

# Road Safety Information

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## Street Lighting and Road Safety

Street lighting provides a number of important benefits. It can be used to promote security in urban areas and to increase quality of life by artificially extending the hours in which it is light so that activity can take place. Street lighting also improves safety for drivers, riders, and pedestrians.

Driving outside of daylight hours results in higher risk – only a quarter of all travel by car drivers is between the hours of 7pm and 8am, yet this period accounts for 40% of fatal and serious injuries to the same group.<sup>1</sup> Pedestrians and vulnerable road users suffer from decreased visibility in the dark too. For these reasons, ways of reducing the risk to all road users during the hours of darkness must be found.

A study for the Department for Transport<sup>2</sup> in 2003 found that road safety was perceived as a key benefit for street lighting improvement. In the study, 73% of respondents agreed that 'better street lighting would improve the safety of children, and 63.8% agreed that 'improved street lighting would lead to fewer accidents on the roads'.

Since this study, there has been a trend to either switch off or dim street lighting. A study<sup>3</sup> led by researchers from the London school of Hygiene and Tropical Medicine was carried out in 2015 to assess the impact of this practice. Researchers analysed 14 years of data from 62 local authorities who had implemented light reducing measures including reducing the number of lights switched on, dimming lights and LED lamp upgrades. To assess the road safety implications all roads in the participating authorities were examined, looking at the lighting used and the number of traffic collisions that happened at night relative to the day between 2000-13. The study concluded that there was no evidence of an association between reduced lighting and night-time collisions across England and Wales.

A further study<sup>4</sup> undertaken by the same academic body in 2015 provides an insight in to the public's perception of the importance of street lighting. This research looked at the determinants of health and wellbeing in relation to switching off and dimming of street lighting. Eight local authorities that had carried out, or were planning, a range of reduced lighting measures at night were chosen for the study. Qualitative data analysis was undertaken with residents' views being collected through interviews, transcripts, field notes, documentary data and open comments on questionnaires.

The report concluded that in a random sample of the population in affected and non-affected streets, there was little evidence that the introduction of part-night lighting had made significant differences to wellbeing, except in residents' feelings of personal security, even where there were strongly held views or anxieties few reported direct impacts on outcomes such as mobility.

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As well as the public perception that better lighting improves safety, earlier research that compares the quality of road lighting with accident reduction, found that it improves safety. Before and after studies have indicated reductions in collisions of around 30% or more where lighting has been improved.<sup>5</sup>

- A European study found that one third of pedestrian casualties had difficulty seeing the vehicle that had struck them, while two fifths of drivers had difficulty seeing the pedestrian.<sup>6</sup>
- A literature review<sup>7</sup> of studies relating the presence of lighting to accident reduction concluded that *“On urban main roads, with mainly a traffic function, a reduction in accidents involving injuries of approximately 30% can be expected at night following an improvement in the lighting from very bad to good”*.
- A Japanese report<sup>8</sup> that looked at the reduction in accidents at junctions, following the provision of lighting, found that there was a 43% reduction in night-time accidents. It also found that the effectiveness of lighting in preventing accidents depended on its illuminance, and that the brighter the lighting, the better it is at preventing accidents. However, it did not define an upper limit to brightness beyond which further brightening would have no, or a negative, effect.
- A report by SWOV<sup>9</sup> found that a ‘relatively large proportion’ of night-time accidents occur on unlit road sections. It also found that *‘there are modest indications that the average injury severity and the proportion of accidents at bends is somewhat greater on unlit road sections’*.
- A report conducted by the University of Manchester Institute of Science and Technology<sup>10</sup> found that low illumination is a major contributory factor in the night-time fatality rate.
- A more recent follow up study<sup>11</sup> by some of the same authors using the same methodology reached the same conclusion and presented up to date figures showing the effect that lighting has on the likelihood of fatal injury.
  - On motorways, 2.6% of accidents are fatal where street lighting is present, compared to 4.3% of accidents where it is not.
  - On built up roads, 1.3% of accidents are fatal where street lighting are present, compared to 1.9% of accidents where it is not.
  - Similarly, on non-built up roads 3.1% of accidents are fatal in lit conditions, rising to 4.9% in areas without street lights.

Both studies cited an increase in thinking and stopping distances in non-optimal night-time conditions as the reason why the rate increases. They concluded that on average the presence of street lighting reduces the severity of injuries by a factor of three.

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This raises the concern about the relationship between the safety that a driver perceives and the actual level of safety, and how drivers behave in both conditions. If a driver perceives a better level of safety due to lighting, and therefore behaves in a more dangerous manner when their vision is not noticeably improved, could this lead to a greater increase in risk than simply reducing the luminance would suggest?

One study<sup>12</sup> states that other studies in the area of street lighting and road safety have low validity due to factors such as publication bias. The study attempted to address a gap in road safety literature – “to what degree do road lighting changes have a practical and relevant effect on collision risk?” This was investigated by estimating the impact of a large-scale street lighting replacement process (implementing broad spectrum/white lights in Birmingham) on road safety. STATS19 data was used to track personal injury road traffic collisions (RTCs), between 2005 and 2013, and the mean number of bright lamps was used to track lighting changes over the same time period.

When using a range of statistical analyses, the study found that as the number of bright lamps increased in Birmingham, so did the rate of personal injury RTCs. However, a common measure in studies such as this is to adjust the darkness injury rate by the daylight rate, and when this is done there is no evidence of any effect of lighting on RTCs. This means it is hard to say whether the increased RTC rates are caused directly by the lighting, or are a result of extraneous variables such as road layout changes. The study states, therefore, that future research in this area should consider such variables.

The study states that the results show that large-scale projects, such as the lighting changes in Birmingham, may not always provide a positive safety/public health benefit, and can even have the opposite effect. Therefore, it states that detailed statistical analyses such as these should be considered when authorities are attempting to make evidence-based decisions, and lighting should be looked into more in regard to public health issues.<sup>12</sup>

## Conclusion

The latest evidence<sup>3</sup> concluded that there was no evidence of an association between reduced lighting and night-time collisions across England and Wales. However, previous research<sup>9</sup> has concluded that there are positive safety benefits. Surveys have shown that the public are in favour of street lighting as a way of improving road safety and that, if anything, it needs to be improved in some areas.

There are economic and environmental reasons why some organisations may wish to reduce the amount of lighting. However, there are safety reasons why lighting needs to be available.

In some locations, a reduction in lighting quality may not increase the risk of an accident. However, there is the danger that an unconsidered removal or reduction in quality could actually increase accidents and their severity. Therefore, when considering removal or dimming of lights, location based traffic and accident evidence should be assessed. Accident rates should be monitored to ensure that sacrificing the quality of lighting does not unduly increase the risk. Increases in risk may ultimately lead to lives being lost.

## References

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<sup>2</sup> Willis et al. (2003) 'The Value of Improved Street Lighting in Rural Areas'

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<sup>3</sup> Steinbach et al (2015) 'The Effect of Reduced Street Lighting on Road Casualties and Crime in England and Wales: A Controlled Interrupted Time Series Analysis', *Journal of Epidemiology & Community Health*, 2015:1-7.

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<sup>9</sup> SWOV (1994) 'Street Lighting and Road Safety on Motorways.'

<sup>10</sup> Murray et al. 'Road Traffic Accidents: The Impact of Lighting', *The Lighting Journal*, 63:42-46.

<sup>11</sup> Planis et al. 'Road Traffic Casualties: Understanding the Night-time Death Toll', *Injury Prevention*, 12(2):125-128.

<sup>12</sup> Marchant, P., Hale, J. D., and Sadler, J. P. 'Does changing to brighter road lighting improve road safety? Multilevel longitudinal analysis of road traffic collision frequency during the relighting of a UK city', *J. Epidemiol. Community Health*, Epub ahead of print: March 2, 2020. doi:10.1136/jech-2019-212208.