A Fresh Approach for Prioritising and Treating High Risk Curves

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Abstract

The Centre for Road Safety at Transport for NSW sought guidance on focussed implementation methods to decrease the number of fatal and serious crashes occurring outside of metropolitan areas on high speed roads, especially on curves. A geospatial method based on the Austroads Operating Speed Model was used to identify out-of-context curves on 37,000 km of State and Regional rural roads in NSW. Road corridors were then prioritised for treatment based on the crash record at curves along each corridor. A treatment hierarchy was also developed to ensure that a standardised approach was applied when assessing corridors for safety improvements.

Background

Following a gradual reduction in the New South Wales (NSW) road toll from January 2011 through to March 2015, the road toll increased sharply the following year. The increasing road toll was naturally of serious concern and the Centre for Road Safety at Transport for NSW urgently sought guidance on focussed implementation methods to reverse the trend. One of the identified focus areas was reducing the number of fatal and serious crashes occurring outside of metropolitan areas on high speed roads, especially on curves. To address this focus, a strategy for prioritising and treating high risk curves was devised.

Methodology

Vehicle Speed Model and Identification of High Risk Curves

The Austroads (2009) Operating Speed Model for rural roads was used to identify out-of-context curves using a geospatial based methodology (Haris et al, 2015). A curve is considered out-of-context if a typical driver must decelerate significantly to negotiate a curve at a safe speed. For this reason, out-of-context curves (OoCCs) are at a higher risk of being the location of loss-of-control crashes.

Prioritising High Risk Curves for Treatment

Rather than simply prioritising individual curves for safety interventions, prioritisation was carried out at a corridor level to ensure consistency from a driver's perspective. Corridors were prioritised based on the number of injury crashes occurring on OoCCs (Out-of-Context Curve Risk) and the number of injury crashes occurring on all curves normalised for traffic volume (Overall Curve Risk). The first metric is a good proxy for the number of crashes that can be targeted if OoCCs along a section are improved to a higher standard. The second metric is useful as it filters out roads which have a high number of crashes relative to the number of curves, but a low crash rate considering the number of vehicles traversing the section. Low crash rates indicate that safety improvements may not provide much safety benefit when compared to sections with high crash rates. Corridors were prioritised into five priority bands based on the two metrics described in this section (Table 1).

Table 1: Combined metric calculation

		Out-of-Context Curve Risk				
		LOW	LOW MEDIUM	MEDIUM	MEDIUM HIGH	HIGH
Overall Curve Risk	HIGH	MEDIUM	MEDIUM HIGH	MEDIUM HIGH	HIGH	HIGH
	MEDIUM HIGH	MEDIUM	MEDIUM	MEDIUM HIGH	MEDIUM HIGH	HIGH
	MEDIUM	LOW MEDIUM	MEDIUM	MEDIUM	MEDIUM HIGH	MEDIUM HIGH
	LOW MEDIUM	LOW MEDIUM	LOW MEDIUM	MEDIUM	MEDIUM	MEDIUM HIGH
	LOW	LOW	LOW MEDIUM	LOW MEDIUM	MEDIUM	MEDIUM

Results

Figure 1 shows that corridors classified as HIGH had 2.5 times the rate of loss-of-control injury crashes compared to sections classified as MEDIUM HIGH and ninety times the rate compared to sections classified as LOW when normalised by traffic exposure. These results show that the prioritisation process is highly effective for targeting crash risk on curves.

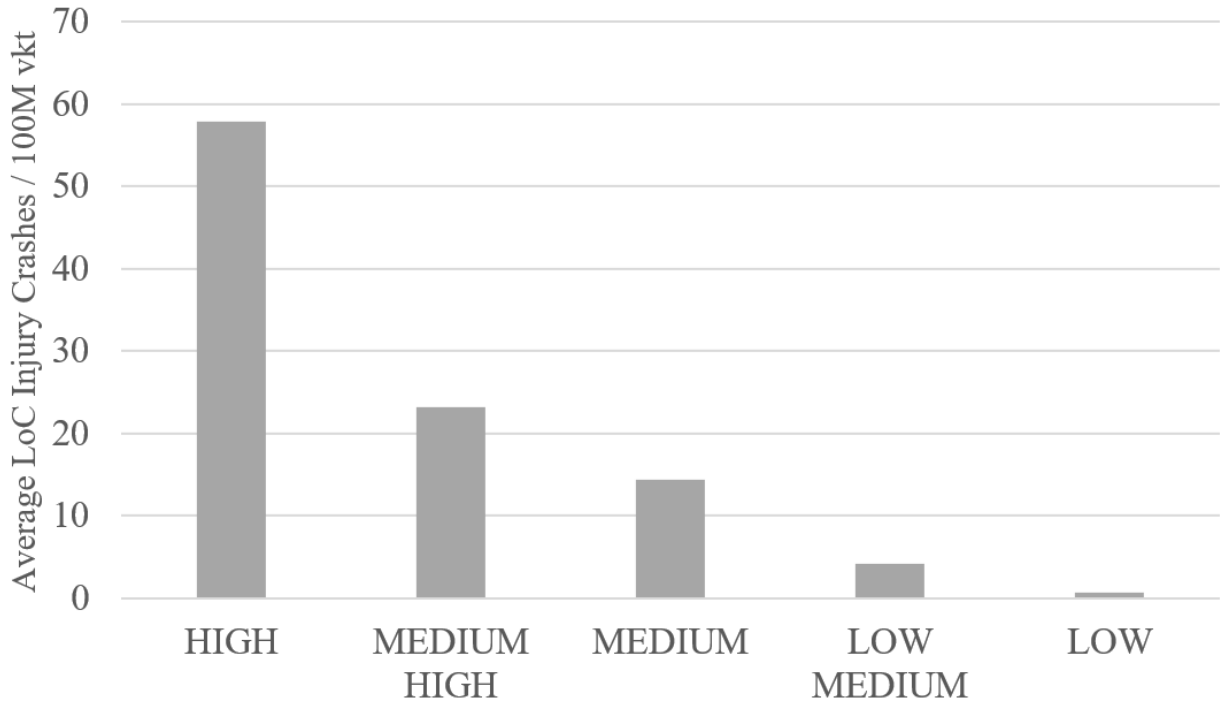

Figure 1. Average loss-of-control injury crashes per 100 million vehicle kilometres travelled in each priority band

High Risk Curve Treatment Hierarchy

Following prioritisation, a 'treatment hierarchy' was developed for assessing individual curves within corridors for safety improvements. The treatment hierarchy was developed to ensure that a standardised approach was applied to all identified high-risk curves when deciding upon appropriate treatments.

Conclusion

The high-risk curve prioritisation and treatment hierarchy represents an innovative and consistent approach to rural curve safety and will be of interest to everyone involved with the targeted identification, prioritisation and funding of curve safety improvements.

References

Austroads (2009). Guide to Road Design Part 3: Geometric Design. Sydney, NSW, Australia: Austroads Incorporated

Harris, D., Durdin, P. (2015). Developing a risk prediction model for a safe system signature project. Paper presented at the IPENZ Transportation Group Conference 2015, Christchurch.