

iRAP Road Attribute Risk Factors

School Zone Warning



This factsheet describes the road attribute risk factors used in the iRAP methodology for School Zone Warning. The fact sheet covers the range of advance warning provided for schools.

About road attribute risk factors

Road attribute risk factors, sometimes called crash modification factors (CMF), are used in the iRAP Star Rating methodology to relate road attributes and crash rates. Risk factors (or CMF) are described by the Crash Modification Factor Clearing House as follows:

A crash modification factor (CMF) is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site.

For example, an intersection is experiencing 100 angle crashes and 500 rear-end crashes per year. If you apply a countermeasure that has a CMF of 0.80 for angle crashes, then you can expect to see 80 angle crashes per year following the implementation of the countermeasure ($100 \times 0.80 = 80$). If the same countermeasure also has a CMF of 1.10 for rear-end crashes, then you would also expect to also see 550 rear-end crashes per year following the countermeasure ($500 \times 1.10 = 550$).

Related documents

This factsheet should be read in conjunction with:

- iRAP Methodology Fact Sheets (<http://irap.org/about-irap-3/methodology>).
- Star Rating and Investment Plan Coding Manual (<http://irap.org/about-irap-3/specifications>).
- Road Safety Toolkit (<http://toolkit.irap.org>).

Risk factors

Risk factors by road attribute category, road user type and crash type

School Zone Warning	Pedestrian			
	Crossing Through Road	Crossing Side Road	Along – Driver Side	Along – Passenger Side
School zone flashing beacons	0.90	0.90	0.90	0.90
School zone static signs or road markings	0.95	0.95	0.95	0.95
No school zone warning	1.00	1.00	1.00	1.00
Not applicable (no school at the location)	1.00	1.00	1.00	1.00

Selection of risk factors

The University of North Carolina (UNC) Highway Safety Research Center was commissioned to undertake a detailed review of the iRAP pedestrian model and provide summary research and recommendations on the risk factors appropriate for the pedestrian Star Rating to reflect the needs, and effective interventions, at schools (refer to the *Star Rating for Schools* methodology fact sheet for more information). Key findings include:

- School Zone “25 mph When Flashing” devices have been found to reduce average vehicle speeds significantly during flashing periods.
- School Zone High-visibility crosswalks have been shown to significantly reduce collisions.

The full research on pedestrian safety by UNC Highway Safety Research Center has been documented in a study for the FHWA, titled *Evaluation of Pedestrian-Related Roadway Measures: A Summary of Available Research* (Mead, Zegeer, Bushell, 2013).

The availability of definitive evidence based research near school zones is made difficult with relatively low crash rates in and around school zones, poor crash data and/or the ability to undertake acceptable control studies. In consultation with the Highway Safety Research Centre pedestrian experts the following details were considered:

- A single study from 1978 indicated the use of flashing beacons resulted in average travel speeds 3.6 mi/h (5.8 km/h) lower than when the flashing beacons were not in operation. Based on the existing iRAP speed model for pedestrian risk (based on existing speeds between 55 and 70 km/h), this would suggest a maximum reduction in risk of 20-30%.
- School zone warnings impact all pedestrian component scores – that is pedestrians crossing the through road, crossing any side roads and moving along the road. It is noted that the reduction in ‘along risk’ may be less if footpaths are present and effective. In this case the along risk score will be very low in any case and therefore inclusion in all pedestrian crash types was recommended.
- As the iRAP Star Rating is based on 85th percentile speeds, any changes to travel speeds will impact the Star Rating directly. School zone signage will alert drivers to the presence of the school and children at the location. Therefore, this factor is included in addition to the speed measurements – with specific advice on where speed measurements are undertaken to ensure no localised signage impacts on point speeds.
- The enhanced signing at a school provides an advantage / benefit over and above pedestrian movements at all other locations. To ensure validity the of existing Star Ratings completed prior to the addition of the school specific attributes, it was recommended that when there is no signage recorded as a base risk factor of 1.0 is used – and enhanced school signage helps reduce risk scores.
- If required in the future, a pedestrian-type risk factor can be added to reflect any future research that quantifies the additional risk that young pedestrians face in school zones or in other areas where children walk.
- For the purpose of the iRAP model, it is assumed that schools signage and marking create a benefit for the full length of the school zone. This requires the start and end of the school zone to be recorded and any section of road in between is considered to benefit from the signage and marking present.
- A further assumption is that the signage and marking will not impact scores or safety on other surrounding roads around the school outside of the official school zone.

With the absence of definitive research in the area, the UNC Highway Safety Research Centre expert group agreed on the attribute descriptions and risk factors for schools warning zones taking into account the issues highlighted above. With operating speed accounted for in the model separately, the independent impact of school zone warnings have been reduced from the one available study. The expert consensus was to adopt a 10% reduction (or CMF of 0.90) for *school zone flashing beacons*. The use of *school zone static signs or road markings* was deemed to be half as effective as the flashing beacons and the 5% reduction (or CMF of 0.95) adopted.

Further evidence based research in the area of pedestrian safety and school zones is encouraged. Contact iRAP at icanhelp@irap.org if you are interested in conducting research in this area and where permitted iRAP data and results can be made available to support the research activity.

School Zone Warning was not included in previous editions of the iRAP methodology

Primary references

The following publications are the primary references used in the selection of the iRAP road attribute risk factors. A complete list of citations is available in: *iRAP Road Attribute Risk Factors: Full Reference List*.

Elvik, R, Høy, A., Vaa, T, and Sørensen, M. (2009). *The Handbook of Road Safety Measures*, Second Edition (2009) Emerald Group Publishing Limited. ISBN 978-1-84855-250-0.

Lynam, D (2012). *Development of Risk Models for the Road Assessment Programme*. RAP504.12 and TRL Report CPR1293, Published by iRAP and TRL and available at: <http://www.trl.co.uk> and at <http://www.irap.org>.

Mak, K. and Sicking, D. (2003). *Roadside Safety Analysis Program – Engineer’s Manual*. Transportation Research Board (TRB) National Cooperative Highway Research Program (NCHRP) Report 492. ISBN 0-309-06812-6.

Turner, B. Steinmetz, L., Lim, A. and Walsh, K. (2012). *Effectiveness of Road Safety Engineering Treatments*. AP-R422-12. Austroads Project No: ST1571.

Turner, B., Affum, J., Tziotis, M. and Jurewicz, C. (2009). *Review of iRAP Risk Parameters*. ARRB Group Contract Report for iRAP.

Turner, B., Imberger, K., Roper, P., Pyta, V. and McLean, J. (2010). *Road Safety Engineering Risk Assessment Part 6: Crash Reduction Factors*. Austroads AP-T151/10. ISBN 978-1-921709-11-1.

University of North Carolina Highway Safety Research Center and U.S. Department of Transportation Federal Highway Administration (2013). *Crash Modification Factors Clearing House*: <http://www.cmfclearinghouse.org/>.

23 February 2013. © International Road Assessment Programme (iRAP), 2013.