Identification of High Risk Metropolitan Intersection Sites in Perth Metropolitan Area

Kyle Chow[a], Michelle Hobday[a], Lynn Meuleners[a], Fritha Argus[b], Tony Radalj[b]

[a]Curtin-Monash Accident Research Centre, Curtin University

[b]Main Roads Western Australia

Abstract

Because of the greater crash risk at intersections compared to the rest of the road network, it is important to prioritise intersections for safety improvements. A three-stage approach was used to identify these intersections: Road Trauma Risk Analysis, then Comparative Safety Performance Analysis and finally ranking the intersections by the KSI (killed and serious injury) metric. The results ascertained the high risk intersections for each intersection type (by speed environment and control type). Extensions to this process are recommended to improve high risk intersection identification, and the use of a taxonomy to identify candidate treatments.

Background

In 2009, the Government of Western Australia adopted the Towards Zero strategy (Office of Road Safety, 2009), based on the Safe Systems approach to road safety (Corben, Logan, Fanciulli, Farley, & Cameron, 2010). The WA Safe System Matrix was created to set identify road safety initiatives in line with the Safe Systems paradigm. In metropolitan Perth, one of these initiatives was the "Safe System intersection transformation" (Langford, 2009), targeting the higher crash risk at metropolitan intersections. This study aimed to use a three-stage approach (outlined below), accounting for both personal risk and collective risk, to prioritise intersections with a high crash risk for infrastructure improvements.

Method

A retrospective population-based study was undertaken, using crash data from the Integrated Road Information System (IRIS) on intersections which reported at least one casualty crash in the Perth metropolitan area from 2011 to 2015. Traffic volume data was obtained from Main Roads Western Australia. Selected intersections were grouped by: i) Speed environment: built-up, open or low-speed; and ii) Traffic control type: traffic signal; roundabout; or no traffic signal, creating nine intersection types.

Each intersection type was assessed using the Road Trauma Risk Analysis. This methodology compared crash density (a count of killed and serious injury crashes plus factored-up medical crashes, i.e., KSI metric) to crash rate (KSI metric divided by product of flow, measuring exposure to traffic at intersections) for each intersection. Based on this, each intersection was allocated to one of four quadrants: black (highest risk), red, orange and green (lowest risk). The high risk intersections were further analysed using the Comparative Safety Performance Analysis. This methodology compared the performance of each intersection to intersections of the same type by KSI metric, ranking each into a category from I (most safe intersections) to V (least safe intersections). Finally, the identified high risk intersections were ranked by the KSI metric.

Results

Most intersections which reported at least one casualty crash in the Perth metropolitan area fell into three intersection types: i) intersections in the built-up speed environment, with traffic signals

(n=310), ii) intersections in the built-up speed environment without traffic signals (n=425), and iii) intersections in the open speed environment without traffic signals (n=135). The majority of intersections in black road trauma risk level were in the built-up speed environment and had traffic signals (n=52). The top-ranked intersection in this category also had the highest KSI metric across all intersection types. Intersections with roundabouts in all speed environments had the lowest number of casualty intersections (n=42) and lowest KSI metrics of all intersection types.

Conclusions

The three-stage approach used in this study provides a method of prioritising high risk intersections by intersection type. The results from the analyses can be used to target the highest crash risk intersections for safety treatments. Recommendations from this study include performing the analyses by crash type, as well as by speed environment and traffic control, and use of Devlin and colleagues' (Devlin, Candappa, Corben, & Logan, 2011) taxonomy to allocate treatments to high risk intersections.

References

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