actively transport themselves to school by walking, cycling, scootering or skateboarding to school. The programmes are led by volunteers from the community and older students who mentor safe-travel to their younger peers.

The Tauranga City Council adopted the NZTA program within the Bay of Plenty, and advocates for Feet First programmes to be implemented within their local schools. These programmes educate students about safe travel and the need to wear protective gear when cycling, scootering and skateboarding. According to the Council, these messages seem not to be adopted by students (Tauranga City Council, 2012). In 2005,

Royal, Kendrick and Coleman completed a meta-analysis of literature examining the effectiveness of non-legislative community-based interventions to improve the use of helmets for cyclists. Some children received free helmets and others subsidized helmets, while still others provided a self-report of whether they owned and/or wore their helmet. The findings showed that more children wore helmets when the community based intervention was received at school.

Many other educational resources are available to help schools facilitate safer travel for students and local Councils have contributed to fund training programmes within schools. For example, the Wellington Regional Council, together with NZTA, funded and launched a scooter training programme to four hundred students within their local schools. The programme was successfully delivered in partnership with Micro-scooters, a leading retailer within New Zealand, and taught children handling skills, traffic awareness and footpath etiquette together with focusing on balance, braking, using your feet for balancing and how to control falling to help prevent injury (Chapman, 2013). Students responded positively to the programme but the need for further training on road safety was noted. While Micro-scooters actively promote and advocate for protective gear to be worn (Micro scooters, 2012), it is worth noting that media reports on the training programme focused on promoting active transport, rather than the safety aspects of the course.

The Tauranga City Council (2012) also facilitates a Travel Safe Programme underpinned by education, engineering, enforcement and encouragement and includes the Kids on Feet campaign. The Council's Travel Safe Team supports parents and volunteers in the community to run the program for children walking, cycling, bussing and scootering to school. Furthermore, senior students are encouraged to take responsibility for promoting active travel and road safety initiatives to their peers, through implementing Feet First within their school. Whilst all the school and community programmes are providing information about safety measures, the associated literature does not reflect the need for children to wear protective gear, and not all schools actively engage with the Feet First campaigns. Promotion of the benefits of protective gear may therefore need to be delivered in other ways.

Late last year, the local Tauranga Newspaper, The Bay News (2012), did a large full-page advertorial on Safe Scootering Practices for children. The article was supported by the Western Bay of Plenty District Council, NZ Police, Tauranga City council and Travel Safe. The article presented many useful safety messages for children:

- Children need to travel on footpaths with smooth surfaces, to stop and look for cars at driveways, hop off scooters to cross intersections and roads, and maintain their scooter in good condition.
- Children need to scooter to their ability level; the skill of scootering takes practice especially learning to start, turn and stop safely.
- Children need to wear protective gear; a safety approved helmet, wrist guard and gloves, knee and elbow pads and durable sturdy shoes like sneakers are preferable- no jandals.

Whilst the Bay News is to be commended for the article, our observations in this study show that children are not protecting themselves with safety gear, nor are they engaging in safe travel when commuting to and from school on public roads. As described in the following pages, substantial risky behaviour was observed during the fieldwork that could have eventuated in serious injury.

Findings

Fieldwork: Recreational settings

Observations were completed on sunny days at three outdoor skateparks. Two of the skate parks were located at a setting with no other recreational activities available and one was alongside a baseball park. Each of the skateparks had stairs, grindrails and ramps, and one also had a bowl. Observations were completed mid to late mornings and early afternoons across the settings. The number of boys (n=24) scootering at the recreational settings was significantly higher than girls (n=3), with most aged eight to nine years. Approximately two-thirds of the children arrived at the recreational setting on their scooters, having travelled on a public road. The remainder of the children arrived in a motor vehicle, and tended to be younger than 8 years of age. With one exception, all of the children who were estimated to be less than five years of age were supervised whilst scootering. Nine children had advanced scooters and the remaining twenty-three had the basic model. Five wore no protective gear at all. While the remainder wore shoes, in two cases these were simply jandals (thongs). Only four riders wore a helmet. No other protective equipment, such as elbow, knee and wrist pads was evident.

Thirteen of the children had a fall or injury during the period of the observation, though only eight showed signs of obvious injury; these comprised of hurt knees, arms, elbows, and a knock to the head. An injury was considered to have occurred if a child displayed a behaviour reflecting discomfort, such as crying, limping or holding the injured site, returning to parents for comfort and one child received assistance for bleeding Not all injuries were self-inflicted. Some riders caused injury to others through collisions while executing tricky manoeuvres. Most of the riders engaged in risky behaviours, predominantly by doing tricks with their scooters. As is to be expected, an increase in risk-taking was associated with an increase in age and confidence, and therefore this behviour was observed more frequently in the nine plus age group. Common risky behaviours identified were:

- Jumping on and off obstaceles like grind rails, ramps and stairs.
- Travelling very quickly down ramps and doing jumps whilst travelling.

- Jumping off ramps to "drop-in", which involves standing on the edge of a high ramp with only the tail of the scooter resting on the surface and the rest of the scooter in midair. The rider must then balance the scooter and drop onto the descending ramp at speed.
- Throwing the back wheel of the scooter into the air and spinning it for a 360 degree rotation, and then trying to land back on the scooter.
- Whilst scootering at speed, lifting the front wheel of the scooter into mid-air and spinning it for a 360 degree rotation, and then landing on the scooter.
- Riders changed their position from standing to sitting whilst travelling on their scooter through the park.
- Older children raced through the setting, travelling quickly and frequently only narrowly avoiding knocking younger children over.
- Younger children crossed the setting in front of other riders who were scootering at speed.
- Lifting the scooter footplate above their head whilst holding the handlebars when exiting onto a ramp, often with other children close by.
- Doing acrobatic manoeuvres whilst travelling at speed, lifting and extending legs.

Hazards identified within the setting were uneven surfaces, including loose stones from nearby gravel and dirt piles. Additionally, other children and adolescents were skateboarding and cycling in the park, often doing tricks at greater speed than riders on scooters, adding to the congestion on the park at various times.

Fieldwork: Travelling to and from school

A greater number of riders were observed travelling to and from school on public roads than at the recreational settings. Twenty-four girls were observed, along with thirty-three boys. The average age was eight to nine years, with 18 riders considered to fall within the 9-11 years age group, and 17 between the age of five and eight years. Five participants ventured on to the public road instead of remaining on the footpath. The vast majority (89%) travelled on basic model scooters. Little protective gear was

worn; 11 riders wore none at all, 38 wore shoes, though, as was the case with recreation riders, some simply wore jandals (7). Only one rider wore a helmet.

Many hazards were evident, and were often accompanied by risky behaviour.

- Travelling on uneven pavement surfaces
- Racing through pedestrians walking on pavement, and other children scootering on the road
- Heavy motor traffic during peak hours outside and around schools
- Travelling on a scooter on a congested main road
- Not stopping before crossing side-roads
- Weaving on and off pavements onto roads to go around pedestrians
- Racing against other children/friends on congested pavements
- Jumping (for fun) on and off pavements whilst travelling, at side-roads, onto a main road congested with motor traffic, and on and off at driveways
- Travelling on the road with fast moving traffic down a large hill and not being aware of possible vehicles entering and exiting the road.
- Doing tricks, hopping and flicking out back wheel when travelling on a busy footpath.
- Scootering in the middle of the road to race a friend travelling on a bicycle
- Not looking at traffic, but instead focussing attention on their scooter whilst crossing the road
- Carrying objects whilst scootering, using only one hand to control the scooter

Datasets

ACC data

As noted above, ACC data show a clear spike in the number of injuries and cost to ACC in 2012. The total number of new claims increased substantially from June 2008, (recording 46 claims for the year) to 309 claims recorded for the year ending June 2012. This has resulted in an increase in cost to ACC to approximately $70 000 over this time period. Boys represented 75% of the children injured. The highest rate of injury resulted from a fall representing 80% of the total number of claims (Figure 3).

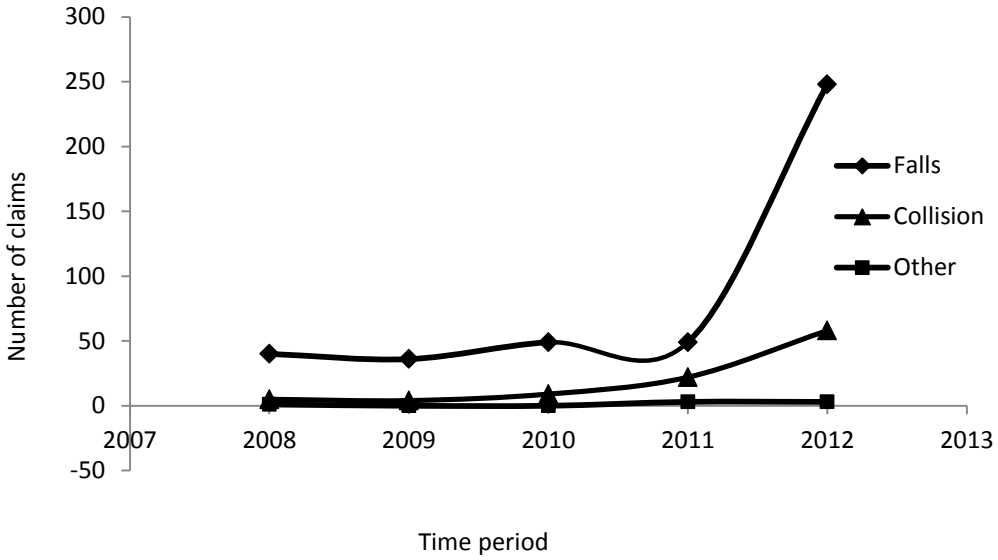

Figure 3. Total number of claims resulting from a fall, collision or other means

For the year ended June 2012, most injuries (132) occurred at home, followed by sport and recreational settings (96), public roads or streets (63), and 17 injuries occurred at school (Figure 4).

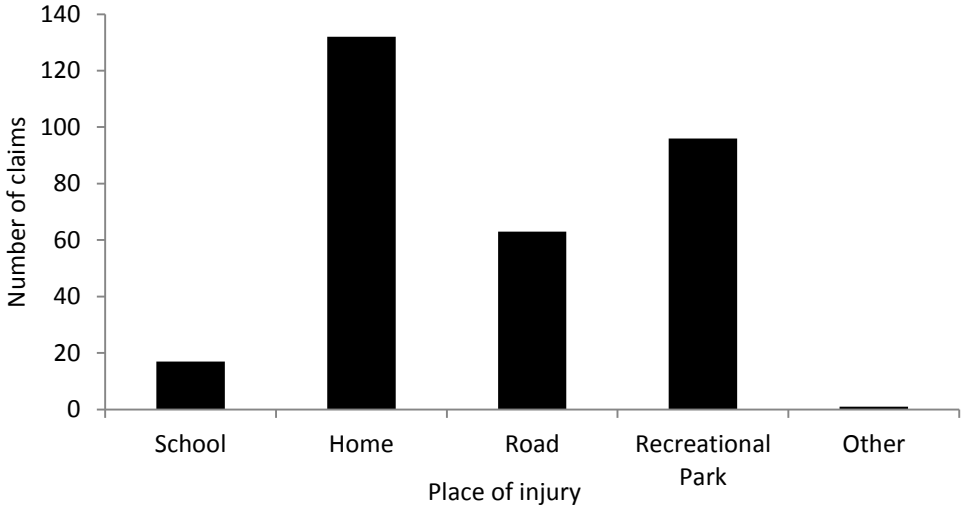

Figure 4. The total number of ACC claims for the year end June 2012 per setting

Most children sustained a laceration or puncture wound (141 injuries) followed by a soft tissue injury (99 injuries). Fifty-nine fractures or dislocations were recorded for the year, but multiple injuries per child were also evident, and this needs to be considered when looking at data. Other injuries included dental injuries and concussions. Fractures and dislocations of the arm and wrist were the most costly to ACC totaling approximately $30 000 for the year, followed by lacerations, puncture wounds and soft tissue injuries, mostly affecting the knees, face, legs and arms of children.

DHB data

The data obtained from the Midland Regional Trauma Registry provided a very small dataset as it included data only for children who were acute admissions to hospital rather than those treated within the Emergency department and then discharged. The number of children (boys and girls) that were admitted to Waikato Hospital has been relatively small; three children were admitted in 2008, three in 2009, four in 2010, and five in 2011. Again, we note that, while most injuries from scootering are mild or moderate, more serious do occur and minimising the risk and subsequent harm is essential.

Discussion

The behaviour of children younger than 15 years riding NMS's was observed across two settings, recreational skateparks and travelling to and from school on public roads. We acknowledge that our sample is small, but we are struck by the consistency of the behaviours observed. The results showed that more boys than girls enjoyed scootering at parks, but a larger number of girls tended to travel on a NMS to and from school than the numbers observed at the park. The majority of the children were about nine years of age and travelled independently, whilst those younger than eight years were generally supervised by a parent. Risky behaviours were evident from all the children with an increased level of risk associated with increased age, and many hazards were identified in both settings.

Whilst 48% of the children scootering at the skateparks sustained an injury during the time of observation, not all of the injuries were self-inflicted. Little or no injury was observed whilst children were travelling to and from school, though many near-miss

events occurred and multiple hazards and risky behaviours that could have eventuated in a severe injury or fatality were evident.

The observation of children engaging in these risky behaviours is consistent with ACC's injury data. For the past five years the statistics recorded by ACC have increased slightly each year, with an impressive spike in the number of injuries recorded in 2012. Most commonly, these injuries were recorded as having occurred at home, followed by a recreational setting and then a public road. We note however, that the ACC data includes only injuries that were seen by a medical practitioner. As the observations attest, many more minor injuries are occurring, though mostly without the need for medical intervention.

ACC data indicate that the most frequent types of injuries are recorded as moderate injuries - lacerations, fractures, dislocations and soft-tissue injuries. As children get older they take more risks, and as well as the obvious dangers associated with sharing these areas with pedestrians and other vehicles, additional hazards such as potholes, uneven surfaces and kerbs need to be negotiated. Younger children can be at heightened risk due to their poorer judgement of their own ability, skill and strength, as well as their lack of ability to correctly judge and anticipate the trajectory and speed of pedestrian and motor traffic. Young children's higher centre of gravity (due to their relatively larger heads) makes falls more likely than for older children. With slower reaction times, they also have limited ability to protect themselves from injury, further increasing the potential for head injuries (Cunningham & Hockey, 2002).

Worldwide, the number of NMS injuries is climbing, and the accidents can cause serious injury and are sometimes fatal. In recent months, children as young as six have been struck by a motor vehicle whilst scootering on the pavement outside their home (The Brisbane Times, 2012). A child in Queensland was struck and killed by a motor vehicle whilst travelling on his NMS to school (Reilly, 2012). As noted earlier, 10 deaths related to NMS's were reported in the United States, most involving collisions with a motor vehicle (Powell, 2003). In New Zealand, a 9-year old boy was riding his scooter at a friend's birthday party and fell and hit his head (Prasad, 2012). He suffered a severe brain injury and underwent life threatening surgery to have metal plates inserted into his skull. His parents said that they never gave much thought to the need to wear protective

gear, but they are now advocating for all children to wear helmets when riding a NMS. They have also recommended to the school that their son attends, that the school requires all children scootering to school wear helmets.

Commenting in 2011 on the 4000 scooter related injuries that occurred over a one-month period, the US Consumer Product Safety Commission noted that the majority of these injuries may have been prevented or reduced in severity, if protective equipment had been worn. For children aged 15 years and younger NMS's were the category of toys with the highest rate of injury in the United States in 2011, outstripping bikes, skateboards and skates (Tu, 2011).

New Zealand in context

Whilst it could be argued that New Zealand does not experience such an extraordinarily high number of injuries as the United States, the sudden spike in injuries during 2011 and 2012 needs exploring. The following may be contributing factors:

- The increase in popularity of NMS's. According to a leading retailer in the New Zealand market, the number of units sold here has progressively increased over the last five years, though there is a 50% increase in numbers sold from 2010 to 2011[3]. These record sales included the 2011 Christmas period, which may have influenced – and help to explain – the spike in the number of injuries sustained during the first-half of the 2012 year.[4]
- The types of scooters currently retailed vary significantly in price and quality, ranging from $30 to nearly $400.[5] This price difference reflects differences in the quality of the NMS, their durability, strength and intended purpose. The more affordable models of scooters seemed to sell faster, with stock more likely to be listed as 'sold out' on company websites. This is further supported by the observational data collected. A higher number of basic scooters were used by the children and these were not used correctly for the activities in which they are engaging. Basic scooters are being used in skate parks for trick manoeuvres,

[3] Given the commercial sensitivity of the data, the retailer requested to not be identified
[4] ACC data quoted as at June for each year recorded.
[5] Retail prices were obtained from the following online shopping websites: The Warehouse, MADD Scooters, and Priceme, a website that compares the price ranges of many different makes and models.of scooters

and for travelling a distance to and from school, even though manufacturers suggest that these scooters are not made for these purposes. Basic, lower cost scooters need to be used on flat and smooth surfaces over a short distance only.

- New Zealand terrain is unforgiving, with many cities built on and around hills. Many roadways ascend and descend, are windy and not level. NMS's are not strong enough to endure the speeds that some children reach when descending a hill. Additionally, the braking mechanism on many NMS's is insufficient for such terrain. A small metal plate that is pressed by a child's foot can quickly overheat and fail to stop a scooter when travelling at high speed. This is equally applicable at skate parks, when children are 'dropping-in', rapidly descending down a steep gradient before travelling across the park.[6]

Australian research by Victoria Road Safety Authority (VicRoads) reports that helmets have been shown to reduce the rate of head-injury in cyclists by 70% (2002) and there is room to argue that elbow and knee pads would provide protection and help reduce the number of moderate scooter injuries currently being seen in emergency departments. We note however, that knee and elbow pads may have an opposite effect in as much as they may encourage children to engage in riskier behaviours in the belief that they are now "bulletproof". Additionally, Cunningham & Hockey (2002), report that scooter riders possess less safety awareness than other types of riders (skateboarders and in-line skaters), and Chapman, Webber and O'Meara's (2001) study showed that only 3% of children with scooter-related injuries wore protective gear. Clearly there are benefits to be gained from protective equipment, but even a full complement of protective gear would not provide protection from some of the most common injuries, especially sprains and fractures. Furthermore, whilst the message is increasingly being conveyed to the public through the media, retailers and governance, the majority of children do not wear safe equipment suggesting that parents and schools are not reinforcing these safety messages.

[6] Somewhat alarmingly, during the course of this research, a family friend (aged fourteen) arrived at the researcher's home with a very distorted scooter wheel. He had been travelling down a steep hill on his NMS with his foot placed periodically on the brake to avoid speed wobbles. The back wheel's bearing became so hot it caught fire, resulting in the rubber on the wheel, as well as the plastic on the hub melting to the point where the wheel is no longer viable.

Evaluation

The message that children should wear protective gear is not being heeded by the general public, if behaviours during the course of this research are any indication. There is evidence of high levels of awareness within governmental bodies, who provide extensive information, promotional material and resources to schools, though even within these resources, the importance of protective gear to reduce the risk of injury seems often to be presented as an afterthought, rather than an essential element of scooter education. It also appears that the potential for injury does not seem to be recognized amongst a large section of the adult population. As the observations of this study show, schools do not insist that children wear protective gear when travelling to and from school on scooters; nor is any age restriction for NMS travel evident. Again, it is useful to consider this in relation to bicycles – many schools restrict cycling to school to year five and six students (10-12 year olds) and actively reinforce the helmet legislation.

Current legislation does not require children to wear helmets when riding a NMS, though bicycle legislation introduced in 1994 in New Zealand requires cyclists to use a helmet. The compulsion resulted in a dramatic increase in the rate of helmet use (Karkhaneh, Kalenga, Hagel & Rowe, 2006; Macpherson & Spinks, 2008), and as noted above, higher helmet use produces a significant reduction in the number of fatalities and head injuries sustained (Victoria, 2002). Whilst the cycle helmet legislation met with substantial resistance initially, once a reduction in the number of injuries started to be recorded and the public slowly became convinced about the need for the protective gear, the rate of compliance increased to nearly 100%. In 2011, a survey completed by the Ministry of Transport showed that the national cycle helmet wearing rate for all age groups was 93% (MoT, 2011). Amending legislation so that one is required to wear a helmet when travelling on any wheeled recreational or transport device, as determined by the Land Transport Road User Rule (2004), would undoubtedly have a positive effect.

If schools were required to ensure that all children using a wheeled conveyance, whether a bike, scooter, skateboard or in-line roller skates, wear basic protective gear (a minimum of a helmet and footwear, for example), the risk of injury would be reduced

immediately – and have a flow-on effect of encouraging children to continue to use this equipment at other times.

Observational data collected for this project reiterates the Tauranga City Council's assessment that safety messages are not being heeded. As observed at both the skate park and on public roads, a mere 6% of the children wore a helmet and no children wore any other form of protective gear such as knee or elbow pads. Very few children wore sturdy footwear. Further research exploring school policy across the region, and their requirements around the use of protective gear when travelling on scooters would help to ascertain whether or not schools are following the Safe Travel recommendations. If so, students' lack compliance needs further investigating.

Retailers are currently required to comply with Product Safety Standards which ensure that they trade within regulations designed to prevent and/or reduce the risk of injury by providing information, warnings and/or instruction for the use of the product at the point of sale. A standard promotional brochure that emphasizes the need for protective gear to be worn would provide awareness and educate parents and caregivers when purchasing a NMS for their child. This provides a great opportunity to disseminate this information to all consumers. As noted, a substantial amount of literature is already available to parents and caregivers, but the proportion of children using protective gear is so small that it appears the message is not being heard.

While the merits of school programmes designed to educate, train and develop road safety skills when actively transporting themselves to school are undoubted, the promotion of active transport needs to incorporate more emphasis on the need to wear protective gear. The school setting provides a captive audience and is ideal for providing an effective intervention. Schools monitor children's use of helmets when riding a bicycle; a similar approach could be adopted for all wheeled recreational and/or transport devices, including NMS's. Additionally, educational and promotional information could be sent to parents and caregivers, illustrating the possible risks and frequency of injury, along with preventative measures families/whanau can take to protect their children. Such a strategy from schools can incorporate the dissemination of existing resources (such as the NZTA Hike it, Bike it, Skate it, Scoot it leaflet, which is available in many languages).

Schools have the opportunity to actively regulate and promote safe NMS travel by ensuring that only children over eight years of age are travelling on a NMS to school, that those children are required to wear a helmet and sturdy footwear, and that they undertake a safe travel skills programme that teaches children scootering and road skills. As already noted, such a programme can be provided by older students, creating an opportunity for leadership and mentoring.

Conclusion

NMS's have become increasingly popular over a short period of time. Various makes and models are available from a variety of retailers, and different models are manufactured for particular recreational and/or transport purposes. Basic NMS's are extremely affordable, lightweight and for use on smooth paved surfaces. Advanced models are more durable and more expensive, ranging in price up to $400 each. Advanced NMS are made for travelling longer distances and have additional features for trick manoeuvres. The observations of this study show most children are riding the incorrect model of NMS within skate parks and when travelling to and from school. Affordability is clearly a contributing factor and may also explain the lack of protective gear. Low-income families may struggle to afford a more expensive scooter better suited for the type travel that their child engages in, let alone the protective gear to go with it. Therefore, given the equity implications, and the generally mild to moderate types of injuries associated with scootering, we are inclined to limit legal regulation of compulsory protective equipment to an approved helmet, though we strongly urge schools to require durable footwear. We also note that many children are risk takers (sometimes unconsciously) and wearing elbow and knee pads may provide a false sense of security, encouraging them to take even further risks. It is no more possible to constrain youthful exuberance than it is to guarantee smoothly paved surfaces in all places at all times.

Wearing protective gear will not exempt children from injury, but it will minimise the harm. Helmets and shoes will not prevent limb lacerations and fractures, but they will prevent a moderate injury from becoming a severe injury. Together with monitoring and education, injury rates can only reduce. Amending legislation to include a

requirement for helmet use in NMS travel in the current Land Transport Road Rule (2004), would increase the current rates of helmet use by children when riding a NMS. Furthermore, mandating retailers to support this initiative by disseminating safety information to families, when purchasing a NMS, would help increase public awareness.

Community-based resources have been shown to have a marked effect through intervention, education and prevention (Royal, Kendrick and Coleman, 2005). Schools have the opportunity to regulate and educate their students about safe travel to and from school on public roads. Implementing skill-based and safe travel training programmes within the school ensures that all children are being made aware of the dangers and hazards. We know that the built environment (roads, parks etc) will always present hazards and learning to negotiate these hazards is one of the best protections children can achieve. Future studies examining current school policies around children's travel to and from school would show whether children are not following the guidelines set, and if so, one could examine why, or whether schools need to consider some form of regulation around children's travel. In combination, these factors will reduce the current numbers of injuries amongst children, as well as the cost of those injuries to families, taxpayers and society at large.

Recommendations

In view of the information and arguments presented above, we recommend:

- Amend the current cycle helmet legislation to include the riders of all wheeled recreational devices, irrespective of the age of the rider;
- Introduce school policies requiring that helmets and footwear are worn when scootering to and from school;
- Implement a minimum age for scootering to and from school;
- Extend the coverage of existing school training programmes on road safety in general and safe scootering in particular;
- Require compulsory distribution of point-of-sale information packs on the risks of scooters and the protective equipment options available;
- Ensure continued funding of current community resources and training initiatives
- Further research on scooter accidents and associated risk factors

References

Accident Compensation Commission (n.d.) *Injury Statistics*. ACC, Wellington. Retrieved on September, 5, 2012, from http://www.acc.co.nz/about-acc/statistics/injury-statistics/index.htm

Accident Compensation Commission (n.d.). *ACC Statistical Inquiry Index*. ACC, Wellington. Retrieved January 8, 2013, from http://www.acc.co.nz/about-acc/statistics/

Adeboye, K., & Armstrong, L. (2002). Pattern and severity of injuries in micro-scooter related accidents. *Emergency Medicine*, *19*, 571-572.

Burrows, G. (2009). Get on Your bikes. *New Statesman*, 17(801), 24. ISSN 1364-7431

Chapman, S., Webber, C., & O'Meara, M. (2001). Scooter injuries in children. *Journal of Paediatric Child Health*, *37*, 567-570.

Chapman, K. (2013, January 30). Scooter training for kids in school. *The Dominion Post,* Wellington. Retrieved from www.stuff.co.nz/dominion-post/news/scooter-training-for-school-kids

Committee on Injury and Poison Prevention (2002). Skateboard and Scooter Injuries. *Paediatrics*, *109*(3), 542-543. doi:10.1542/peds.109.3.542

ConsumerSearch. (2011). *Product Reviews and Reports* Retrieved September 6, 2012, from http://www.consumersearch.com

ConsumerSearch (2012) *Product Reviews and Reports* - ConsumerSearch.com. Retrieved November 24, 2012, from http://www.consumersearch.com/kids-scooters

Cunningham, K., & Hockey, R. (2002, May). Small wheeled devices: a safety challenge for 2002. *Queensland Injury Surveillance Unit Injury Bulletin*, *72*, 1-4. Retrieved from www.ausport.gov.au

Fong, P. H., & Hood, N. (2004). A paediatric trauma study of scooter injuries. *Paediatric Emergency Medicine*, *16*, 139-144.

Karkhaneh, K., Kalenga, J., Hagel, B., & Rowe, B. (2006). Effectiveness of bicycle helmet legislation to increase helmet use: a systematic review. *Injury*

Prevention, *12*, 76-82.

Kubiak, R., & Slongo, T. (2003). Unpowered scooter injuries in children. *Acta Paediatrics*, *92*, 50-54. doi:0803-5253

Macpherson , A., & Spinks, A. (2008). Bicycle helmet legislation for the uptake of helmet use and prevention of head injuries. *Cochrane Database of Systematic Reviews*, *3*, 1-21.

Mankovsky, A. B., Mendoza-Sagaon, M., Cardinaux, C., Holfeld, J., & Reinberg, O. (2002). Evaluation of scooter-related injuries in children. *Jounal of Paediatric Surgery*, *37*(5), 755-759.

Microscooters (2013) *Scooter safety program*. Retrieved January 12, 2013, from http://www.microscooters.co.nz

Ministry of Transport (2011, April). *Cycle helmet use survey 2011*. MoT, Wellington. Retrieved November 24, 2012 from http://www.transport.govt.nz/research/roadsafetysurveys/Cyclehelmet

New Zealand Government (2004). *Land Transport (Road User) Rule 2004*. Parliamentary Counsel Office, Wellington. SR2004/427.

New Zealand Transport Agency (n.d.). *Hike it, bike it, scoot it, skate it. Safer journeys for school children. A whanau and caregivers guide.* NZTA, Wellington. Retrieved January 10, 2013, from http://education.nzta.govt.nz

Powell, E. C. (2003). Non-motorized vehicles and walkers: going for broke. *Clinical Pediatric Emergency Medicine*, *4*(2), 103-111.

Prasad, V. (2012, April 13). Boy's scooter scar a risky reminder. *The New Zealand Herald,* Auckland. Retrieved from www.stuff.co.nz

Reilly, T. (2012). Boy killed travelling to school. *The Brisbane Times*. Retrieved from www.stuff.co.nz

Royal, S., Kendrick, D., & Coleman, T. (2005). Non-legislative interventions for the promotion of cycle helmet wearing by children. *Cochrane Database of Systematic Reviews*, *2*, 1-43.

Rutherford (Jnr), G. W., & Ingle, R. L. (2000). *Analysis of special study data and injury rates, and a comparison with other riding products.* Consumer Product Safety Commission. Division of Unintentional Injury Prevention, National

Center for Injury Prevention and Control*, CDC.*

Schalamon, J., Sarkola, T., & Nietosvaara, Y. (2003). Injuries in children associated with the use of non-motorised scooters. *Journal of Paediatric Surgery*, *38* (11), 1612-1615.

Simonian, H. (2010, December 21). Scooter pioneer that survived to ride again. *Financial Times*, London. Retrieved December 23, 2012, from http://www.ft.com/cms/s/0/039978ae-0d3e-11e0-82ff-00144feabdc0.html#ax-zz2LsSUIV10

Statistics New Zealand (2006). *Socioeconomic status: Tauranga* from 2006 Census Data. NZ Parliamentary Library. Retrieved December 16, 2012, from http://www.parliament.nz/en-NZ/GoogleSearch

Tauranga City Council (2010). *Travel Safe*. Retrieved January 16, 2013, from http://www.tauranga.govt.nz

The Bay News (2012, October 25). Safe Scootering. *The Bay News,* Tauranga, p. 17.

Tu, Y. (2011). *Toys related deaths and injuries calendar year 2011*. Report for the Division of Hazardous Activities. US Consumer Product Safety Commission. Retrieved December 18, 2012, from http://www.cpsc.gov/library/-foia/foia13/os/toymemo11.pdf

Victoria, K. (2002). Scooter and safety. *Better Health Channel*. Retrieved November 12, 2012, from http://www.betterhealthchannel-.vic.gov.au

Whelan, K. R. (2007). Using PEACE to target helmet legislation involving non-motorised wheeled sports in Canada. *Public Health Nursing*, *24*(2), 184-189.