Speed Limit Reduction Studies

Aim

This document provides a brief summary of existing research into the impact of speed limit reductions on road safety. This document examines research into reductions from 30mph to 20mph in urban areas and reductions from higher speed limits on rural roads.

Background

Vehicle speeds remain one of the most important factors in both the likelihood of collisions occurring and the severity of injuries when they do occur. Speed related factors are involved in over 30% of KSI collisions making them the second most common group of contributory factor behind the group covering distraction and observational errors. Collisions on urban roads account for the largest share of all collisions, and those occurring on rural roads are the ones most likely to result in death or serious injury.

Vision Zero & the Safe System

The Vision Zero strategy, adopted by all member organisations of the Safer Essex Roads Partnership, seeks to adopt the Safe System approach to road safety. The Safe System requires, amongst other things, safe roads and roadsides and safe speeds.

Safe speeds are defined as those where typical crash energies involved are within a survivable threshold. These crash energies depend on road use and types of collision. For example pedestrians, motorcycle riders and cyclists can tolerate much lower crash energies than car occupants, and crash energies at any given speed are much higher for vehicles travelling in opposite directions than for vehicles colliding while merging into the same lane.

The ideal Safe System road design provides physical separation of traffic with different kinetic energies (e.g. bicycles and cars) and of traffic travelling in different directions. Where traffic separation is not possible the Safe System requires traffic to travel at speeds where the risk of serious injury or death is less than 10%. Fundamentally this means that existing policies around speed limits and road design standards don't always achieve the optimum result for the Safe System. For example on rural roads with T-junctions and unseparated oncoming traffic, a 60mph limit will result in crash energies that are frequently fatal for car occupants. On urban roads used by pedestrians, crash energies at 30 mph are 2.25 times higher than crash energies at 20mph, making collisions on 30mph roads much less survivable than those on 20mph roads.

Reductions to 20mph

Sources

A review of studies into 20mph speed limits/zones was carried out in 2018 by Dr Adrian Davis for the Welsh Government. This covered 29 previous studies, most of which were based in the UK, but included some from mainland Europe, Japan and one covering multiple countries (Davis, 2018).

A meta-analysis of nine studies of 20mph zones and two 20mph limits was published in 2020, bringing reviews of existing research since the Davis report fairly up to date (Cleland et.al., 2020).

Summary

Safety

In the event of a collision at 20 mph there is a 1.5% risk of death, compared with 5% at 30 mph.

Introduction of 20mph limits in Portsmouth were associated with a 22% reduction in casualties against a 14% reduction in comparable areas. There was a 25.5% reduction measured for schemes in Warrington and a 30% reduction in Halifax. Modelling for the Bristol scheme estimated 4.5 lives saved per year and 11.3 serious injuries prevented. Estimates for Wales[1] calculated 6-10 lives saved per year and 1,200-2,000 injuries avoided.

Vehicle speeds

The DfT recommends the threshold for successful operation of a 20mph limit is average vehicle speeds of no more than 24mph. A reduction in overall extreme speeds was observed in Portsmouth, with evaluated schemes around the UK seeing traffic speed reductions ranging from 0.9mph to 6.3mph. A wider study found an average reduction in speeds of 2.5mph, but specific reductions were highly dependent on local circumstances.

One of the studies reviewed in the Davis report was itself a meta-analysis of 10 other studies. This found 20mph limits/zones reliably reduced collisions, casualties, traffic speeds and volumes. It also found 20mph was cost effective and improved perceived safety as well as actual safety.

The importance of perceived social norms in determining compliance with 20mph is discussed in some detail. In the absence of widespread enforcement and re-engineering, there is little more than social pressure to ensure the aims of any 20mph scheme are met. Influencing these norms is therefore critical.

Health and active travel

The impact on health inequalities was not well-researched and there was limited evidence to support the view that 20mph reduces health inequalities by encouraging more active travel. However there was no evidence to the contrary and some informed speculation that 20mph does at least provide a mechanism to help reduce health inequalities. Walking and cycling did see measurable increases in both Bristol and Edinburgh, with some reductions in travel by car. Shifting to active travel modes was not achieved by 20mph alone, so these benefits may only be realised in combination with other initiatives that make active travel compatible with residents' needs and lifestyles.

[1] The population of Wales is around 1.7 times the population of Essex, albeit with a very different geography.

Air quality

The impact on air quality is complex, affecting petrol and diesel cars differently, as well as being dependent on the road environment and traffic volumes. There were moderate increases in NOx and CO2 emissions from petrol cars but decreases from diesel cars in these emissions and decreases from all cars in particulate emissions. This led to a net effect of an 8.2% reduction in particulate matter and an 8.3% reduction in NOx associated with 20mph.

The worst-case scenario for net effect on overall pollution was zero change. Increases in NOx pollution were more than offset by decreases in particulate pollution, leading to an estimated net benefit for Wales[1] of 647 extra years of life per year due to the health benefits of reduced pollution.

Larger scale schemes were more likely to have a positive impact on air quality as they supported a consistent driving style that was optimised for 20mph areas. Road environments that minimised stop-start traffic and supported constant speeds (e.g. absence of speed bumps) resulted in better air quality.

Public opinion

Public opinion is generally in favour of 20mph roads, typically around 65% of local people support their introduction. Support for 20mph in local areas tends to increase after implementation, suggesting the reality of 20mph is a better experience than is sometimes anticipated by locals. After implementation, 89% of people surveyed in Bristol supported 20mph on residential roads and 56% on main roads. Support after implementation in Edinburgh increased from 68% to 79%. A wider study of multiple schemes by Atkins found that although support on average increased from 51% to 75% after implementation, opposition also increased from 9% to 12%.

Communications, including myth-busting was seen as critical in allowing the public to reach informed opinions about the introduction of 20mph zones and limits. It was also recognised that a certain amount of courage is required to implement 20mph where there is a vocal opposition.

Rural road speed reductions

Sources

In contrast to research carried out for 20mph limits and zones, there appears to have been relatively little research carried out into the effects of reducing speed limits on rural roads. In 2012, updated guidance from the DfT on setting local speed limits received some media attention due to 40mph limits being suggested for some types of rural road (BBC, 2012). More recently in France there has been a reduction in the rural speed limit from 90kph (56mph) to 80kph (50mph) (ETSC, 2018). This reduction applied to two-way roads outside of urban areas with no central separator.

The main sources on rural road speeds in the UK are a rural road environment policy paper (RoSPA, 2010) and the DfT circular on setting local speed limits (DfT, 2012). However most of the evidence for the efficacy of rural speed limit reductions comes from evaluation of the French reduction from 90kph to 80kph (OSINR, 2020).

Findings

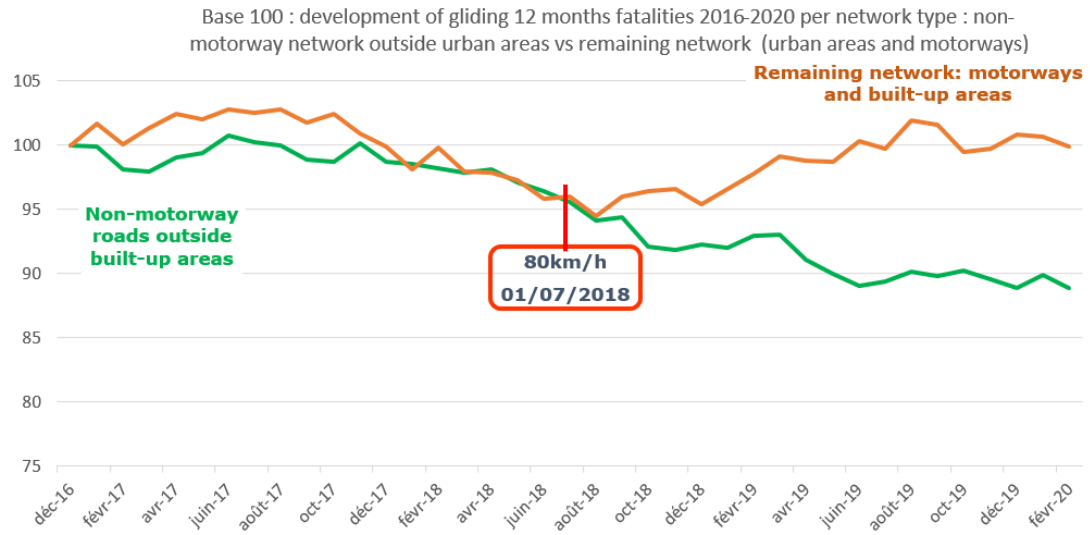
The DfT circular on setting local speed limits states the following guidance for rural roads:

> ***"60mph:*** *Recommended for most high quality strategic A and B roads with few bends, junctions or accesses.*
>
> ***50mph:*** *Should be considered for lower quality A and B roads that may have a relatively high number of bends, junctions or accesses. Can also be considered where mean speeds are below 50 mph, so lower limit does not interfere with traffic flow.*
>
> ***40mph:*** *Should be considered where there are many bends, junctions or accesses, substantial development, a strong environmental or landscape reason, or where there are considerable numbers of vulnerable road users.*
>
> *The national speed limit of 60 mph is only appropriate for the best quality C unclassified roads with a mixed (i.e. partial traffic flow) function with few bends, junctions or accesses - in the longer term, these roads should be assessed against through-traffic criteria. For lower quality C and Unclassified roads with a mixed function and high numbers of bends, junctions or accesses 50 mph may be appropriate.*
>
> *A speed limit of 40 mph may be considered for roads with a predominantly local, access or recreational function, for example in national parks or areas of outstanding natural beauty (AONB), or across, or adjacent to, unenclosed common land; or if they form part of a recommended route for vulnerable road users. It may also be appropriate if there is a particular collision problem."* (DfT, 2013)

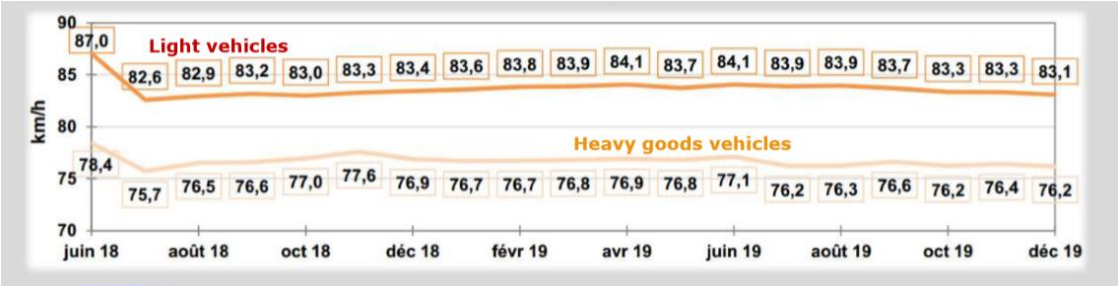
Analysis of rural road safety from RoSPA found historically there has been less progress in rural casualty reduction than on urban roads, and the proportion of casualties who were killed was higher on rural roads than urban for all road user groups (RoSPA, 2010). The RoSPA document also discusses the need for rural road speed limits to be perceived as appropriate by motorists, with clear and consistent signing. The use of environmental modifiers, such as removal or changes to white lining, road surface modifications, and visual cues to give the impression of narrowing space, were suggested as methods to create roads where motorists feel lower speeds are appropriate.

The experience with a modest 10kph (6mph) reduction in France has been well measured and evaluated using 20 months of post implementation data from 1st July 2018. Key findings from this work are as follows (ONISR, 2020):

- 10% reduction in the fatality rate; 15.2 fatalities per 100 accidents before, 13.7 afterwards. Other roads saw a 1% increase during the same period. This translates to 349 lives spared while over the same period the motorway network saw 48 more fatalities than the previous 5 year average.



- No change in the total number of accidents.
- Sustained reduction in average vehicle speeds of 3.5kph for light vehicles and 1.8kph for HGVs.



- Net gain to the economy of €700 million per year, this is derived from:

Casualties	**€1.2 billion gain**
Journey times	**€800 million loss**
CO_2 emissions	**€60 million gain**
Fuel efficiency	**€300 million gain**

- The average increase in journey time was 1 second per kilometre per vehicle.
- The measures were introduced despite only 30% of the public being in favour and 40% being strongly opposed. Since implementation public opinion has changed with 48% now in favour and only 20% strongly opposed.

Conclusions

1) There are clear and proven safety benefits to speed limit reductions, both in reducing urban road speed limits to 20mph and in reducing rural road speed limits.

2) There is a strong precedent for implementing urban 20mph zones and limits in the UK, with more evidence available for the efficacy of zones than limits.

3) 20mph zones are effective at reducing casualties and collisions, with small but meaningful reductions in vehicle speeds being consistently observed.

4) There is weaker evidence for the effect of 20mph on health, active travel and air quality. The realisation of these benefits is more dependent on other measures taken at the same time, specific design details of the schemes, and the nature of the traffic and road environment.

5) Established guidance from the DfT gives a mandate for highway authorities to apply lower speed limits to rural roads, especially where route quality is low and there are more hazards or a collision history.

6) Even modest reductions in rural road speed limits can achieve considerable safety, environmental and economic gains.

7) For both urban and rural speed limit reductions there is a consistent message that the following characteristics improve the chances of a scheme being successful:
   a) Clear and consistent signage making driver requirements unambiguous and predictable.
   b) Driver requirements operating in the same way over similar roads, so drivers can adopt the same driving style regardless of where they are.
   c) Strong communication with the public to help them reach informed opinions and understand the changes.
   d) Road environment modifications where necessary to create roads where motorists feel the posted speed limit is appropriate.
   e) Positive influence on perceived social norms around adherence to the speed limit.

8) Public opinion is generally in favour or 20mph zones in residential areas, with opinion becoming more favourable after they have been implemented. Drawing conclusions for the UK from the French experience with rural road speed limit reductions is problematic due to the differing cultural landscapes. However, the fact that French public opinion swung decidedly in favour of lower rural speed limits after they were implemented suggests that experiencing roads with lower speed limits does persuade some sceptics of their benefits and value.

References

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