

## The Restricted Roads (20mph Speed Limit) (Scotland) Bill

### Evidence on the impact of 20mph Speed Limits

#### Introduction

This short briefing highlights the main findings from academic and technical research into the effect of sign-only 20mph speed limits on collisions, average speeds, road collision casualties, emissions, modal share of walking and cycling and journey times and congestion.

All references in this briefing have been mentioned in written and/or oral evidence submitted by at least one person or organisation to the Rural Economy and Connectivity Committee during its scrutiny of the Restricted Roads (20mph Speed Limit) (Scotland) Bill.

Key documents referenced in this briefing include the assessment of sign-only 20mph speed<sup>1</sup> limit schemes implemented in the following UK towns, cities and local authority areas:

[Bristol](#), [Calderdale](#), [Edinburgh \(south-central\)](#), [Manchester](#), [Portsmouth](#), [Warrington](#).

In addition, a number of reports looking at multiple sign-only 20mph speed limit areas are also mentioned. These are:

[Atkins/UK Department for Transport \(DfT\)](#), [Journal of Public Health](#) and [Journal of Epidemiology and Community Health](#).

Other documents are referenced as appropriate throughout the briefing.

#### Collision reduction

The Transport Research Laboratory report "[The effects of drivers' speed on the frequency of road accidents](#)", concludes that:

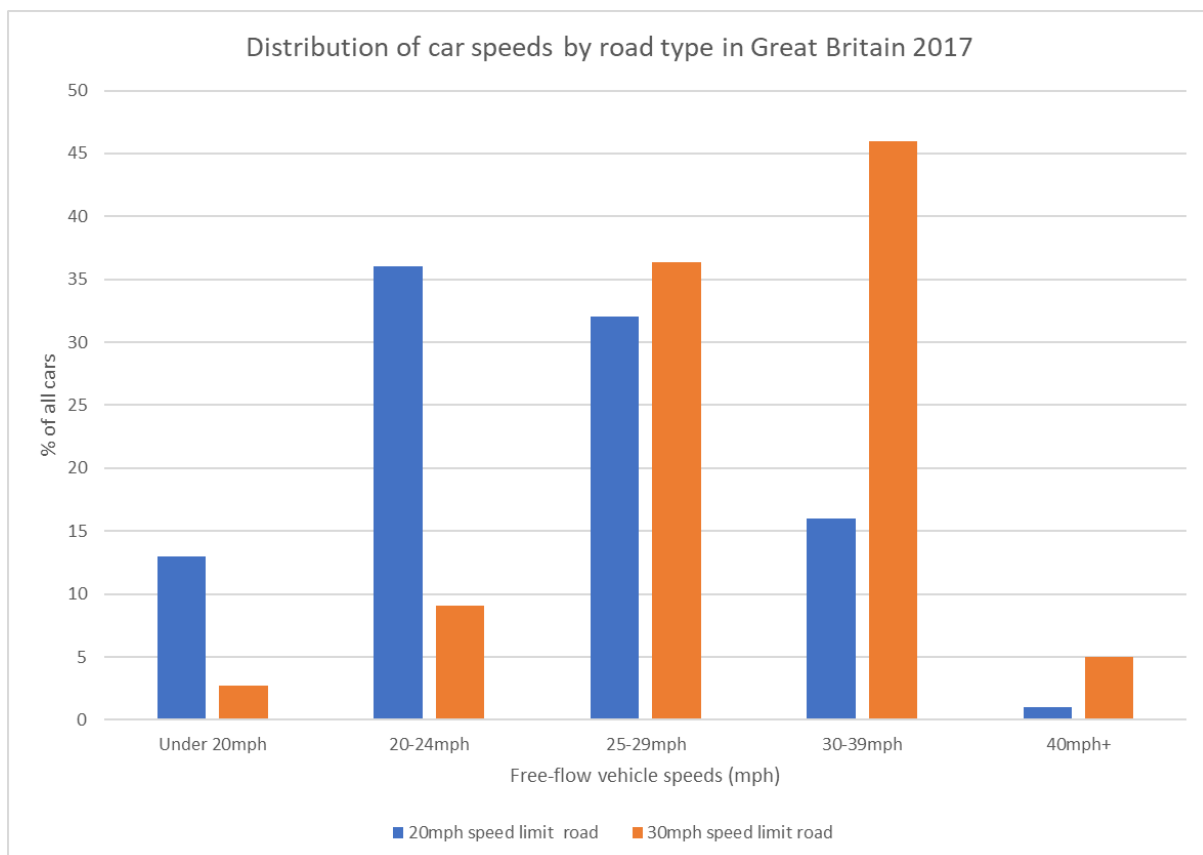
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<sup>1</sup> There are two distinct types of 20mph schemes; sign only 20mph limits that are indicated by speed limit signs only and 20mph zones, which are designed to be 'self-enforcing' through the introduction of traffic calming measures, e.g. speed humps and chicanes. The research included in this paper focuses on new sign-only 20mph limits, where the speed limit has been reduced from 30 mph to 20mph and where there is no pre-existing traffic calming in place.

“The percentage reduction in accident frequency achievable per 1 mile/h reduction in average speed is between 2-7%. The earlier 5% figure remains a robust general rule. The reduction achievable, however, varies according to the road type and the average traffic speed. Specifically, it is:

- about 6% for urban roads with low average speeds;
- about 4% for medium speed urban roads and lower speed rural main roads;
- about 3% for the higher speed urban roads and rural main roads.”

[Statistics](#) collected by the UK Department for Transport on speed limit compliance during 2017 shows the speed profile of cars travelling on roads with either a 30mph speed limit or a 20mph speed limit, as illustrated in the graph below.



This shows that, while 86% of car drivers on a road with a 20mph speed limit and 52% of drivers on a road with a 30mph speed limit exceed those speeds in free-flow conditions, the profile of vehicle speeds is quite different for each category of road. 81% of cars travelling on roads with a 20mph limit travelled at 29mph or below, compared with 49% of vehicles on roads with a 30mph limit.

The analyses of the impact of sign-only 20mph speed limits have tended not to report directly on collision reduction, principally focusing instead on the reduction in average speeds and in some cases casualties – both of which are examined below.

## Reductions in average speed

The analyses of the sign-only 20mph speed limit schemes all reported a reduction in mean vehicle speeds following the introduction of the new limit, as set out in the table below.

Area	Reduction in average speed
Bristol	2.7mph
Calderdale	1.9mph
Edinburgh	1.9mph
Manchester	0.7mph
Portsmouth	0.9mph
Warrington	1.45mph

The Atkins/DfT research considered speed reduction in some detail and concluded that:

“The journey speed analysis shows that the median speed has fallen by 0.7mph in residential areas and 0.9mph in city centre areas. Faster drivers have reduced their speed more, with the 85th percentile speed falling by -1.1mph in residential areas and by -1.6mph in city centre areas, based on journey speed data. This is a key finding, as other research shows that higher speeds are associated with increased safety risk (more collisions, increased severity, perceptions that the environment is not safe for vulnerable users).

The overall change in speeds is greater where speeds were faster before. The median speed fell by -1.3mph on residential roads with a before speed of more than 24mph; and by -1.1mph on ‘important local roads’ which typically had higher before speeds. On ‘minor local roads’ the median speed was already below 20mph and dropped by just 0.1mph.”

## Casualty reduction

Available data on casualty reduction reported in the analyses of sign-only 20mph speed limits are briefly summarised in the table below - no useable casualty reduction data was reported for South-Central Edinburgh or Manchester. The data is provided in the format used in the individual reports, meaning they are not directly comparable.

Area	Casualty Reduction
Bristol	4.53 fatalities, 11.3 serious injuries, 159.27 slight injuries avoided per year
Calderdale	30% casualty reduction over a 3-year period, later schemes indicate a 40% reduction. This equates to 154 fewer injuries - 51 from the 3 years data available (a statistically significant

	reduction). and 103 from the projected 3 years data for the later schemes.
Portsmouth (data from Prof. Adrian Davis)	Comparing the 3 years before the scheme was implemented and the 2 years afterwards, the number of recorded road casualties has fallen by 22% from 183 per year to 142 per year, faster than the fall in casualties in comparable areas elsewhere in the country.
Warrington (data from Prof. Adrian Davis)	A reduction of injury collision occurrence of 25.5%.

Casualty reduction data from the research reports examining multiple sign-only 20mph schemes is set out below.

<b>Report</b>	<b>Casualty Reduction</b>
Atkins/DfT	The evidence available to date shows no significant change in the short term in collisions and casualties, in the majority of the case studies (including the aggregated set of residential case studies). There is some evidence to suggest a positive 20mph impact in one location (Brighton Phase 1), where a blanket 20mph limit was introduced covering both major and minor roads, and where there is sufficient data to indicate a statistically significant change in collisions and casualties relative to the 30mph comparator area. It should be stressed that this represents just one case study, and the extent to which the findings are transferable to other locations is unclear.
Journal of Public Health	This umbrella review confirms these findings and that 20 mph zones and limits can reduce accidents and casualties.
Journal of Epidemiology and Public Health	In Wales, between 1 January 2011 and 31 December 2013, 14 639 people were killed or injured on 30 mph limit roads. Reducing all current 30 mph limit roads to 20 mph limits could prevent 6–10 deaths and 1203–1978 injuries per year at a value of prevention of £58M–£94M.

### **Emissions and local air pollution**

None of the individual analyses of sign-only 20mph speed limits include data on the impact the reduced limit has had on vehicle emissions. The Bristol study notes:

“A number of studies have been conducted into the effects that 20mph limits have on air pollution. Overall, a smoothing of driving style and cutting out of the acceleration phase from 20mph to 30mph is considered to be beneficial for emissions of harmful pollutants”

While the Atkins/DfT research states:

“Existing research suggests that 20mph limits (signed only) have the potential to affect vehicle emissions and air quality, reduce CO<sub>2</sub> (greenhouse gas) emissions, and reduce noise levels, as a result of:

- a reduction in average speed and top percentile speeds;
- a smoother, more consistent driving speeds;
- a small-scale displacement of traffic; and
- mode shift away from car.

Evidence from this study suggests that these factors are unlikely to have had a negative influence on air quality in the case study areas, however, it has not been possible to collect primary data on air quality, greenhouse gas emissions and noise levels to assess the impact.”

Many assessments of the impact of sign-only 20mph speed limits refer to [research](#) conducted by Imperial College (London) for the Corporation of the City of London, which concludes that:

- NOX<sup>2</sup> emission factors are higher for petrol vehicles over 20mph drive cycles compared to 30mph drive cycles; for diesel vehicles they are lower
- Given the higher contribution of diesel vehicles to emissions of NOX, this is a significant result
- PM10<sup>3</sup> emission factors are lower for both petrol and diesel vehicles over 20mph drive cycles compared to 30mph drive cycles; the exception is vehicles with engines over 2.0 litres in size

The overall conclusion being:

- It is concluded that it would be incorrect to assume a 20mph speed restriction would be detrimental to ambient local air quality, as the effects on vehicle emissions are mixed

[Research](#) reported in the Journal of Epidemiology and Community Health conducted into the possible impact of introducing a default 20mph speed limit in Wales, reporting an earlier study into this issue, found that it could result in 12% reduction in gear changes, 14% reduction in braking and 12% reduction in fuel use, reducing transport emissions in residential areas by 12%.

### **Modal share of walking and cycling**

Only three of the analyses of the impact of sign-only 20mph limit schemes reported the impact on modal share for walking and cycling, details of which are summarised in the table below:

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<sup>2</sup> Exposure to a high concentration of NOX (a term covering a number of gases known as nitrogen oxides, including NO<sub>2</sub>) can irritate airways in the human respiratory system. Short term exposure can aggravate respiratory diseases, particularly asthma. Longer exposures may contribute to the development of asthma and potentially increase susceptibility to respiratory infections.

<sup>3</sup> PM stands for particulate matter, a term for a mixture of solid particles and liquid droplets found in the air. PM<sub>10</sub> are inhalable particles, with diameters that are generally 10 micrometres and smaller. Studies have linked PM exposure to a variety of problems, including premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function and increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.

Area	Impact on walking and cycling
Bristol	The number of residents who walk for 10 minutes or more in their local area most days has generally increased. The number of people who cycle for 10 minutes or more in their local area at least once a week has remained the same or has slightly increased. More children walk or cycle to school in every area. The number of people using the car most days has stayed the same in every area.
Calderdale	Increased cycling in Todmorden for those who already owned/had use of a bike. No change in walking patterns in Todmorden; increase in walking in Sowerby Bridge.
Edinburgh	7% increase in journeys by foot, 5% increase in journeys by bicycle and a decrease of 3% for journeys by car.

The Atkins/DfT research concluded that the introduction of 20mph speed limits had produced small increases in the proportion of people travelling on foot or by bike, stating that:

“...there has been a small (but significant) increase in the proportion of survey respondents stating that they have increased their use of active travel modes. Some 5% of residents surveyed said that they are walking more, and 2% said that they are cycling more, since the introduction of the 20mph limits...In addition, a small proportion of households with children reported that their children are cycling locally more often since the introduction of 20mph limits (9% of households for children aged 6-10 years, 6% of households for children aged 11-14, and 6% of households for children aged 15-17) ...The results suggest that while the introduction of a 20mph limit is perceived as a largely positive measure for pedestrians and cyclists; infrastructure-related barriers to walking and cycling remain (see Chapter 9) and the change in reported levels of walking and cycling undertaken by residents in general appears to be small (but statistically significant).”

The report cautioned that these figures were "self-reported", meaning they may not accurately reflect real-world travel behaviours.

### **Journey times and congestion**

None of the individual analyses of the impact of sign-only 20mph limit schemes reported on the issue of congestion or journey times. The Atkins/DfT research considers that:

“Journey times are estimated to have increased by 3% in residential areas and 5% in city centre areas, based on the observed change in median speed (from GPS journey speed data). This adds less than half a minute to a two mile trip and less than a minute to a five mile trip (Table 5).

In most of the case study areas, major roads have been excluded from the limit. The distance travelled on 20mph roads is expected to be substantially less than the 2 or 5 miles assumed above, and hence, the journey time impact will be a few seconds only. Most drivers are unlikely to notice this level of change. Furthermore, a substantial proportion of drivers were already travelling at less than 20mph and are unlikely to have experienced a change in journey times.”

The negligible impact of 20mph speed limits on already low journey speeds during peak times was noted in the Bristol study, which reported that:

“Average speeds declined by a greater amount in the summer months and on weekends, where traffic volume (and congestion) is lowest.”

**In summary, the research and information highlighted above show that:**

- **TRL research shows that, on urban streets in the UK, a 1mph reduction in vehicle speeds typically produces a 5% reduction in collisions**
- **The profile of car speeds on roads with a 20mph speed limit and roads with a 30mph limit are quite different, e.g. 49% of cars using roads with a 20mph speed limit in free flow conditions travel at 24mph or less, compared with 12% of cars using roads with a 30mph limit.**
- **The imposition of 20mph speed limits on roads previously subject to a 30mph limit typically produces a small, but statistically significant, reduction in average (both mean and median) vehicle speeds.**
- **City-wide 20mph speed limits generally reduce road collision casualties, although some smaller schemes have not reduced casualty numbers.**
- **The imposition of 20mph speed limits on roads previously subject to a 30mph limit can produce small increases in modal share for walking and cycling.**
- **The air pollution impacts of 20mph speed limits are mixed, and so should not be assumed to be conclusively positive or negative.**
- **20mph speed limits generally have no significant impact on journey times or traffic congestion.**

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