

Improving safety for people who cycle on rural roads

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Research has examined how to cost effectively improve safety for people who cycle on low-volume New Zealand rural roads.

Low-volume rural roads are defined as roads in rural areas that are not state highways and that have traffic volumes of 3,000 (or less) vehicles each day.

The safety of these roads for cyclists came under investigation after the Transport Agency became concerned there had been no improvement in the numbers of fatal and serious injuries being sustained by cyclists using rural roads, despite the measures in the Safer Journeys strategy, which was launched in 2010.

Research by a team from Opus Research sought to determine the most cost-effective ways to improve safety for cyclists, and understand the relative risks presented to cyclists by the current range of rural New Zealand road layouts.

Initial investigations included a crash analysis for low-volume rural roads and a literature review. This was followed by on-road trials of the most promising options.

The trials showed no significant difference between data for treated and untreated areas of road for three key performance measures. However, it did enable the team to collect unique baseline data for low-volume rural New Zealand roads. It also clarified the measures that would help make future research in this area more effective, from which the team was able to develop a suite of implementation recommendations.

Preliminary investigations

The crash analysis, completed early on in the project, showed that 354 crashes between cyclists and motorists had been recorded on low-volume rural roads in New Zealand between 2004 and 2013. These crashes resulted in 18 fatalities, 96 severe injuries and 236 minor injuries. The most common crash types were overtaking and rear-end crashes. The crashes carried a large social cost: estimated at over NZ\$161 million for the whole period (or \$16 million per annum).

A review of the international literature revealed a range of potential solutions to enhance the safety of cyclists on rural roads. The Dutch 2-1 solution emerged as arguably the most successful and was chosen, with some other measures, for trial as part of the research.

In essence, the 2-1 solution involves removing the centreline of the road, and replacing it with 1.5m

to 2m-wide cycle edge strips on either side of the road and a single central vehicle lane. A speed limit of 60km/h is set for the area. Threshold treatments to advise motorists they are entering a shared road space include speed limit signs, transverse lines and physical obstacles.

The trials

The research team selected two road treatments for trial:

- advisory signs for motorists on ideal passing distances
- a 2-1 road layout, adapted for New Zealand, combined with sharrows (shared space arrows) road markings on curves and a 60km/h speed limit.

Trial condition visuals



Advisory distance signage 3D image of 2-1 layout Sharrow (shared space arrow)

The treatments were assessed in two 'real-world settings' on a low-volume rural road in the Waipa District that were known to be popular with local cyclists.

Driver behaviour in the treated areas was assessed against three key performance measures:

- approach speed (of passing vehicle)
- passing distance (distance between cyclist to vehicle when overtaking)
- bicycle speed.

Metrocounters were used to collect data about the overall speed of all motorists in the two treated areas, while an integrated suite of bicycle-mounted instrumentation was used to collect data about cyclist and driver behaviour. Baseline data was also collected. Eleven cyclists took part, recruited from local cycling clubs and contacts. Vehicle drivers were the usual motorists using the treated routes during the trial times (as the main purpose was to test how driver behaviour might change).

Results and recommendations

Research team member Maggie Trotter of Opus Research explains that, although the 2-1 component of the treated areas appeared to be intuitive for most drivers and riders, it had to be discontinued 24 hours into the trial.

'We removed this aspect of the treatment in response to safety concerns and public complaints,' says Maggie. 'What this showed us was the importance of incorporating a robust communications and engagement strategy into any future trials of this, or other new or innovative, road designs.'

'We left the sharrows in place, however, so the two treatment options we ended up assessing were the passing distance advisory signs and the sharrows treatment for curves.'

The data collected by the instrumented bikes showed no significant differences between areas treated with advisory signs, areas with sharrow treatments or untreated (baseline) areas for any of the three key performance measures used: vehicle approach speed, passing distance or bicycle speed. The data did reveal, however, that about four in every five drivers across all the areas provided cyclists with the recommended passing distance of 1.5m or more.

The Metrocount data yielded more promising results, indicating that although there was no change in the average free-flowing vehicle speed as a result of the sharrows, there was a 2km/h speed reduction in the advisory sign treatment area.



One of the riders about to go out on site with their bike instrumented as part of the trial.

There was also a large positive speed finding for the 2-1 design area during the day-time, where the design reduced average motorist speeds from about 90km/h to about 62km/h. However, motorists travelling through the area at night were still shown to be travelling at higher than desirable speeds.

Another positive outcome of the research was that the lack of differences between the data collected by the instrumented bikes for the baseline and treatment areas allowed the team to combine the data. The result was a unique set of baseline data for low-volume rural roads in New Zealand. This data is shown in the following table:

Performance measure	Baseline
Average driver approach speed	73.8km/h
Average cyclist speed	23.67km/h
Average driver passing distance	212cm
Driver compliance with 1.5m recommended distance (%)	82%

The project findings also enabled the team to make several recommendations for how future trials could be conducted. This included recommendations for further trials of the 2-1 design to test its application in the New Zealand context; and recommendations about the community consultation, communications and engagement that should accompany these and other trials.

Another recommendation related to the use of advisory distance signs as part of a suite of measures to improve the safety of cyclists on rural roads. 'These signs have been shown to lead to a significant reduction in vehicle speed (a speed reduction that has the potential to benefit the safety of all road users)' the team conclude in their research report.

Other recommendations related to the desirability of developing standardised advisory signs 'to encourage desirable overtaking behaviour when passing cyclists'; and collection of robust baseline data about how drivers and cyclists interact in different settings and road hierarchies, which could then be used to 'better inform and monitor safety intervention outcomes'.