

iRAP Road Attribute Risk Factors

Street Lighting



This factsheet describes the road attribute risk factors used in the iRAP methodology for Street Lighting. Street Lighting records the presence of lighting that is sufficient to provide illumination for vehicle occupants, motorcyclists, pedestrians and bicyclists.

About risk factors

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:

- *Star Rating Roads for Safety: The iRAP Methodology.*
- *Safer Roads Investment Plans: The iRAP Methodology.*
- *Star Rating and Investment Plan Coding Manual.*
- *Road Safety Toolkit (<http://toolkit.irap.org>).*

Risk factors

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

Street Lighting	Vehicle occupant and motorcyclist intersection	Pedestrian along and crossing	Bicyclist run-off and intersection
Present	1.0	1.0	1.0
Not present	1.15	1.25	1.25
Not applicable	1.0	1.0	1.0

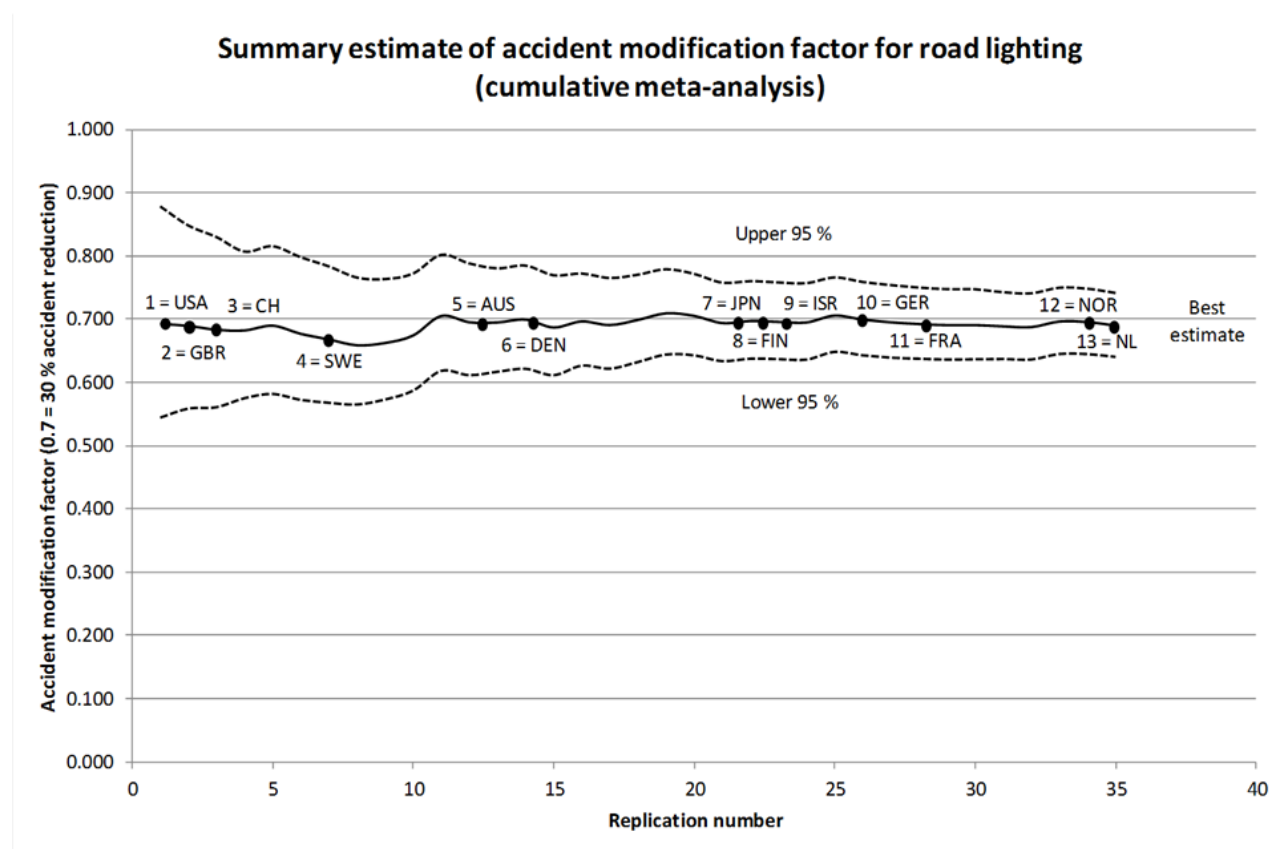
Selection of risk factors

This subject was reviewed extensively by Turner et al. (2012). They report medium confidence in an overall reduction of 35% in night-time crashes for installing new lighting where no lighting was present, based on eight studies. Such crashes may represent 30-50% of all crashes.

Turner et al. (2012) report no robust information on the differential effect of street lighting during the day and night and so no information has been provided on this, although the authors comment that, as would be expected, some of the research provides indications that the effect for both day and night combined is less than the effect for night-time alone. They also comment that various studies provided information on the expected crash reduction for different crash types (for example, rear-end crashes) and severity (for example, fatal) but that confidence is low in these results because generally there has only been one study on each. The risk factors for pedestrians are those used in the Australian Road Safety Risk Manager (RSRM). The benefits for pedestrians and cyclists are considered to be greater than for vehicle occupants and motorcycle riders.

A search of the Crash Modification Factor Clearing House (12 July 2012) found 51 studies (31 involving severe injury) with an average CMF of around 0.65 (and 0.35 for studies involving pedestrians). Many of the studies quoted by CMF Clearinghouse were already considered by Turner et al. (2009).

The figure below was presented by the OECD (2012) and indicates an accident reduction of around 30%, with narrowing confidence limits.



Note that because iRAP surveys are carried out during daylight it is not possible to verify the effectiveness of lighting installations.

Having considered these results, and the comments on the percentage of overall accidents affected by improved lighting, RAP has opted for risk factors of 1.15 (vehicle occupants and motorcyclists at intersections) and 1.25 for pedestrians and cyclists.

Background research and model development

Street Lighting was not included in previous editions of the iRAP methodology.

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. 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>.
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- 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/>.