

Improving the safety of children who use school buses

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Abstract

This paper summarises the results of two research projects on the safety of children that use school buses.

The first project took a "*Safe System*" approach to determine what options are available to improve the safety of the 100,000 children who use school buses. This NZTA funded research included safety both on and around school buses. A number of interventions, and their effectiveness were identified. For example: improvements to bus stops, installing speed limit signs on buses that are activated when children may be crossing, increased enforcement, educational/information campaigns and bus design and management improvements. The research found that the most immediate and cost-effective solution is to slow the traffic around school buses that are dropping off or picking up children.

The second project, funded by the Road Safety Trust, investigated various sign options and their effectiveness in slowing the traffic down. The current legal speed limit near school buses that have stopped to pick up or drop off children is 20 km/h. Currently almost no motorists comply with this speed limit and many appear to be unaware of it. The most effective sign was an active, LED-based, speed limit sign that included flashing beacons. Major reductions in average speeds were achieved, although there was an increase in speed variation.

The results suggest that a combination of active bus signs, public awareness raising and enforcement may be required to achieve compliance with the 20 km/hr speed limit past a school bus.

Key words: School bus, safety, speed, bus stops, signs

1. Introduction

This paper summarises the findings of two studies undertaken by TERNZ into school bus safety.

The first study was initiated by the Bus Safety Technical Advisory Committee (BUSSTAC) and funded by NZTA. BUSSTAC included representatives from the Ministry of Education (as lead organisation), NZ Transport Agency (NZTA), Ministry of Transport, NZ Police, Bus and Coach Association (BCA), bus builders and bus operators. All aspects of school bus safety were considered, including the safety of children while on the bus, when waiting for the bus, and when they are crossing the road to and from the bus.

In the 23 years since 1987, twenty three children have been killed in New Zealand when crossing the road to or from school buses (Baas et al 2010). In addition, 47 have been seriously injured and 92 have received minor injuries³. By comparison, six children were killed while actually on a school bus during that period. Five of those fatalities occurred during a single crash in 1987 when passengers were ejected from the bus and crushed by

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² Rural Women New Zealand

³ It should be noted that, although it is required by law, not all injury accidents are reported. The actual number injured may be higher.

the bus rolling on top of them. That incident resulted in bus and coach strength requirements being introduced.

Clearly most of the fatalities have been when children were crossing the road to and from school buses rather than while on school buses.

Several coroners' reports have recommended immediate action be taken to improve school bus safety (Matenga 2008, Shortland 2009). Many groups, such as Rural Women NZ, the National Council for Women of NZ, the New Zealand Society of Paediatric Surgeons (Collins 2009), Safe Kids, New Zealand Automobile Association, NZ School Trustees Association, local authority Road Safety Coordinators (Robinson 2008) and bus operators (as well as asking for more to be done at a national level) have been trying to do what they can at a local level. There has also been a considerable amount of media attention given to school bus safety.

2. Safety of children crossing the road to or from a school bus

When considering the options to reduce the number of children killed or injured when crossing the road to or from school buses, it must be remembered that children, especially those of primary school age, are poor judges of traffic speed and are often impulsive. A safe system approach to this issue must consider these limitations and the fragility of young pedestrians in such situations.

It is standard health and safety practice to address hazards by eliminating them where possible. If they cannot be eliminated they should be isolated and if they cannot be isolated, they should be minimised. In the context of the safety of children crossing the road to or from school buses, this translates to:

- eliminating the need for students to cross the road
- preventing children from running heedlessly across the road
- minimising the consequences by slowing down the traffic when children are crossing.

2.1.1 Eliminating the need for students to cross the road

The Ministry of Education and their service agents already try to rearrange the bus routes to reduce the number of children who have to cross the road. However doing so is not always practical.

The NZ Police, NZTA, Ministry of Education, schools and community groups have been raising awareness of the need for caregivers to meet their children at the bus stop, including parking on the same side of the road as the bus. Reminding caregivers of their responsibilities is not sufficient on its own because, as many studies have found, convenience plays an important role with perceived risks weighed up against the time and effort required (Lobb 2006). Overcoming this barrier may be difficult and may require engineering measures such as improved parking facilities near bus stops.

Some road authorities have been improving school bus stops as the opportunity arises. A draft bus stop guide was developed (as part of this project) to assist road authorities with upgrading bus stops, especially on major roads in rural areas. An important feature of rural bus stops is the provision of parking for caregivers who are waiting for a bus to arrive.

2.1.2 Preventing children from running heedlessly across the road

Caregivers, bus drivers, schools and other stakeholders have a shared responsibility to do what they can to make sure children cross the road safely. While there have been some questions about the effectiveness of educational and awareness-raising interventions, there are things that can be done that are not difficult or expensive. For example caregivers can be reminded regularly what safe road crossing is and that they need to model it to the children

they are looking after. School community-based initiatives, such as bus wardens and neighbours taking turns to meet the bus should be encouraged. Children should be reminded of the need to take care. The Ministry of Education has produced a fact sheet that explains the responsibilities of all parties, including caregivers, bus drivers and schools.

Improving attitudes to and knowledge of how to cross safely is taught by the NZ Police as part of its road safety education programme.

2.1.3 Minimising the consequences by slowing down traffic when children are crossing

The greatest gains will come from changes to bus routes, better bus stops and other measures that remove the need for children to cross the road. However, funding for engineering solutions and longer bus routes is limited and these will take time to implement. In the absence of these measures, the next most effective approach is to slow the traffic when children need to cross.

In order to be able to slow down the traffic, the legal requirements have been changed to enable more effective enforcement of the 20km/h speed limit when passing school buses that are picking up or dropping off students. This on its own is not sufficient because of the very low awareness of the speed limit.

Awareness can be raised by:

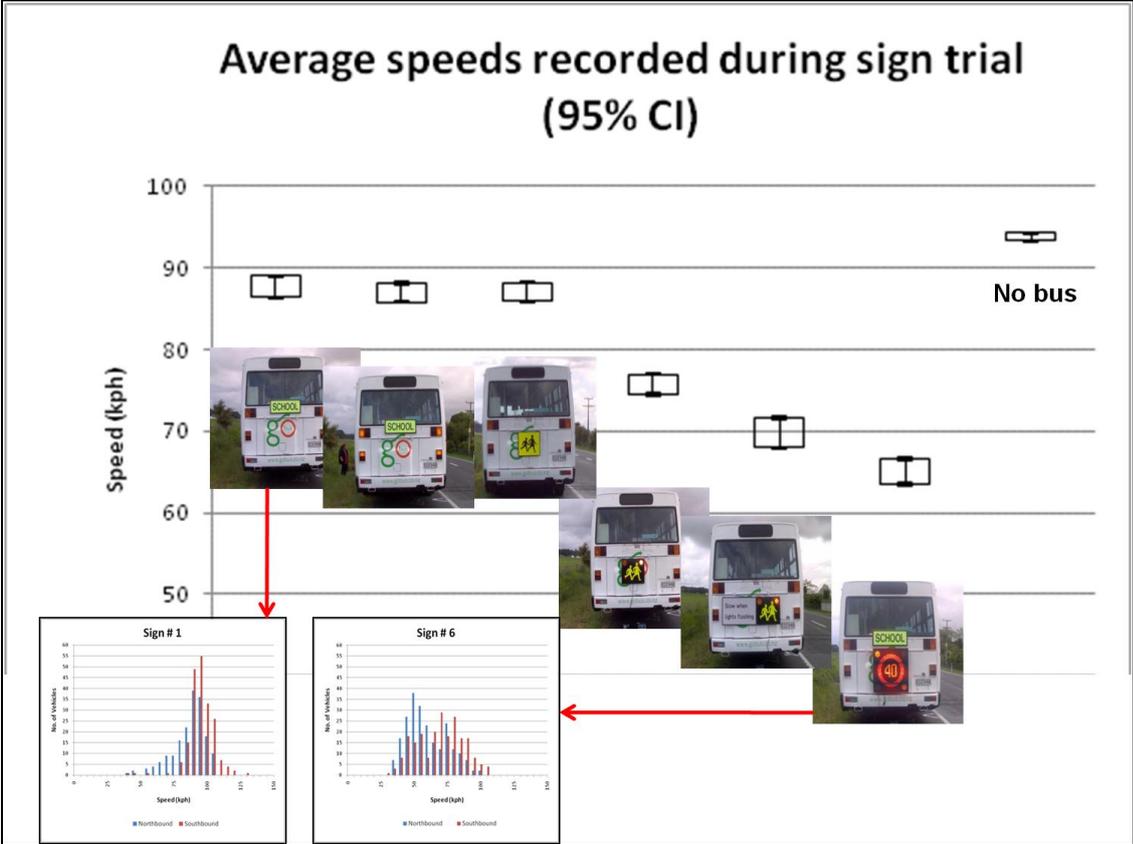
- having active speed signs on the buses that are activated when the buses are at the bus stop.
- undertaking public awareness campaigns. A number of organisations, such as Rural Women New Zealand, SafeKids New Zealand, NZ School Trustees Association, the NZTA, Accident Compensation Corporation and local authority road safety coordinators have put a lot of effort and thought into trying to slow down traffic with billboards and other awareness-raising measures that remind drivers of the legal speed limit when passing a school bus.

A number of different school bus signs were evaluated, including a symbolic children sign with flashing lights and a LED based speed limit sign. Data were collected in three ways:

- a) The effects of different sign designs on passing traffic speed. The signs were mounted on a stationary school-bus outside a school on SH27.
- b) Evaluation of speeds of vehicles travelling past a school bus, using a speed laser gun on actual school bus runs
- c) A perceptions survey of school road safety personnel to further evaluate the potential effectiveness of the four main sign designs.

Overall, the active signs had a significant effect on reducing traffic speed (figure 1 and appendix A-1). However there was also significant variation in speeds, which is of some concern as less homogenous speeds have been linked with a lower level of safety.

Figure 1: Sign trial results (see appendix for more information)



The best performing sign on the rear of the bus in terms of speed reduction was the smaller and more highly placed sign, with illuminated LED roundel, flashing beacons, and accompanying “School” sign (figure 2). A preference for this sign was also shown by the stakeholder perceptions survey. On the front of the bus, the large sign was more effective but may be difficult to fit on many buses because of its size. Subsequent tests evaluated various arrangements of the “20” LED speed limit sign as shown in figure 2.

Figure 2: LED-based sign



Copies of the reports are available on request.

3 The safety of children while travelling on a school bus

The following options were investigated to further improve the safety of school bus passengers:

a) School bus management standards.

Since this research project started, the Ministry of Education has written into their school bus contracts more stringent requirements for the construction and maintenance of school buses. This appears to have been effective as a NZ Police sting operation in the Coromandel Peninsula found that none of the 39 school buses inspected had vehicle safety faults. This excellent level of compliance is very uncommon (BCANZ 2010). It is recommended that the Ministry of Education and the NZTA continue to encourage bus fleet operators to adopt best practice.

b) Occupant protection.

The bus structural strength requirements appear to have been effective in reducing the risk of injury during bus crashes. Further improvements in occupant protection could include having higher seat backs. However, retrofitting older buses with these seats may not be justified because of the high cost per preventable injury.

Conclusions and recommendations

Children are most at risk when crossing the road to and from a school bus rather than when they are on the bus.

The following programme of action is being developed:

- a) An area will be selected for a trial (for example Hawkes Bay)
- b) An awareness campaign will be run in the trial area to raise awareness of the 20km/hr speed limit.
- c) After 2 to 3 months, approximately 50 buses will be fitted with LED-based speed limit signs. Speed and driver behaviour around buses will be monitored when the signs are on. The awareness campaign will continue while the signs are in use for a further 3 months.
- d) Very visible Police speed enforcement will be then be added.

The results will help to determine what the best mix of awareness campaign, bus signs and enforcement is best.

Other measures such as improved bus stops and improved occupant protection are being implemented as the opportunity arises.

Acknowledgments

This research was initiated by the Bus Safety Technical Advisory Committee (BUSSTAC), a government and industry initiative led by the Ministry of Education. BUSSTAC also includes representatives from the Ministry of Transport, NZ Transport Agency (NZTA), NZ Police, Bus and Coach Association (NZ), and bus operators and coach builders. Funding was provided by NZTA and the Road Safety Trust with BUSSTAC acting as the steering group.

The assistance provided by all of the individuals and organisations that assisted with this project is acknowledged and appreciated. They included:

- The members of BUSSTAC
- Assoc Prof Samuel Charlton, University of Waikato

- Kieran Forde, Bernadette Scannell, Margaret Gascoigne, Kirsten Sharman, Joanne Moyer and colleagues at the Ministry of Education
- Go-bus Ltd (for providing a bus, driver, workshop time and other assistance)
- Harding Traffic (for the manufacture and loan of the signs that were evaluated)
- NZ Police (for assistance at the intercept stop and advice)
- ACC (for assistance at the intercept stop and advice)
- Department of Infrastructure, Public Transport Division, Victoria, Australia and ARUP, Melbourne (for approval to use the information in their report as the basis of a New Zealand guide (ARUP 2006)
- Murphy Buses Ltd. (for their advice and access to their buses and drivers)
- Dr Brenda Lobb, University of Auckland
- Mr Michael Cummins, NZTA
- Rural Women NZ

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Appendix: School bus signs evaluated by Baas et al. (2010)

<p>Sign 1. Currently used sign</p>	 The image shows two views of a white school bus. On the left is the front view, featuring a green 'go' logo on the left side of the windshield and a yellow rectangular sign with the word 'SCHOOL' in black capital letters centered below the windshield. On the right is the rear view, showing a similar green 'go' logo on the left side of the rear window and a yellow rectangular sign with the word 'SCHOOL' in black capital letters centered above the rear window. The bus has the license plate 'ECE948' and the website 'www.gobus.co.nz' printed on the rear.
<p>Sign 2. Currently used sign with hazard lights</p>	 This image is identical to the one for Sign 1, showing the front and rear views of the school bus with the 'SCHOOL' sign. In this version, the bus's hazard lights are illuminated, as indicated by the flashing amber lights on the front and rear.
<p>Sign 3. Children crossing sign</p>	 The image shows two views of the same white school bus. On the left is the front view, with a yellow square sign featuring a black silhouette of two children walking across a road, positioned below the windshield. On the right is the rear view, with a similar yellow square sign featuring a black silhouette of two children walking across a road, positioned above the rear window. The bus has the license plate 'ECE948' and the website 'www.gobus.co.nz' printed on the rear.
<p>Sign 4. Children crossing sign with beacons</p>	 This image is identical to the one for Sign 3, showing the front and rear views of the school bus with the children crossing sign. In this version, the sign is illuminated with red beacons, as shown by the glowing red lights around the sign.

The findings of this research showed that the existing “School” sign had little effect on passing traffic speed, nor did the same sign with the hazard lights on or a static ‘children

crossing' symbolic sign. A step change downward in speed came when flashing beacons were added to the children crossing symbolic sign and the most effective sign was an existing 40km/hr school zone sign. This sign was associated with a mean speed of 57 km/hr for traffic on the same side as the bus and 67 km/hr for traffic on the opposite side to the bus.

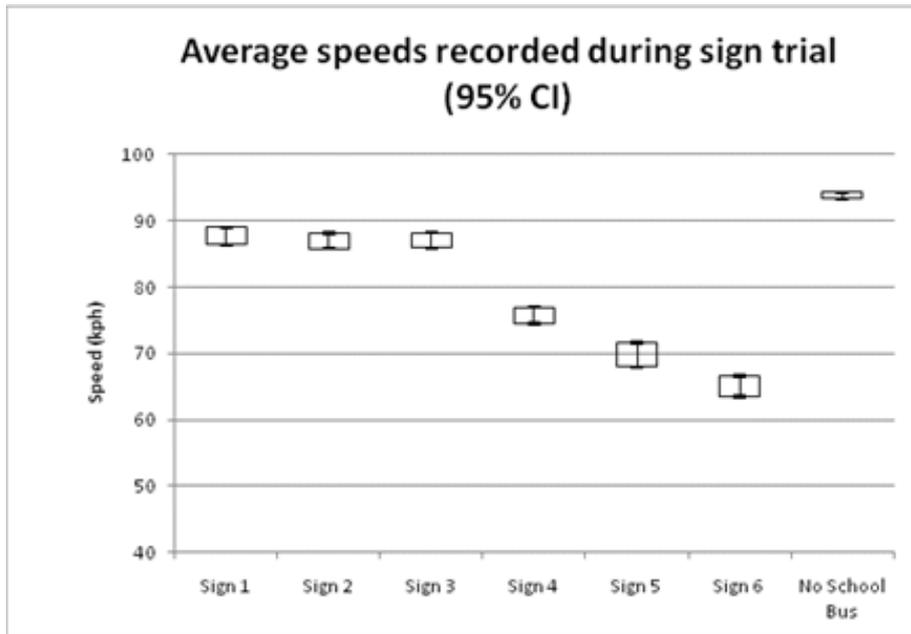


Figure A-1. 95% confidence intervals for mean speed of traffic travelling opposite to the direction of the school bus