Calibrating Infrastructure Risk Rating (IRR) for Victorian Roads

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Abstract

IRR, developed in New Zealand, is a simplified-risk based road assessment methodology, based on fewer features than other road risk tools – requiring the input of only ten key road variables. Although early days, IRR seems to perform as well as more complicated, proprietary, road risk tools.

Safe System Solutions Pty Ltd is undertaking a project that involves calibrating New Zealand's IRR by correlating the IRR rating for Victorian roads against real world crashes so as to understand and quantify the strength of the relationship between crash rates and risk as assessed by IRR.

Background

Road and roadside characteristics are a factor in the number of fatalities and serious injuries. Australian and New Zealand road safety engineers developed many tools to quantify the crash risk of existing or proposed roads: the Australian National Risk Assessment Model (ANRAM), the Australian and New Zealand Road Assessment Programs (AusRAP/KiwiRAP), the international Road Assessment Program (iRAP) and New Zealand's Infrastructure Risk Rating tool (IRR) all produce either risk scores or star ratings for road segments.

IRR, a simplified risk-based road assessment methodology, is based on fewer features than other road risk tools – requiring input of only ten road variables (Zia et al., 2016). It outputs ratings over homogeneous road lengths, and can use readily available imagery from Google Earth or Google Maps.

This study seeks to verify the applicability of the infrastructure risk rating (IRR) model on rural Victorian roads by examining the relationship between the IRR model's scores and historical crashes.

Method

IRR scoring is based on input of ten variables to determine nine road features: Road stereotype; Carriageway width; Land Use; Access Density; Speed; Alignment; Roadside Hazard Risk (Left and right side assessed separately and averaged.); Intersection Density; Traffic Volume.

Results

This paper presents the results of Safe System Solutions Pty Ltd's project that involves calibrating New Zealand's IRR by correlating the IRR rating for Victorian roads against real world crashes so as to understand and quantify the strength of the relationship between crash rates and risk as assessed by IRR.

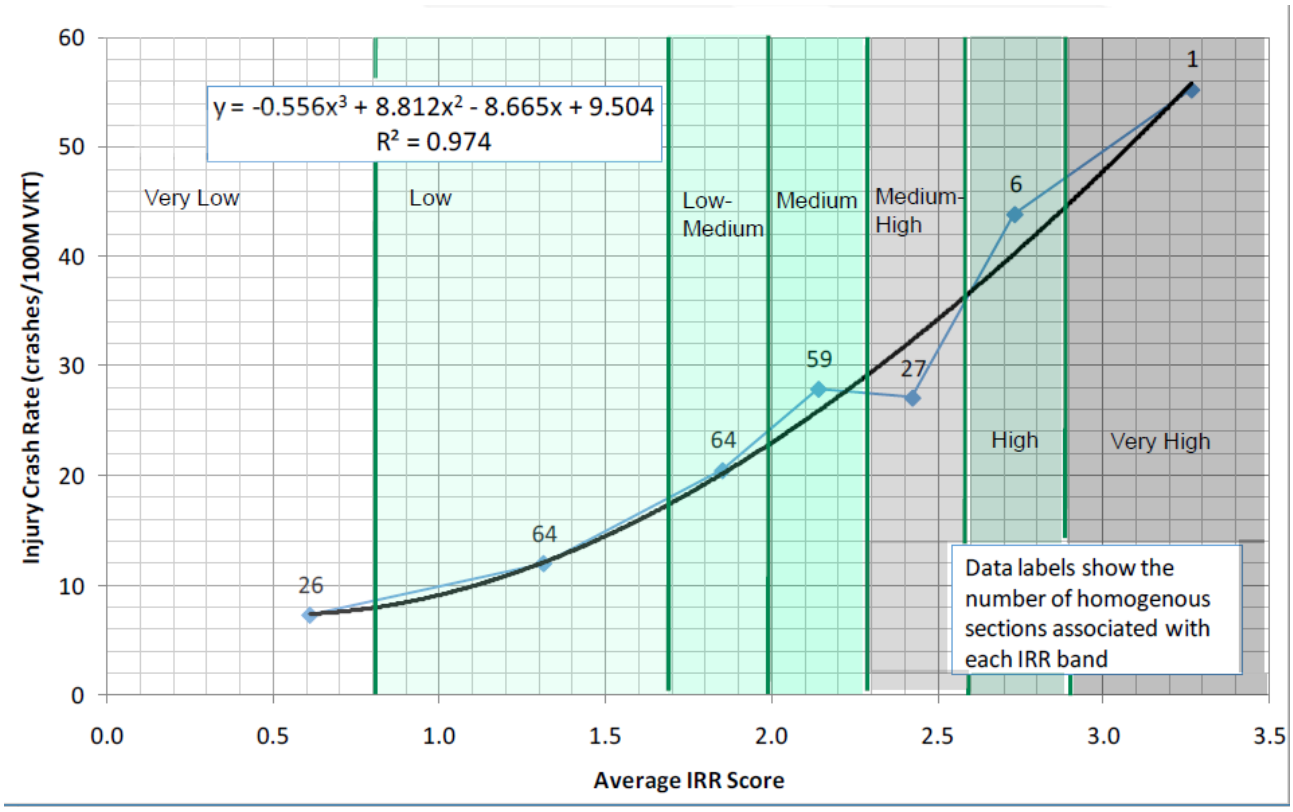

Figure 1. Scatter plot of IRR score against the Injury Crash Rate indicates good correlation on New Zealand roads (Tate, 2015)

Work undertaken in New Zealand (Tate, 2015) shows that IRR correlates with the outputs of more complicated road risk assessment programs such as KiwiRAP. Tate (2015) also shows that IRR is a good predictor of risk in relation to New Zealand roads. He fitted a cubic polynomial to the results of Table 1 ($r^2 = 0.974$) to link crash rate and IRR score (Figure 1).

A similar analysis for 40 Victorian roads for which crash data was readily available is given in Table 1. Roads with zero fatal and serious injury (FSI) crashes have been excluded from the Table.

Comparing the results of Figure 1 and Table 1 indicates that New Zealand roads cover a much greater range of IRR values. No Victorian road that was analysed had an IRR of greater than 1.8. Furthermore, the road with an IRR value of 1.8 (Darlimura Road) had no crashes and was thus excluded from analysis in Table 1. Whether this is a statistical aberration, or whether this indicates Victorian success in road improvement and road toll reduction, needs further examination.

Table 1. Comparison of Injury Crash Rate and Average IRR Scores for Victorian Roads

Number of Victorian Roads used in analysis	Fatal and Serious Injury Crash Rate (FSI Crashes per 100 MVKT)	Average IRR Score of the roads	Road Risk Rating Based on Crash Rate range given in paretheses
3	1.24	0.97	Very Low (0-2.5)
5	3.98	1.04	Low (2.5-5)
4	6.43	1.11	Low-Medium (5-7.5)
7	9.47	1.15	Medium (7.5-12.5)
10	26.43	1.28	Medium-High (>12.5)

Conclusions

The outcomes of this project to calibrate IRR for Victorian roads demonstrate a measure of agreement, at a broad-scale, between the New Zealand results and the Victorian results. The next step will be to develop a Victorian IRR tool for road safety practitioners to assess the risk of their road. This project may also include the production of an App and/or web based application.

Acknowledgements

The IRR model was developed as part of a collaborative process in New Zealand. We acknowledge the following for the development and testing of the model:

- Colin Brodie & Fergus Tate, New Zealand Transport Agency
- Paul Durdin, Haris Zia, Dale Harris, Abley Transportation
- Shane Turner, MWH
- Gina Waibl, Gina Waibl Consulting

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