Calibrating Infrastructure Risk Rating (IRR) to Inform Speed Management in Queensland

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Abstract

Infrastructure Risk Rating (IRR) is a road assessment methodology designed to assess road safety risk, primarily as an input to the speed management process. It is one of the attributes underpinning the framework in NZ Transport Agency's Speed Management Guide and has been applied nationwide in New Zealand. As part of reviewing their speed management guidelines, the Department of Transport and Main Roads were keen to test IRR on Queensland roads. This paper presents the results of applying IRR on various road environments in Queensland with the aim of developing a single IRR model that is calibrated for all roads.

Background

In 2017, the Department of Transport and Main Roads started a review of the method for determining an appropriate speed limit specified in the Manual of Traffic Control Devices (MUTCD) Part 4 Speed Controls. The intention of this review is to identify a speed management method that supports the implementation of speed limits that are more aligned with the Safe System framework underpinning Queensland's Road Safety Strategy 2015-21.

As part of this review, TMR were keen to understand the effectiveness of Infrastructure Risk Rating (IRR) on Queensland roads in a speed limit setting context. IRR is a road assessment methodology developed in New Zealand to assess road safety risk based on infrastructure elements and interactions with surrounding land use, independent of crash history (Waibl et al., 2016). It is a significant input to the framework in NZ Transport Agency's Speed Management Guide and has been applied nationwide in New Zealand (Durdin et al., 2016).

The testing and calibration of IRR on Queensland roads involved the application of the methodology on:

- A sample of Queensland's state-controlled network (12,635 km),
- The Rockhampton network (577 km), and
- The Logan network (1,527 km).

Methodology

IRR assessment involves the input of the following road and roadside attributes: road stereotype, land use, carriageway width, horizontal alignment, roadside hazards, intersection density, access density and traffic volume. A category-based risk score is assigned to each attribute which then feeds into the IRR equation resulting in an overall risk score and rating for the road (Waibl et al., 2016).

The effectiveness of IRR on Queensland roads was evaluated by comparing the correlation between IRR and actual safety performance. The calibration process involved identifying modifications to the New Zealand IRR model to make it suitable for Queensland roads. This was an iterative process with the aim of achieving the highest correlation between IRR and actual safety performance for all three networks.

Modifications

Application of IRR on Queensland roads identified several modifications to the New Zealand IRR model to calibrate it for Queensland roads. These modifications were identified with a view of developing a single IRR model for all Queensland roads.

The traffic volume attribute was removed from the urban IRR model. This attribute is used to account for exposure to multi-vehicle conflicts. However, the Logan network results suggested that the link between traffic volumes and head-on crashes observed on rural roads does not apply on urban roads.

A slight modification was made to the alignment category score. The risk score associated with 'curved' alignment was changed from 1.8 to 1.5. This change suggests a lower crash rate on curves in Queensland compared to New Zealand.

Results

A comparison of the calibrated IRR model with fatal and serious injury (FSi) rates for the sample of Queensland's state-controlled network is shown in Figure 1.

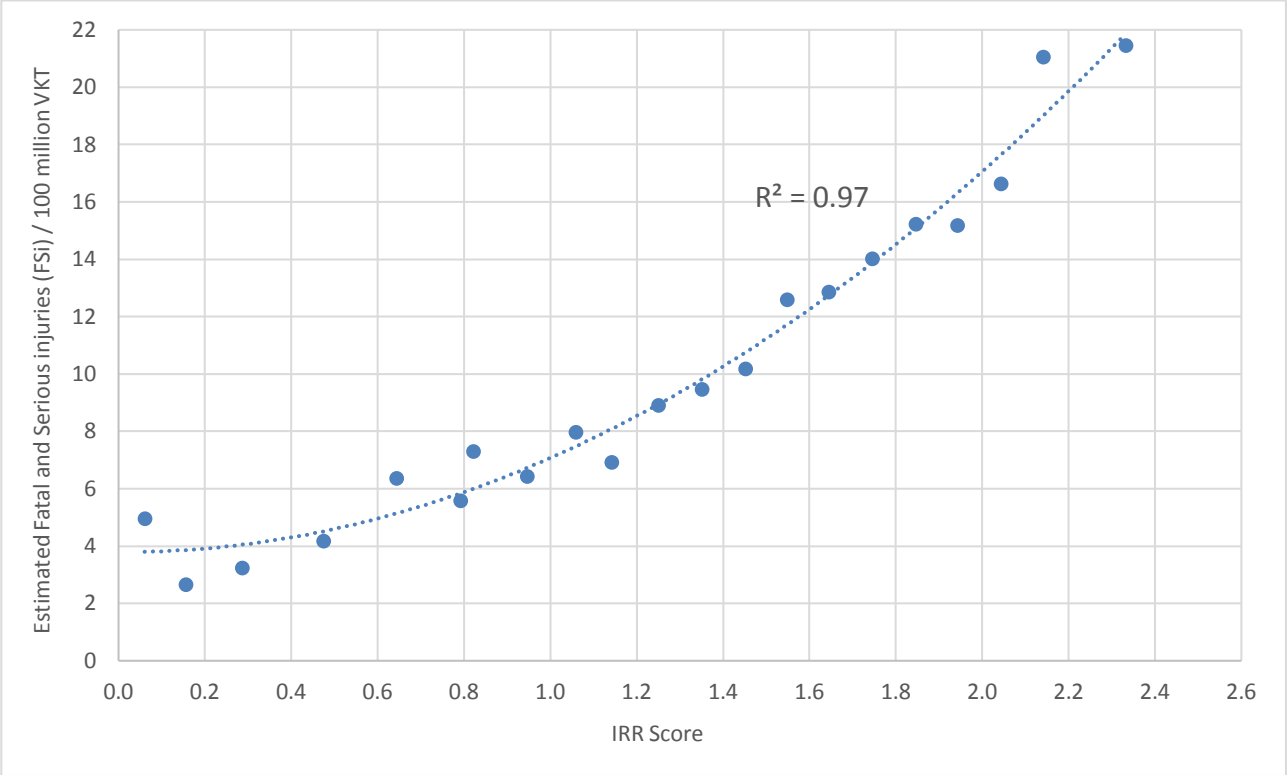

Figure 1. Comparison of IRR with FSi Rate – State-Controlled Network Sample

Across most of the 21 data bins, FSi rates increase as the IRR scores increase. This strong correlation validates the suitability of the model for Queensland roads. Following this result, TMR have incorporated IRR to their speed limit setting process.

References

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