

## **Announcement and legislation enactment improve children's seating position in regional areas**

Johns, M.C., Lennon, A., Haworth, N.  
Queensland University of Technology  
Centre for Accident Research and Road Safety Queensland  
email: [m.johns@qut.edu.au](mailto:m.johns@qut.edu.au)

### **Abstract**

New legislation requires all children 7 years and younger to use child-specific Australian Standards approved restraints suitable to their age and restricts seating young children in the front of cars. Observations of child seating position and restraint use were undertaken in Toowoomba and Rockhampton before the Queensland legislation was announced (T1), after the announcement but before it was enacted (T2) and after it came into force (T3). From T1 to T2, the percentage of children seated in the rear increased (69% to 75%), with a further increase from T2 to T3 (75% to 77%). This pattern was clear when there were one or two children in the car, but not when there were 3 or more. The effect on restraint use was more complex. After the announcement (T2) the percentage of children using adult seatbelts significantly increased regardless of the number of child passengers. However, once the legislation was enacted (T3) there was a significant increase in the percentage of children using child seats/boosters where there was one or two child passengers. Where there were three or more children in the vehicle there was little change in restraint choice between pre (T1) and post (T3) legislation.

### **Keywords**

Vehicle Safety, Seat belt, Child Seat, Legislation

### **Introduction**

Injury to children in car crashes can be reduced or prevented by placing all children in the rear seat of the vehicle in a dedicated Australian Standard (AS/NZS1754) child restraint. Australia was one of the leading nations in relation to vehicle safety during 1970s, being the first to introduce compulsory seat belt use [1]. However, in recent years this status has deteriorated in relation to the restraint of children [2]. Research in the past decade has demonstrated that children are safer when restrained in restraints specifically designed for their smaller, less mature frames [3]. Queensland legislation prior to March 2010, in line with that of other Australian states, required children to be seated in an approved child restraint, but only specified the type of restraint that must be used for infants aged under 12 months. Legally, this allowed children from 12 months of age to travel in an adult seatbelt rather than in a dedicated child restraint [3].

In response to concern from researchers and road safety organisations that children over 12 months of age are less protected than they could be, the Queensland Government adopted new legislation that acknowledges recent developments in child restraint technology and incorporates recommendations from these advisors. The new legislation, which was introduced in March 2010, specifies the type of restraint suitable for specific age groups and requires rear seating for all children under 7 years of age [4, 5]. For children aged between 0 and 12 months the law did not require any change as these children must still be placed in an approved rear facing infant restraint with a top tether until the child outgrows the restraint, after which time the child is permitted to sit in forward facing child restraint with a 6 point built-in harness and top tether. The 0 to 12 month age group must be seated in the rear of the vehicle [4,5].

However, for children aged between 1 and 7 years, the new legislation requires specific dedicated restraints and rear seating. As of March 2010, children aged between 1 and 4 years are required to use an approved forward facing child restraint with a 6 point built-in harness secured in the rear of the vehicle. Children aged between 4 and 7 years are required to use a booster seat secured either with the adult belt or child harness. These children also have to sit in the rear seat unless all rear seats are occupied by other children under 7 years of age. Parents and children of the 4 to 7 year age group may feel the effects of the new legislation more than any other cohort due to allowing children in this age group to sit in the front of the vehicle and use adult seatbelts, especially once the child reaches school age.

Previous research both in the US [6] and in Australia [7-10] shows that many preschoolers are taken out of child restraints and placed in adult seat belts at ages that are too young for good fit. Correct seat belt fit is not achieved until the child is able to sit against the back of the seat and bend his or her legs over the seat, and requires that the child's height allows the adult belt to sit over the shoulder without touching the neck and across the centre of the sternum [6]. If the seatbelt touches a child's neck, a child is too small to use a seatbelt without any other restraint, such as a booster cushion or belt positioning booster. The use of an adult belt on a young child who weighs less than approximately 36 kilograms or whose height is less than approximately 145 centimetres presents an increased risk of injury in a crash [6, 11-14].

The following observational study was conducted to examine the effect of the announcement of the new legislation (and accompanying media advertising) and the introduction of the legislation on parents' behaviour. Specifically, the interest was in the position in which parents and caregivers sat the children in their care and the types of restraints being used. Estimates of the proportion of children travelling in the front seats or inappropriately restrained were obtained for two regional areas of Queensland.

## Methods

Members of the research team observed children seated in passenger vehicles with rear seats at primary schools and shopping centres in the Queensland regional cities of Toowoomba and Rockhampton. These observations were taken in July to September 2008 before the announcement of the legislation (T1), in November 2009 after the announcement of the legislation but before enactment (T2), and in May 2010 after the enactment of the legislation (T3).

### *Location and site selection*

Toowoomba and Rockhampton were chosen as comparable regional areas of Queensland because they are similar in demographic and population characteristics (eg. population size, both with a sub-population of university students, and clearly definable boundaries). The observation sites were selected on the basis that shopping centres and primary schools would have a higher proportion of cars with child occupants than in other areas. Observers stood at the roadside in moderate to high traffic areas where vehicles needed to slow or stop, which allowed the possibility to see inside each vehicle. These places included drop-off areas, parking lots, traffic lights, and pedestrian crossings. Observers were instructed to remain as unobtrusive as possible and were far enough away from drop-off and pick-up points to have no influence on parents' decisions about children's restraint (children were already in the vehicle when they passed the observer). Different primary schools and shopping centres were visited either in the morning or afternoon of observations to avoid counting the same vehicles more than once. In addition, the same sites were visited no more than once during each data collection phase. Observers were trained to observe and record data in the same way for each phase.

For the purposes of this study, only private passenger vehicles with rear seats were included, so that the normal everyday seating and restraint use patterns of children could be observed. Taxis, buses, commercial vehicles, motorcycles, utilities and all other vehicles without a rear seat were not included in the observations. Given that the observations occurred at primary schools and shopping centres, children were presumed to be under 12 years of age. Observations of children in the 7-12 year age group (although not covered in the legislation) were also taken due to the research interest in restraint choices for this age group as well as younger children. Observations were conducted from July to October 2008, November 2009, and May 2010 between 8.00am and 9.00am and 2.00pm and 3.30pm for primary school sites and 10.00am and 1.00pm for shopping centre sites.

Trained observers recorded the number of children in each vehicle, whether children were seated in the front or the rear of the vehicle, and the type of restraint worn (a rear facing infant restraint, a forward facing child restraint/booster seat, an adult seatbelt, or unrestrained). Judgments were made regarding whether the child was the appropriate size for the type of restraint, but these data are not presented here. In addition, the presence of an adult or teenager in the front passenger seat was also recorded as in most cases this meant a child could not have been placed in the front seat. Though this information was collected for all vehicles with child passengers at each site, for the purpose of this study, the vehicles with an adult in the front passenger seat were removed from the data.

Results

A total of 5832 vehicles containing 7645 children aged approximately 12 years and under were observed. Details of the numbers of vehicles and children at each time period and city are provided in Table 1.

A univariate analysis identified that the average number of children per car varied across cities ( $F(1,5829)=7.4, p<0.01$ ) and across phases ( $F(2,5829)=41.9, p<0.01$ ) and that there was an interaction ( $F(2,5829)=7.4, p<0.01$ ) between these factors. The mean number of children per car was slightly but significantly higher in Toowoomba (1.33) than in Rockhampton (1.29). In addition, the mean number of children per car was greatest at T1 (1.40), followed by T2 (1.35), followed by T3 (1.25). The overall pattern was the same across both cities but the decrease from T1 to T2 appeared to be greater in Rockhampton. Given that the number of children in the car could potentially influence seating position and restraint use, further analyses were stratified according to the number of children in the car.

**Table 1.** Child restraint and seating position in two regional areas of Queensland over three time periods

	T1			T2			T3		
	Rockhampton	Toowoomba	Total	Rockhampton	Toowoomba	Total	Rockhampton	Toowoomba	Total
Number of vehicles	886	1066	1952	822	1059	1881	920	1079	1999
Number of children	1259	1474	2733	1024	1417	2441	1114	1373	2487
% of vehicles with n children	%	%	%	%	%	%	%	%	%
1	65.5	66.4	66.0	77.4	71.0	73.8	81.5	76.6	78.9
2	27.4	29.1	28.3	20.8	24.4	22.8	16.0	21.0	18.7
3	6.7	4.3	5.4	1.7	4.4	3.2	2.4	2.1	2.3
4	0.5	0.2	0.5	0.1	0.2	0.2	0.1	0.3	0.2
% of children in front	29.5	31.8	30.7	22.2	26.5	24.6	21.8	23.1	22.5

*Seating Position*

Overall, 30.7% of children were seated in the front at T1, 24.6% at T2 and 22.5% at T3. The results stratified by number of children in the car are presented in Table 2. The percentage of children who were seated in the front differed significantly by time period when there were one or two children in the vehicle, but not when there were three. The data show a clear reduction in front seating from T1 to T2, but little change from T2 to T3 when there were one or two children in the car. There was little change across time in front seating when there were three or more children in the vehicle.

**Table 2.** Percentage of children seated in the front seat as a function of the number of children in vehicle and time period

Number of children in vehicle	T1	T2	T3	$\chi^2$
1	31.0	23.3	20.3	$\chi^2(2) = 45.404, p < .001$
2	31.1	26.5	26.4	$\chi^2(2) = 7.065, p < .05$
3+	28.6	26.2	27.1	$\chi^2(2) = 0.398, ns$

*Restraint Type*

Table 3 summarises the percentage of children using each restraint type as a function of the number of children in the car and time period. Regardless of the number of children in the car or time period, the most common restraint used was an adult seatbelt. The percentages of children travelling unrestrained varied from 0.7% to 3.2%.

The chi-square values in Table 3 show that the pattern of restraint use varied significantly over time for each number of children in the car. The pattern of the results was somewhat complex. When there was one child in the car, it appears that the announcement of the legislation (T2) increased parents' use of an adult seatbelt to restrain their children, while the enactment (T3) decreased this behaviour to below the baseline level (T1). There was a corresponding change in the use of childseat/boosters for these children, with a drop in use with the announcement (T2) and a rise above baseline levels with enactment (T3).

**Table 3.** Percentage of children using each restraint type as a function of the number of children in vehicle and time period

Restraint Type	T1	T2	T3	$\chi^2$
1 child in vehicle				$\chi^2(8) = 81.022, p < .001$
Rear facing	3.8	1.4	2.8	
Child seat/booster	36.8	32.7	45.0	
Seatbelt	55.1	61.9	47.4	
Unrestrained	2.4	1.4	1.8	
Unknown	1.9	2.6	3.0	
2 children in vehicle				$\chi^2(8) = 70.158, p < .001$
Rear facing	3.0	0.8	0.9	
Child seat/booster	22.1	18.1	20.4	
Seatbelt	70.4	79.0	71.1	
Unrestrained	2.9	0.7	2.1	
Unknown	1.6	1.4	5.4	
3+ children in vehicle				$\chi^2(8) = 21.143, p < .05$
Rear facing	4.7	1.0	0.6	
Child seat/booster	23.0	13.8	21.9	
Seatbelt	67.6	78.5	72.3	
Unrestrained	3.2	2.6	1.9	
Unknown	1.5	4.1	3.2	

When there were two children in the car, a similar increase in the use of adult belts to restrain children occurred with the announcement (T2) but the enactment period appears to have had less impact, with the percentage of children using adult belts returning to baseline levels (rather than decreasing below them). Changes in childseat/booster use reflected this pattern, with the overall percentage of children restrained in this type of restraint initially decreasing but overall there was little change between T1 and T3.

The pattern of results when there were three or more children in the car appears similar to that for two children, with the announcement apparently increasing the use of adult belts for children and the enactment reducing this. However, there were substantially smaller numbers in this analysis and thus patterns may need to be viewed with some caution.

## Discussion

The research showed that the percentage of children seated in the front seat of cars has decreased and that patterns of restraint use have also changed. The results suggest that the announcement of the legislation had a significant impact on parents' seating choices for their children, reducing front seating, and this appears to have changed relatively little with the later enactment of the legislation. Parents seating three or more children in the vehicle did not appear to change their behaviour over the period of the study. However, the initial proportion of children using front seats where there were three or more child passengers was at about the same level as the T3 results for 1 child and 2 child vehicles. This may be partially an artefact of children in the front being necessarily a relatively smaller proportion of all children as the number of children in the car increases.

Overall, it appears that parents in the two cities responded to the legislation announcement and enactment similarly. Both Toowoomba and Rockhampton parents appeared to have changed their choice of seating position of their children after the announcement of the legislation, with results showing a decrease in front seat usage. In addition, both Toowoomba and Rockhampton parents used seat belts more and child seats or boosters less after the announcement of the legislation, then appeared to reverse this pattern once the legislation was enacted.

For the legislation to be effective, we expected that both the announcement of the proposed law and the implementation of the new legislation would have been associated with a significant increase in the proportions of children using both seatbelts (as the unrestrained begin to use a restraint) and child seats/boosters (as a marker of more appropriate restraint). Overall it appears that this may have happened, though not all at once. One explanation for the pattern of results is that the announcement and enactment of the legislation, along with the associated media attention, prompted parents and caregivers to inform themselves about the new requirements. As seating a child in the rear seat requires no additional technology or financial outlay, it is usually very simple for parents to comply. Thus for situations of 1 and 2 child passengers, parents may have moved their previously front seated under-7-year-old children to the rear seat with the announcement, but not altered the type of restraint used (adult seatbelt). It is only with the enactment of the legislation that we see an increase in the use of child seats or boosters. This suggests that parents are sensitive to the content of the legislation. However, it is less clear whether this is due to desire to comply with the wording of the legislation rather than grasp of its underlying intent to guide more appropriate selection of restraint type. In the latter case we might have expected the increase in the use of child seats/boosters to occur at the same time as the increase in rear seating. For parents carrying 3 or more children in the vehicle there is arguably less flexibility in choice of seating positions, particularly if the vehicle is small and younger children are using larger child restraints, and our results probably reflect this restricted choice.

One of the problems for parents dealing with the new legislation is the fact that the law requires children up to 7 years of age to be seated in a dedicated child restraint, but the Australian Standards on child restraints specify their suitability only for children weighing up to 26 kilograms. Thus heavier children technically should not be placed in these child restraints. This could be confusing for parents of heavier children, and may be one reason leading to premature graduation to seatbelts. In addition, the law does not make recommendations for smaller children who should still be in a child restraint even after the age of 7 years, though road safety authorities do stress that children should remain in a restraint until they outgrow it. Despite this problem parents face with the new legislation, it is important to note that it has encouraged parents to be more aware and to inform themselves about their children's safety whilst in the car. We would hope that for some at least this also resulted in raising their awareness of the potential dangers from front seat travel and inappropriate restraint choice. A limitation of this study was that, while we could estimate that a child was under 12 years old, we did not have more accurate information on children's ages in years, which meant we could not determine which restraint was required by legislation for these children. Another limitation was the choice of observation sites. The data shows a higher proportion of child seats/boosters being used at those observation points around shopping centres,

which is likely due to a higher proportion of toddlers and babies travelling to these sites during primary school hours.

Finally, the observational nature of the study meant that we could not determine whether the child restraints used were correctly installed. More than a quarter of respondents in recent US-based research reported that they had driven with a child restraint that was not securely attached, most of whom mentioned as an explanation that they had forgotten or were careless. The researchers noted that while inspection stations were available for parents who were unsure of how to install restraints, only 13% of the parents in the study said they had been to have their child restraint inspected [15]. Australian research suggests that installation errors for some restraint types are common [16-17] and thus this is an important safety factor to consider.

This study has shown that there is a need for further education of parents regarding the new legislation and specific interventions to address front seat usage and the misuse of child restraints as well as continued premature graduation to adult seatbelts. This study forms part of a larger study examining children's restraint use and seating positions in Queensland and further research will examine on parental opinions, views and knowledge of the law to ascertain how the legislation has affected parents' attitudes regarding the safety of children in cars.

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