

Child motor vehicle passenger safety - using research to build a campaign.  
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## **Abstract**

*Background:* New Zealand's rate of child motor vehicle occupant injury fatality and hospitalisation is high by international comparisons (1.87 per 100,100 and 31.80 per 100,000 respectively). A plethora of research and science has repeatedly stated the safety benefits of keeping children in booster seats until they reach 148cm in height. Currently, in New Zealand there is no legislation to require the use of child restraints beyond the fifth birthday. Consequently, in comparison to children from other jurisdictions, children in New Zealand are prematurely graduated to adult safety belts and exposed to unnecessary injury risk.

*Aim:* The aim of the Safekids NZ 2009-2011 campaign was to educate parents, carers and the general community and to promote public awareness of the safety benefits of booster seats for children up to 148cm tall, as well as to advocate for regulation change to require the compulsory use of booster seats for children up to 148cm tall.

*Method:* In July 2009, Safekids launched a multi-pronged, two year campaign to promote regulation, education and public awareness of the safety benefits of booster seats for children up to 148cm tall. Key activities included:

- The creation of a solid base of evidence
- The implementation of a national advocacy project to influence government strategy
- The delivery of a series of capacity building workshops to practitioners
- The development of targeted resources to support a nation-wide public awareness campaign.

*Results:* Monitoring and evaluation of the Safekids Campaign shows wide spread reach of booster seat information to communities across New Zealand.

*Significance:* Following the success of the Campaign, the New Zealand Government's Road Safety Action Plan 2011-2012 acknowledged that New Zealand has fallen behind international best practice for child restraints, and includes consideration of regulatory interventions and education to improve restraint use as a priority area.

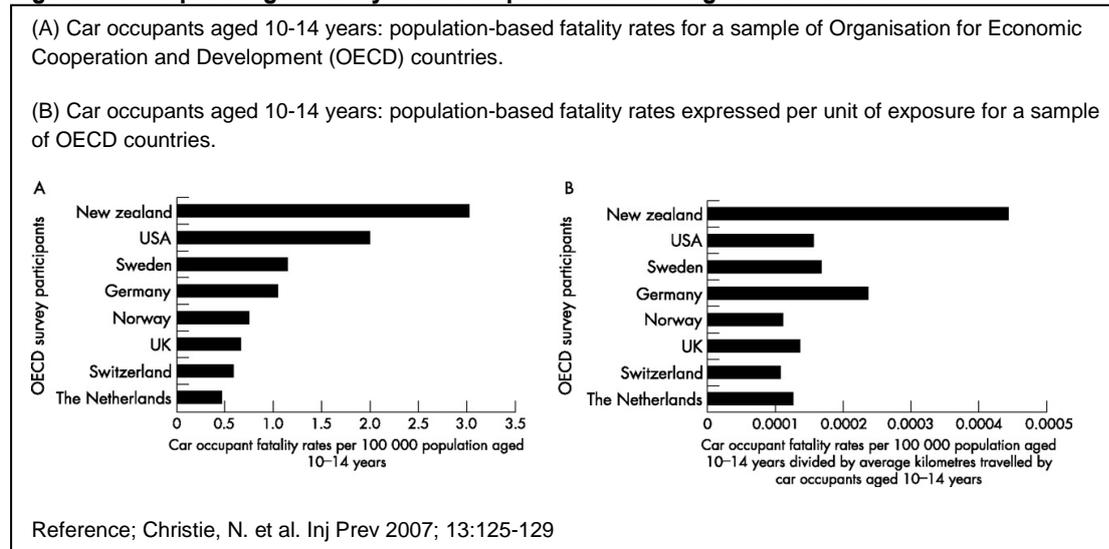
**Key words:** Safekids New Zealand, Safekids Campaign, child restraints, booster seats, prevention of motor vehicle passenger injuries

## **1 Introduction: *Child passenger fatality and injury***

Road traffic injuries are a significant burden of harm for New Zealand, and are a leading cause of death and hospitalisation for New Zealand children aged 0-14 years (Safekids, 2008, Gulliver, 2007, Craig, 2007). Deaths, injuries and disability resulting from motor vehicle crashes inflict considerable pain and suffering on individuals, families and communities, as well as on other road users, emergency service providers, health workers and others (MSD, 2008).

New Zealand has one of the highest rates of child road fatalities in the OCED, and it is recognised that this is in part due to the lack, or incorrect use of, appropriate child restraints (MoT, 2010). In the period 2000-2004, an average of 16 children aged 0-14 were killed as a result of injuries incurred in road traffic crashes where they were a passenger in the vehicle (Craig, 2007). In the period 2002-2006, an average of 279 children per year were hospitalised with injuries sustained when they were a passenger in a motor vehicle (Craig, 2007). Car passenger fatalities contribute to 22% of all unintentional child deaths in New Zealand (IPRU, 2008).

**Figure I: Child passenger fatality rates compared between eight OECD countries**



Children aged 10-14 years are at increased risk of death and injury following a motor vehicle crash where they are a passenger compared to children in other age groups, accounting for nearly half (46%) of all hospitalisations. Children age 5-9 years represent nearly one-third of hospitalisations (29%), and those aged under five account for one-quarter of hospitalisations (IPRU, 2008, Gulliver, 2007).

Tamariki Maori aged 0-14 years are more likely than other children to be killed as passengers in motor vehicle crashes: they are six times more likely to die in a motor vehicle crash than Asian children and five times more likely than Pacific children (IPRU, 2008). Maori children are also over-represented in hospitalisations following motor vehicle crashes: 40% of children aged 0-14 years hospitalised as a result of injuries incurred in a motor vehicle crash are Maori (IPRU, 2008).

## 2 Identifying the Problem: *Incorrect use of child restraints and seat belts*

There is strong evidence that the use of an age and size-appropriate restraint is the most effective strategy for preventing injury and death to children involved in motor vehicle crashes. The use of car restraints for children younger than five years old has been compulsory in New Zealand since 1994 (Simpson, 2003). In summary, the correct installation and use of age and size appropriate booster seat and child restraints significantly reduces injury and death to children involved in vehicle crashes (Decina, 2008, Peden, 2008) and specifically reduces:

- The risk of hospitalisation and death for primary school aged children by up to 59% (Partners for Child Passenger Safety, no date)
- The risk of hospitalisation by 69% for children aged 4 years and younger (Task Force on Community Preventive Services, 2001)
- The risk of death by 70% for infants and 47% to 54% for children aged 1 to four years and younger (NHTSA, 1998).

However, while adult seat belts offer some protection for children in the event of a crash, they are designed to fit the anatomical structure of an adult. Child car restraints, including booster seats, are essential because they offer the protection necessary for the unique body structure of a child (Simpson, 2003; Appleton, 1983).

Booster seats are designed to provide protection for primary school aged children. They work in conjunction with the seat belt. Evidence demonstrating that adult seat belt dimensions are not appropriate for school aged children, and that in the event of a crash, children require booster seats for adequate protection, has been known for a long time (Simpson, 2003; Appleton, 1983; Fredrickson, 2006; Klinich, 1994). Yet booster seat use rates in New Zealand are low.

Evidence demonstrates that child car restraint use rates in New Zealand children aged 5 and over are low. For example, a survey of 1100 New Zealand children demonstrated that 60% of children 4-12 years who required a child restraint were not using one (Cameron, 2006). Overall, parents do not use child restraints for older children because they do not realise they are necessary, and are not required to use them by law. Parents also

significantly underestimate the risk to their child of motor vehicle injury, and are naive about the risks of injury or death in a crash if their child is inappropriately restrained. Parents are not aware that the incorrect use of adult seat belts by children can result in serious injury (Shepherd, 2006). Primary school aged children also require additional equipment – child restraints – to benefit from the full safety effects of seat belts (Ehiri, 2006)

During 2005 New Zealand's Accident Compensation Corporation (ACC) reported that as many as 35% of New Zealand families they surveyed were using incorrectly fitted child restraints (Cameron, 2006). Over five years 66% of the children admitted to the Starship Hospital Paediatric Intensive Care Unit due to injuries received in a car crash were either inadequately restrained, or not restrained at all. The restraint status of 33% was unknown; only 1% of cases were thought to be correctly restrained (2000-2004) (Nuttall, 2008).

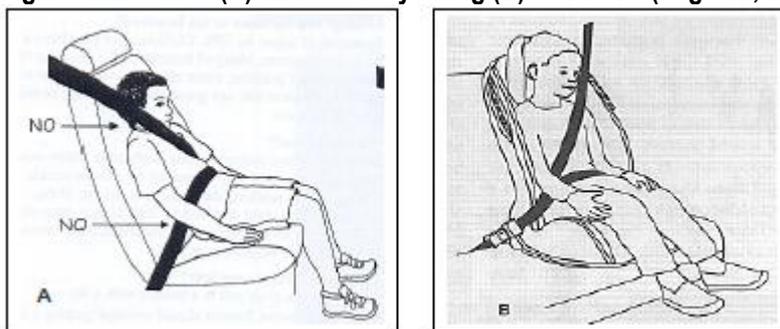
The premature and inadequate use of adult seat and lap belts to restrain children in vehicles also contributes to significant child passenger injuries (Cameron, 2006; Byard, 2004; Krahn, 2007; Shepherd, 2006; Winston, 2006). Shepherd et al (2006) reviewed children who were admitted to Starship Hospital with lap belt injuries during the period 1996 to 2003. Injuries caused by incorrectly fitting seat and lap belts included severe head injury, spinal fractures, bowel transection, severe liver and spleen damage, and paraplegia. Overseas studies also describe similar injuries from the incorrect use of age appropriate restraints (Byard, 2004; Shepherd, 2006; Kortchinsky, 2008).

## 2.1 Booster seats

Child transport experts have long been aware that booster seats are required to provide protection for children until they are the correct proportion to fit seat belts. Research conducted in 1994 by Klinich et al for the USA National Highway Traffic Safety Administration (NHTSA), demonstrated the value of booster seats for improving the fit of the seat belt for older children. It was found the minimum size child who should use a three point belt alone had a sitting height of 74cm, standing height of 148cm and a weight of 37kg (Klinich, 1994). When compared with restraint by seat belts alone, the use of a booster seat has been shown to result in 59% fewer injuries (Aborgast, 2005).

As illustrated below, children require a booster seat to enable them to fit an adult seat belt correctly and gain the full safety benefit of the adult seat belt, in the event of a crash. Children's upper legs are not long enough to sit comfortably upright with their knees bent over the edge of the seat and buttocks against the back of the seat, so they slouch backwards allowing the lap portion of the belt to ride up over the abdomen. Children are also too short to sit up and reach the anchor point for the sash portion of the belt especially when slouched backwards, allowing the belt to rest over the neck. In addition, children's overall small size and lack of fit to the belt mechanisms allows some children to be completely ejected despite a fastened belt (see Figure II) (US Dept of Transportation, 2005, NHTSA, 2005).

**Figure II: Incorrect (A) and correctly fitting (B) seat belts (Segedin, 2008)**



Booster seats ensure children avoid the types of injuries that can occur due to poorly fitting seat belts (Shepherd, 2006; Winston, 2006; Kortchinsky, 2008; Safe Kids Canada, 2004; Koppel, 2008). The booster seat positions the child and guides the seat belt across the child's thighs and hips to provide a better fit than if the child was seated on the seat restrained only by the car seat belt (Durbin, 2003).

Booster seats, and the regulations mandating their use, have been tested in cost outcome terms and show net resource cost savings against child injury, which places them in the top tier of preventative interventions (Miller, 2006).

A recent Australian study assessed child car passenger injuries to children in the four to seven year old age group. The treatment costs of injuries received from not providing booster seats (and relying only on adult seat belts) was measured against the combined cost of creating and enforcing the regulation and the direct cost of the booster seats. The results, based on a total booster seat cost of \$US 197.00, showed a return on investment of 9.4 to 1; providing a saving of \$US 1,854.00 per seat. Even lower bound estimates in sensitivity analysis indicated a social benefit. Booster seat laws alone are shown to offer a return of 8.6 to 1 (Miller, 2006).

New Zealand estimates suggest that strengthening the child restraint requirements for children aged 5 to 10 years will save one life and prevent five serious injuries per year, and deliver an annual social cost saving of \$9.8 million (MoT, 2010). Australian estimates of the use of an appropriate child restraint instead of an adult seat belt indicate that this would save in excess of three child occupant fatalities (12% of estimated annual fatalities) and 151 serious injuries to child occupants (30% of estimated annual serious injuries) (National Transport Commission, 2007).

## **2.2 Why do so few New Zealand families use booster seats?**

Currently, the New Zealand Road Code does not require the compulsory use of a child restraint after children reach five years of age, and many New Zealand parents believe their child does not require a car restraint after this age (NZTA 2010). From 5-14 years, children are required to use a child restraint or a seat belt, only if one is available in the car.

Many New Zealand parents do not appear to be aware of the requirements for children requiring a booster seat, and report a range of reasons for their children not using one, including:

- 51% considered their child was 'too big' for a car seat
- 38% reported not owning a booster seat
- 3% considered there was not enough room in the car
- 2% reported child resistance to using the seat
- 2% reported they were only on a short trip (Cameron, 2006).

Internationally, other research has identified a range of similar barriers to the use of booster seats, including cost, lack of acceptance by the child, parental misinformation, and uncertainty from parents about when to move their child into an adult seat belt (Decina, 2008, Peden, 2008, Howard, 2004, Koppel, 2008, Bilston, 2008).

New Zealand evidence indicates that a key challenge for parents is keeping older children in a booster seat until they are old enough to safely transition to an adult seat belt (Cameron, 2006). Children are likely to have prematurely graduated to adult seatbelts when they are older, have other children travelling in the vehicle, and have younger parents (Koppel, 2008). In one study 60% of children who required a booster seat were found not to be using one (Cameron, 2006; NZ Govt MoT, 2007).

Barriers to the use of booster seats include: cost, child acceptance, parental misinformation and uncertainty about when to move their child into a seat belt. Some studies identified an inverse relationship between the likelihood children would use a booster seat and the number of children in the car. Associations between parental income, the age and make of the car and the likelihood children would be using a booster seat have also been observed. Lower income families, in older model cars, were found to be less likely to use booster seats (Klinich, 1994; Koppel, 2008; Howard, 2004).

## **2.3 What are the best ways to achieve booster seat use?**

Promoting the correct use of age appropriate child restraints for younger children through both regulation and education has long been accepted as the way to reduce child passenger death and injury (Simpson, 2003, Cameron, 2006; Durbin, 2003).

## **2.4 Education**

Community based education and awareness programmes coupled with distribution projects have been shown to be effective for increasing the use of booster seats for younger (0-4 years) and older children to 16 years (Ehiri, 2006, Task Force on Community Prevention Services, 2001, Turner, 2005, Zaza, 2001). A systematic review of interventions to promote the use of child car restraints among 4-8 year old children demonstrated that educational interventions combined with incentives or the distribution of car restraints produced the most consistent results, increasing self-reported car restraint use by 30%, compared to control groups (Ehiri, 2006).

Evidence from a systematic review of eight community based programmes to increase child restraint use and/ or reduce injury rates due to motor vehicle crashes indicates that multi-strategy community based programmes are effective in increasing child safety, reducing risk of child passenger injury and increasing use of car restraints (Turner, 2005). The community based interventions included in the review incorporated a range of strategies, such as occupant-restraint enforcement programmes, mass media materials, education, reducing financial barriers to purchasing child car restraints, and supportive legislation.

A recent evaluation of a national one-week campaign focusing on promoting the use of booster seats among 4-9 year old children through the use of media messages, car restraint fitting stations, and the distribution of growth charts reported significant increases in self-reported booster seat use among exposed population groups, compared to before the intervention (Howard, 2007). Parents exposed to campaign messages were twice as likely to report using a booster seat with lap and shoulder belt for their child, compared to control and unexposed groups. Also, following the campaign, parents exposed to the campaign messages were more likely to correctly identify that the seat belt should fit across a child's shoulder, and not across the chest.

Findings from evaluations of a range of programmes which aimed to increase the age-appropriate use of child car restraints demonstrate that these interventions do not appear to reach all population groups equally. In the USA low socio-economic and demographic characteristics have been associated with the sub-optimal use of restraints for children. The importance of identifying poverty as a predictor of sub-optimal use of child car restraints emphasises the need for adequate booster seat disbursement projects, along with education programmes and regulation (Winston, 2006; Krahn, 2007; Gunn, 2007).

## **2.5 Regulation**

The New Zealand Government has required and enforced the compulsory use of child restraints for children under the age of five since 1994. The government also leads a training and certification programme for child restraint technicians. This programme has replaced the former Safe2Go programme (Simpson, 2003; Cameron, 2006; NZTA, 2011).

Internationally the need for booster seats for older children is being increasingly recognised. Legislation requiring booster seat use is being systematically implemented (in conjunction with education programmes) within, for example, the United Kingdom, the USA, Canada and the European Union (NHTSA, 2005; Durbin, 2005).

A Monash University study identified parental uncertainty as an issue in reducing booster seat use. Legislation has been shown to have a positive effect on children's restraint wearing rates by removing parental uncertainty about when to move their child into a seatbelt (Koppel, 2008). A Tennessee study of 1,247 children transported by 1,191 drivers assessed the recent implementation of enhanced child restraint laws in 2005. The study's authors concluded that enhancing the law to require the use of booster seats for the particular group of children was also effective in increasing the use of child restraints in the wider population (Koppel, 2008).

Overseas research has also indicated that community support for booster seat legislation is possible. The majority of respondents (88%) in a Canadian study of 260 participants in a booster seat education programme said they would support a law requiring the use of booster seats until their children were ready for a seat belt (Howard, 2006).

## **3 Safekids Campaign, 2009-2011**

### **3.1 Context**

The Safekids Campaign, an annual child safety programme, is nationally coordinated by Safekids NZ in collaboration with Government and non-Government partners. In July 2009 Safekids launched a multi-pronged, two year campaign to focus on child motor vehicle passenger safety.

Informed by the review of the evidence about effective interventions to improve child passenger safety, Safekids considered that a comprehensive education plan that incorporated risk communication and maximum parental participation would achieve improved results for New Zealand families. Evidence suggested that the Campaign should include three essential components;

- Marketing to increase community understanding of the need for booster seats.
- Identifying the best, most effective locations for families to access expert advice about booster seats and a range of booster seat products.
- Making these locations well known to the public (Will, 2004).

The aim of the campaign was to educate the parents, carers and the general community and to promote public awareness of the safety benefits of booster seats for children up to 148cm tall, as well as to advocate for regulation change to require the compulsory use of booster seats for children up to 148cm tall.

### **3.2 Key activities**

During the period of the Campaign, Safekids implemented the following key activities to improve the safety of child passengers in New Zealand:

- The instigation of a national advocacy project for regulations to mandate the use of booster seats for child passengers beyond the fifth birthday up to 148cm in height
- The delivery of workforce capacity building workshops to present updated booster seat information to practitioners. Workshops were delivered in two phases; in 2009, 376 practitioners attended 23 sessions and in 2010, 361 practitioners attended 20 workshop sessions.
- The development of a range of resources to support a nation-wide public awareness campaign to raise awareness and achieve wide-scale acceptance of the safety benefits of booster seats.

### **3.3 Overview of evaluation**

The purpose of the evaluation process was to assess the utility of Campaign services (data, information, workshops, messaging, resources and media tools). The evaluation process aimed to explore how the Campaign contributed to local child injury prevention initiatives, particularly within the context of Māori, Pacific Peoples and high needs communities.

Evaluation activities included:

- Analysis of archival information including Campaign resource order records, media clippings and website traffic, for the period May 2009 to June 2011;
- Electronic survey conducted in 2011 with 100 injury prevention practitioners;
- Structured interviews with nine key informants undertaken in 2011;
- Post-interventions telephone interviews with 21 parents undertaken in 2009/10

### **3.4 Data analysis**

A mixed method approach collected qualitative and quantitative information from survey forms, interviews and archive material. Information from different sources was triangulated to provide a means of verifying and qualifying evaluation findings. Survey forms and interview schedules included closed and open-ended questions. Responses to closed ended questions were reported as a percentage or average. Responses to open ended question were analysed thematically.

### **3.5 Evaluation Findings**

#### **3.5.1 Workforce engagement**

Over the duration of the two year Campaign, Safekids responded to 574 requests for child vehicle passenger safety information and resources. Requests were received from Plunket, health services, Government and Local Government agencies, Maori providers, educators, family and community support services and car seat services.

Cross-sector involvement with the Safekids Campaign was further demonstrated by e-survey respondents who represented a wide variety of services and organisations illustrating the breadth and reach of the campaign amongst individuals who are positioned to positively influence the safety of children.

#### **3.5.2 Geography of Campaign reach**

Analysis of Campaign resource order records showed that requests were received from organisations within every District Health Board area of the country. Campaign material was sought by organisations based in cities, urban areas and remote rural locations.

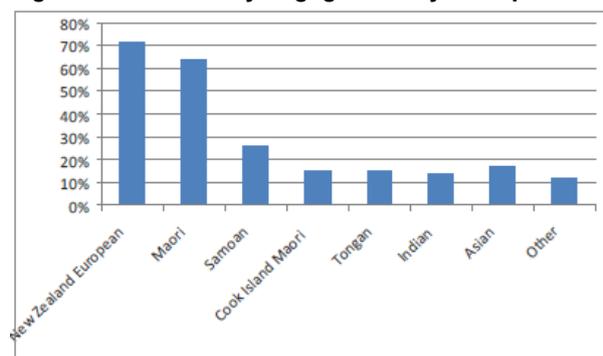
New Zealand Transport Agency's *Communities at Risk Register* (NZTA, 2001), has identified high needs communities based on a significantly above national average percentage of unrestrained child passengers. Territorial Authorities (TAs) and TA cluster groups identified as high priority on the *Register* include: Western Bay of Plenty and Tauranga District; Far North District Council; Kaipara District Council; Manukau City Council, Whakatane, Kawerau and Opotiki District Councils and New Plymouth District Council. These TAs are incorporated within the District Health Board areas from which resource orders were placed. E-survey respondents were also located within these TAs demonstrating that the Campaign reached these communities.

### 3.5.3 Reaching Maori and other high needs communities

Evaluation findings presented clear evidence that Campaign material reached Maori, Pacific Peoples and other high needs communities. Demand for resources was strong from DHB areas with large Maori populations including: Northland, Waikato, Bay of Plenty, Tairāwhiti, Lakes, West Coast and Wanganui (Statistics NZ, 2006, White, 2008). These DHB regions also include areas highlighted on NZTA's *Communities at Risk Register*.

A breakdown of e-survey respondents revealed that a high percentage of feedback participants primarily delivered services to high needs communities including Maori and Pacific peoples (Figure III). Of 81 respondents, 64 percent indicated that they did most of their work with Maori and 45 percent with Pacific Peoples.

Figure III: Community engagement by local practitioners, by ethnicity.



### 3.5.4 Utility of resources

Between July 2009 and June 2011, a total of 359,858 child motor vehicle passenger resources were distributed to communities across the country. Safekids' *Booster Rooster* collateral and NZTA's *Dual Card* were the most frequently utilised resources over the two year campaign; 185,984 *Booster Rooster* resources and 122,340 *Dual Cards* were disseminated to children, parents and families.

Feedback obtained from structured interviews with key informants indicated appreciation for the simplicity of resource design, the use of clear language and minimal text to articulate safety information in easy to understand messages.

An e-survey conducted with injury prevention practitioners in 2011 showed that the *Booster Rooster height chart (English)* was used by 86% of respondents and *The higher you sit the safer the fit block wall poster (English)* was used by 72% of respondents (n=88); an indication of sector-wide support for Safekids' booster seat messaging and material.

### 3.5.5 Local action

Feedback from e-survey respondents, monitoring of resource orders and analysis of media activity and website traffic suggest that the Campaign has supported a significant amount of locally led child injury prevention action.

Ninety five percent of e-survey respondents (n=100) indicated that they had utilised Safekids Campaign material to support their child injury prevention work. Campaign material was used to raise awareness of the safety benefits of booster seats at community events and activities, with parents, families and whānau, in conjunction with Police activities and the Fire Service and in schools and early childhood facilities. Information was utilised to build workforce capacity and to inform strategic planning and policy development.

Post-intervention telephone interviews were with 21 parents of primary school children who had been exposed to a school-based booster seat programme. Findings suggest that parent knowledge and awareness of the safety benefits of booster seats had been increased or reinforced; when questioned, 20 parents indicated that 148cm was the safe height to graduate a child to an adult seat belt. Feedback also suggested that parents had a good retention of information pertaining to seat belt fit. Six parents indicated that they would prolong their child's use of a booster seat as a result of the information presented through the school.

### 3.5.6 Media

Monitoring of media activity suggested that the media was influenced by, and responsive to the Safekids Campaign. Analysis of media attention to campaign themes for the period July 2010 to June 2011 showed that

46% (n=259) related to the Campaign themes of child motor vehicle passenger safety. Safekids recorded a total of 120 editorial articles published in newspapers and magazines and items broadcast on TV and radio.

#### **4 Conclusion**

Safekids acknowledges that collaboration between organisations and individuals is required to accomplish outcomes in child injury prevention. However, synthesised evaluation results demonstrate that the Safekids Campaign made a valuable contribution to the effectiveness of injury prevention work in the fields of child motor vehicle passenger safety between July 2009 and June 2011.

Prior to the launch of the two year child vehicle passenger safety campaign, the road safety sector was focused on the delivery of education and information to parents of children under five years of age. Since the launch of the campaign, promotion of booster seat use up to a height of 148cm by road safety experts and child restraint technicians has become normalised. The two year campaign has also seen a shift in Government perception of booster seats; New Zealand's Road Safety Strategy *Safer Journeys 2010-2020* acknowledges the need to make the use of booster seats the norm for children aged 5 to 10 years (Ministry of Transport, 2010).

In November 2011, attitudinal changes brought about by the Safekids Campaign were recognised by New Zealand's road safety sector. The New Zealand Local Authority Traffic Institute (TRAFINZ) awarded Safekids the TRAFINZ Road Safety Leadership Award for outstanding contribution and national leadership in transportation safety in New Zealand.

Evaluation and monitoring exercises indicate that the Safekids Campaign experienced a period of growth between June 2009 and July 2010, the duration of the child vehicle passenger focus. The number of Campaign resource order requests placed by practitioners increased and there was a rise in total resource dissemination figures. Evaluation results indicate that Campaign information and resources were used to support a high level of locally lead child passenger safety action. Local action has been mirrored by media attention to Campaign themes.

The availability of easy to access Campaign information and best practice key messages and resources has positively influenced workforce capacity, capability and motivation to deliver child motor vehicle passenger safety work. Local community practitioners who are routinely engaged with these injury themes have utilised Campaign material to enhance and extend existing projects and work. In addition, evaluation findings suggest that Campaign material has enabled and motivated practitioners who are not routinely involved with child restraints to action this injury issue.

Evaluation results demonstrate that the Campaign had a long reach geographically and in terms of organisational engagement. Campaign resources were utilised in all 20 DHB areas; importantly, resources reached areas of high deprivation, large Maori populations and areas defined as high priority on NZ Transport Agency's *Communities at Risk Register*. The Campaign also reached a wide cross section of the workforce including health, education, Government, Maori providers and family support services to mention a few.

#### **Acknowledgements**

Safekids New Zealand is the national child injury prevention service of Starship Children's Health and is a member of Safe Kids Worldwide. Our mission is to reduce the incidence and severity of unintentional injury to children aged 0 - 14 years in New Zealand. Safekids works to raise public awareness of child injury issues and advocates for the adoption of policies and strategies that will improve child safety.

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