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20 mph Zones and Speed Limits

There are still a high number of casualties on urban roads in the UK. In 2011, there were 816 fatalities and 145,530 injuries in total reported on built up¹ roads in Great Britain. A large proportion of these accidents occurred on residential roads, with 116 fatalities on B roads and 280 fatalities on other minor C and unclassified roadsⁱ.

The majority of pedestrian casualties occur in built up areas: 25 child pedestrians and 311 adult pedestrians were killed in 2011 on such roads. In total there were 25,346 pedestrian injuries. Pedal cyclists are also vulnerable in built up areas and there were 59 cyclist fatalities and 17,789 casualties of all severitiesⁱⁱ.

Speed significantly increases the chance of being injured in a collision. One of the first studies of pedestrian injury and car impact speed found that at 20mph there was a 2.5% chance of being fatally injured, compared to a 20% chance at 30mphⁱⁱⁱ.

A recent review identified the studies which had produced the most reliable modern estimates^{iv}. The results from one of these is presented in figure 1^v

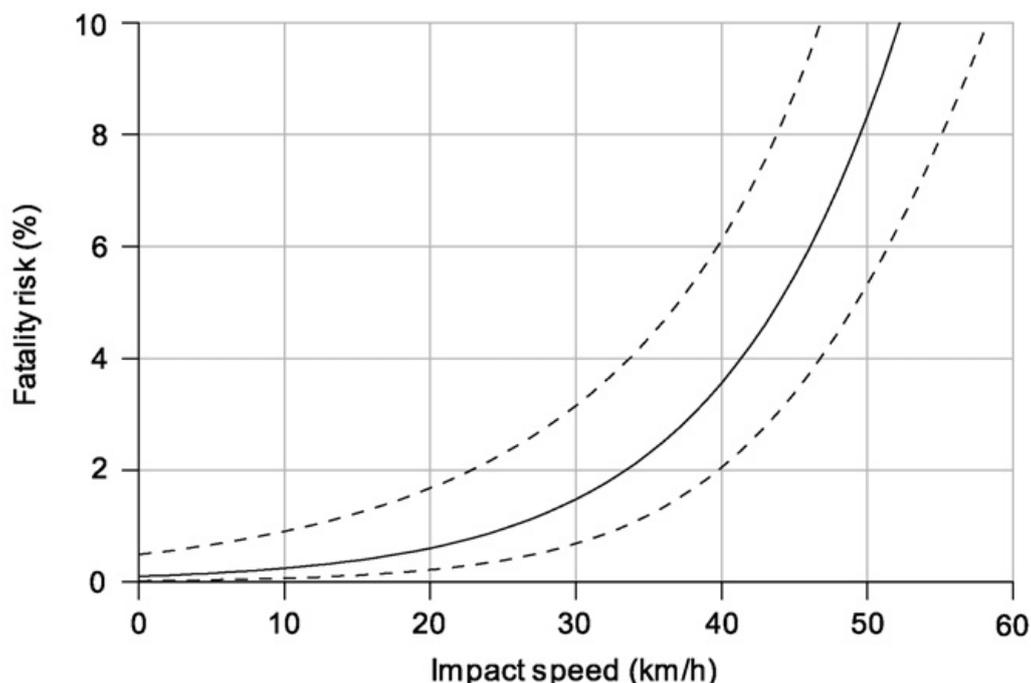


Figure 1: Showing the relationship between the risk of fatal injury to adult pedestrians and vehicle impact speed². The solid line is the most likely estimate and the dotted lines show the 95% confidence limits.

¹ Built up roads are defined in Reported Road Casualties GB as “roads with speed limits (ignoring temporary limits) of 40 mph or less”

² The difference between 30km/h and 50km/h is the closest rounded approximation to 20mph and 30mph. 30km/h = 18.6 mph, 40km/h = 24.9mph, 50km/h = 31.1mph

History of 20 mph Speed Limits in the UK

In December 1990 the Department of Transport issued Circular Roads 4/90 which set out guidelines for the introduction of 20mph speed limits; local authorities had to apply for consent from the Secretary of State to introduce a 20mph zone.

The initiative was based on experience internationally, which had demonstrated that lower speed limits could have safety benefits when combined with traffic calming measures to ensure that vehicles maintained low speeds through the zone. Road safety publicity messages at the time, such as the “Kill Your Speed, Not a Child” campaign highlighted 20mph speeds as crucial to reducing the risks of injury in an accident

The first 20mph limit was in Tinsley, Sheffield on the junction between Raby Street and Sheffield Road. Kingston upon Thames and Norwich introduced 20mph zones shortly after. There were 450 20mph speed limits introduced between 1991 and 1999.

In 1999, the law was changed by the Road Traffic Regulation Act (Amendment) Order 1999, which gave Highways Authorities more flexibility so they no longer had to apply for permission to introduce a zone. The updated legislation made two distinct types of 20mph speed limit possible:

- 20mph limits, which consist of just a speed limit change to 20mph which is indicated by the speed limit (and repeater) signs, and
- 20mph zones, which were designed to be “self-enforcing” due to the traffic calming measures that were introduced along with the change in the speed limit.

The Department for Transport’s current guidance is set out in DfT Circular 01/2006 which encourages and supports Local Authorities to implement 20 mph limits and zones in situations where there is a particular risk to vulnerable road users^{vi}. The guidance sets out that the purpose of 20 mph areas is to create conditions in which drivers naturally drive at around 20 mph as a result of traffic calming measures or the general nature of the location.

It, therefore, suggests that 20mph limits are appropriate for roads where average speeds are already low (below 24mph) or along with traffic calming measures. Ultimately the Local Authority is responsible for deciding which of these was the most appropriate.

In 2001, The Scottish Executive issued SEDD Circular No 6/2001 which includes guidance on mandatory and advisory 20 mph speed limits. The Scottish Executive concluded that there was a role for advisory 20 mph speed limits, in certain circumstances

The Scottish executive also provided funding between 2003 and 2006 for the introduction of more 20mph areas to complement safer routes to school programmes. As well as 20mph zones and limits, the funding helped to introduce:

- mandatory part-time 20 mph speed limits, which operate at times when children are going to or from school, and
- advisory 20 mph speed limits in residential areas with little or no through traffic.

The latest figures in England are that by 2008 there were an estimated 2,148 20mph zones in England, of which 399 were in London.

In a recent consultation, the Department for Transport set out plans to *encourage highway authorities to introduce, over time, 20 mph zones or limits into streets which are primarily residential in nature and into town or city streets where pedestrian and cyclist movements are high, such as around schools, shops, markets, playgrounds and other areas, where these are not part of any major through route*^{vii}

Characteristics of 20 mph Zones and Speed Limits

There is a significant difference between the characteristics of a 20mph speed limit and a 20mph zone.

20mph limits are areas where the speed limit has been reduced to 20 mph but there are no physical measures to reduce vehicle speeds within the areas. Drivers are alerted to the speed limit with 20mph speed limit repeater signs.

20mph limits are most appropriate for roads where average speeds are already low, and the guidance suggests below 24mph. The layout and use of the road must also give the clear impression that a 20mph speed or below is the most appropriate.

20 mph zones use traffic calming measures to reduce the adverse impact of motor vehicles on built up areas. The principle is that the traffic calming slows vehicles down to speeds below the limit, and in this way the zone is becomes 'self-enforcing'. Speed humps, chicanes, road narrowing, planting and other measures can be introduced to both physically and visually reinforce the nature of the road.

Traffic calming programmes can incorporate a wide range of measures designed to work in partnership to reduce speeds and improve the overall environment, and in effect this means there can be significant differences between schemes.

There are four main techniques to traffic calming programmes:

- Vertical deflections
- Horizontal deflections
- Road narrowing
- Central islands

Vertical deflections in the carriageway are the most effective and reliable of the speed reduction measures currently available. There are several different techniques available to achieve this:

- Road hump
- Plateau (speed table)
- Cushion
- Uneven road surface (rumble strips)

Horizontal deflections in the carriageway are less effective than vertical ones in achieving reductions in speed, although their impact is significantly increased when used in combination with a vertical measure. Essentially all horizontal shifts may be classified as chicanes. The impact of chicanes is reduced if the design has to allow for the passage of HGVs as the wider carriageway increases the speed that it can be negotiated at. Chicanes can significantly reduce parking spaces.

Road narrowing can also be used to support vertical deflections. It is not a speed-reducing device in itself, but it can be a reminder or encouragement to drive slowly or calmly. The effectiveness of this measure in controlling speed can be increased if the carriageway width is reduced to a single lane. However, this is largely dependent on the balance of the opposing traffic flows. The extra space created by road narrowing can be used to provide some combination of widened footways, dedicated cycle lanes and formalised parking bays, or to provide more space for public transport, for example, bus lanes.

Central islands have only a limited effect on reducing speeds unless combined with another measure such as a chicane. They do, however, provide useful pedestrian refuges.

Often traffic calming involves providing more space for pedestrians and cyclists, and improving the local environment. Traffic calming schemes operate on a principle of shared space between all road users. Roads can be redesigned to give greater prominence to the residential function of the road and reduce the dominance of motor vehicles.

Locations of 20mph Zones

The Department for Transport commissioned research in 2009 to estimate some of the characteristics of 20mph zones in England^{viii}. It found that zones typically covered between 1 km and 25 km of roads.

The study found that there was a correlation between 20mph zones and schools, with over half of the zones being next to a school. There was no correlation between zones and hospitals, which the report also notes are a significant destination in urban areas.

The research also looked at several Local Highway Authorities to examine the relationship between 20mph zones and the Indices of Multiple Deprivation data where they are implemented. This showed that:

- 33% of LHAs had implemented the majority of 20 mph zones in the most deprived areas;
- 33% of LHAs had implemented the majority of 20 mph zones in the least deprived areas; and

- 33% of LHAs had implemented 20 mph zones in a relatively even mix between areas of least and most deprivation.

A more recent study used high-resolution map data to study the distribution of traffic calming and to determine how the distribution of traffic calming varied by deprivation across small areas, in 5 locations nationally^{ix}. It found that traffic calming measures were most likely to be found in the most deprived areas. 20mph zones can be effective safety measures across areas of all socioeconomic groups^x.

This is important as there is a well established link between socio-economic status and risk of being injured in road traffic accidents. Research has found that children from the lowest socioeconomic group in England and Wales are five times more likely to be injured in accidents than those from the highest^{xi}.

Effectiveness of 20mph Zones and Speed Limits

The evidence supports the effectiveness of 20mph zones as a way of preventing injuries on the road.

There is currently less experience with 20mph limits although they have generally been positive at reducing traffic speeds. They do not reduce traffic speeds as much as zones.

20mph Zones

Before 20mph zones were first introduced in the UK, it had been recognised in the Netherlands that 30km/h was a suitable speed for residential areas and that vehicle speeds could be reduced through road design. In 1984, regulations were introduced which allowed municipalities to reduce traffic speeds and volumes through this approach.

An evaluation of 15 of the 30km/h zones was conducted. There were engineering measures in all of these areas, including signage, speed humps, narrower roads and chicanes.

The reduction in speed was dependent on the type of engineering measure introduced into the area, but speed humps and narrowing the road almost always reduced vehicle speeds to below 30km/h. The researchers noted that there was also a reduction in traffic volume by 5% to 30%.

There were reductions in the number of accidents and injury accidents compared to the rest of the municipalities with the experimental areas and also the whole of the Netherlands. Whilst both accidents and injury accidents showed between a 10% reduction to 5% increase in the 6 years following their introduction in the municipality and whole of the Netherlands; the number of accidents dropped to around 80-85% of the initial figure in the trial areas, and injury accidents dropped to between 60-80%.

The first widespread evaluation of 20mph zones in the UK was carried out by TRL in 1996^{xii}. It found that injury accidents were reduced by 60%, and child injury accidents were reduced by 67%. The evaluation did not find evidence that accidents increased on surrounding roads due to drivers changing their route. There was a decrease in traffic by 27% in the zones during the evaluation, but the authors attributed a large part of this to bypasses which were also built in conjunction with some of the schemes to take through traffic away from the area.

From 1994, there was a widespread introduction of 20mph zones in Hull, and by 2003, there were 120 zones covering 500 streets. The casualty statistics between 1994 and 2001 showed a drop of 14% in Hull, compared to a rise of 1.5% in the rest of Yorkshire and Humberside. In the 20mph zones in Hull, there was a decrease in total accidents of 56% and in fatal and serious injuries of 90%. The biggest reductions were pedestrian casualties, which fell by 54%, child casualties which dropped by 54% and child pedestrian casualties fell by 74%. These figures were reported in Local Transport Today^{xiii}.

A 2007 review of half of the 20mph zones which had been implemented in London (78 zones) found that they reduced injury accidents by about 42% and fatal or serious accidents by 53%^{xiv}.

A major review of road casualties in London between 1986 and 2006 was published in the BMJ in 2009^{xv}. It demonstrated that 20mph zones reduced the number of casualties by over 40% (41.9%). The 20mph zones were slightly more effective in preventing fatal or serious injuries to children, which were reduced by half (50.2%). There was a smaller reduction in casualties among cyclists than any of the other major groups of road users studied, with a reduction of 16.9%.

The analysis showed that the reduction in road injuries in 20mph zones occurred at a greater rate than the overall trend of reduction in casualties in London, that this was not attributable to any regression-to-the-means effect, and that there was no displacement in accident risk to roads close to the 20mph zones.

Based on the casualty reductions seen in the 2009 BMJ paper, the North West Public Health Observatory predicted what the effect would be of introducing 20mph zones in all residential zones in the North West region^{xvi}. Casualty figures collected by the police were used and the average number of casualties per year in the region was calculated using data from between 2004 and 2008.

This study found that there would have been 140 fewer killed or seriously injured child casualties if there were 20mph zones in all residential areas in the region. This was an improvement of 26% on the actual figures. In addition, there would have been a 26% reduction of all pedestrian casualties and 14% reduction in all cyclist casualties.

Traffic Calming

Many 20mph zones use area wide traffic calming measures to ensure lower speeds, and there have been two reviews of the literature, although the areas reviewed employed a wide range of traffic calming measures and may not necessarily have used lower speed limits as part of the measure.

A Cochrane review found that area-wide traffic calming in towns and cities may be a promising intervention for reducing the number of road traffic injuries and deaths^{xvii}. A meta analysis found that traffic calming schemes reduced the number of injury accidents by about 15% on average, with schemes in residential areas showing a greater reduction^{xviii}.

20mph Limits

The earliest examples where 20mph (30km/h) limits have been introduced without traffic calming without traffic calming are outside of the UK. Graz, in Austria, introduced 30km/h as the speed limit on all residential streets in September 1992. This accounts for around 800km of roads in the city, around 4/5ths of the total network^{xix}.

The introduction was part of a comprehensive traffic plan in the city. The two strands were: to promote walking, cycling and public transport through improving the infrastructure and education activities; and to limit the volume and speed of traffic through introducing restrictions in the city centre and prioritising public transport. The limit itself was marked by signage and a key component was police enforcement of the limit. An education campaign about the limit also accompanied the change.

There was only a small reduction in average speeds before and after the limit was introduced, however, there was a reduction in extreme speeds. The number of drivers exceeding 50 km/h (31 mph) dropped from 7.3% percent the year before the limits were introduced, to 3% afterwards.

Comparing the year after the introduction of the limits, there was a 12% reduction in accidents which resulted in a minor injury and 24% fewer accidents which resulted in a serious injury. There was a reduction in all pedestrian accidents by 17% and with car drivers by 14%. There were also reductions in the number of accidents on the roads which remained at 50km/h, this was seen at both crossings and free stretches of road. The researchers argued that this was due to the comprehensive traffic plan establishing a new "traffic culture".

To control for the effects of increased enforcement of the new limit, a comparison was made by giving police in other cities the same laser enforcement equipment used in Graz. These cities showed either a smaller decrease, or an increase, in the number of accidents.

There has been an expansion of 20mph limits in the UK recently. The reasons for this rapid expansion are not solely for road safety reasons, and many are being introduced to contribute towards healthier environments.

TRL carried out research on 20mph limits in 1998 which examined the effectiveness of 20mph limits without traffic calming measures^{xx}. It found that traffic calming was a more effective way of reducing vehicle speeds than signs only, which only produced a small reduction in speed. There was some evidence that public awareness campaigns and enforcement further reduced traffic speeds.

The largest area in the UK with a 20mph limit is Portsmouth, where the lower limit has been introduced on around 94% of roads previously had a 30mph limit^{xxi}. There were 223 monitored sites within Portsmouth, split between six different areas of the city. There was a staggered introduction and the limit was introduced at a different time in the six areas.

When monitoring the results a distinction was made between roads where the average speed before the 20mph zone was introduced was: 20mph or less; between 21 and 24 mph; and over 24mph. This allowed the effect of the limits to be examined in these different conditions. The before and after period, when the traffic speeds were measured, was different for each of the six areas. This was due to the staggered introduction.

There was an overall average speed reduction of 1.3mph following the introduction of the limits, as the average speed dropped from 19.8mph to 18.5mph. The change

across the six areas varied from a reduction of 0.6mph to 1.7mph. This was a statistically significant reduction in speeds across the city.

Overall there was a drop in the number of police reported injuries in the six areas comparing the average of 163.7 casualties per year over the 3 years before the introduction and an average of 129.4 casualties per year in the two years after. This represented a 21% reduction. The number of KSIs rose from an average of 18.3 per year to 19.9 per year in the same time period, although the relatively low numbers of recorded KSI casualties in Portsmouth mean that small fluctuations up and down by chance can have an undue influence on this. Much of this increase came from the number of pedestrians injured and it was not possible to measure whether the amount of pedestrian activity had increased following the introduction of the 20mph limits.

Bristol has also piloted 20mph limits in two areas using only signage as one element of a strategy to increase physical activity in Bristol^{xvii} along with events that encourage children to play outside and increase the uptake of cycling. There was also a communications strategy that resulted in several different education campaigns about the 20mph limits.

The Inner East Bristol pilot area covered around 300 roads and the Inner South Bristol pilot area covered around 200. Vehicle Activated Signs were used on higher speed or major roads within the areas to supplement the signage at entry points, and repeater signs. Roundels with the speed limit painted onto the road were also used.

Two years after the introduction of the limits, speed surveys were recorded on 10% of the roads covered by the scheme. There was a reduction in mean daytime speeds on 65% of the roads. On residential roads there was on average a 0.4mph reduction in traffic speeds. There was a greater reduction on main roads, as 1.7mph was the average reduction in the Inner East area and 1.3mph in the Inner South area.

There were reductions in speed in the 30mph roads within the areas too. In the Inner South area there was a reduction of 1mph comparing the mean speeds before and after, and in the Inner East area there was a 9.2mph reduction on the same roads. There was a 1.1mph reduction in average speeds on 30mph roads outside of the Inner South area.

Given the relatively low numbers of casualties in each of the two areas, it was not possible to draw conclusions about the effect of 20mph limits on injuries from the data available.

Lower Traffic Speeds and Health

Accident risk is not usually the only intended outcome to a traffic calming scheme, as transport policy.

As well as road safety benefits, it is important to highlight the contribution that 20mph zones can have in encouraging more physical activity, such as walking and cycling, by contributing towards a safer environment. The money spent on the schemes can also greatly improve the residential area.

Assessment of any Unintended Negative Consequences

Vehicle Damage

RoSPA has received enquiries from members of the public who have raised concerns that traffic calming used in 20mph zones has unintended negative consequences, such as causing vehicle damage and injuring vehicle occupants when vehicles go over the calming, slowing emergency services, or increases vehicle emissions.

Research has been carried out to evaluate the impact on road humps on both vehicle damage and the likelihood of occupant injury by TRL and Millbrook^{xxiii} which included testing vehicles on speed cushions and road humps and creating computer models of vehicles and their occupants.

The tests did not show evidence of any vehicle damage from the humps or significant and permanent changes to the vehicle's suspension systems. The report concluded that the levels of discomfort caused by the humps were generally acceptable if they were traversed at an appropriate speed (15-20mph) and that the forces on the spine were an order of magnitude smaller than what typically causes an injury. However, some people with conditions such as degenerative discs or weak bones are more susceptible to an injury.

Emergency Services Response Times

There have been concerns raised by the London Ambulance Service about the effect on ambulance response times, and that this puts people at risk. There are two relevant studies.

In 1997, a US study looked at the effect of three traffic calming measures on response times^{xxiv}, two different lengths of speed bumps (14 and 21 feet length), and traffic circles (similar in design to mini roundabouts, although the plan in the paper shows vegetation in the middle). The delay of different emergency vehicles travelling between 25 and 40mph was measured.

It found that the traffic circles had the greatest effect on response times, adding between 1.3 to 10.7 seconds of delay to vehicles. Road humps added between 9.4 and 0 seconds to the response time, with shorter 14 feet bumps adding slightly more time.

However, the relevance of these results to the UK is not clear, as the traffic calming measures examined covered the whole width of the road, which is not typically representative of the narrow speed cushions used in the UK.

TRL research looked at the average speed of a fire tender running over different types of traffic calming in an estate in Surrey^{xxv}. The authors estimated that on average, traffic calming measures caused a time delay of 1.25-1.40 seconds, and that the average speeds were lowest over flat top humps, and highest over speed cushions.

When implementing 20mph zones, consultation with the emergency services, as well as the local community would be beneficial to identify any issues before the traffic calming is put in. This would help to provide safer roads and meet the concerns of the emergency services, or to identify other ways to ensure rapid response times without losing the significant road safety benefits of a 20mph zone.

It is important that communities, and other stakeholders, know what they are getting from a 20mph zone or limit and have a say in their development. Results from the Inner City Road Safety Demonstration Project^{xxvi} highlight that residents often had concerns about the amount of available on street parking, and proposals which reduced it were opposed. There was both opposition and support for traffic calming features, with greater levels of support for it in residential areas.

One important finding from the demonstration project was that consultation must be 'right first time'.



Road Safety..... **Information**

RoSPA's Policy Position on 20mph Zones and Speed Limits

20mph zones are very effective at preventing injuries and RoSPA would like to see their wider use in residential areas.

20mph zones significantly decrease the risk of being injured in a collision through reducing vehicle speeds. Their greater use, especially in residential areas, would help to reduce the number of traffic injuries in the UK.

Evidence on 20mph limits is generally positive but they are less effective at reducing traffic speeds than 20mph zones.

Typically there are small reductions in speed following the introduction of 20mph limits. However there is a smaller evidence base for the introduction of signs on their own as they are a more recent intervention, and most schemes have only had a short follow up period.

20mph limits are cheaper to introduce over a wide area than 20mph zones which require traffic calming.

Some European experiences have shown the value of introducing lower limits as part of a more comprehensive traffic plan rather than on their own.

Local evaluations of 20mph limits, along with monitoring of traffic speeds will help to understand the effects of 20mph limits in different circumstances and whether there needs to be more work to reduce traffic speeds. In the Netherlands 30km/h speed limits are seen as the initial step to reduce speeds in residential areas, and in future more road engineering will be introduced where needed^{xxvii}.

Local Authorities are the bodies responsible for determining where 20mph zones and limits should be introduced.

Local Authorities should take advantage of opportunities to introduce them where they are needed. 20 mph areas should initially be prioritised to places where they are most needed, for example, in areas of social deprivation which have high populations, areas which consistently display accident problems or have other issues which a 20mph zone could alleviate, and in residential areas around locations which are common urban destinations. The need for 20mph zones can be examined when developing safer routes to school.

Consultation and engagement with local communities and other stakeholders is of vital importance.

Local communities should have input into the schemes development. Emergency services must be consulted when implementing 20mph zones to ensure that their requirement to use the roads quickly is balanced with the considerable benefit of a 20mph zone.

The underpinning idea behind the argument for 20mph zones is that the speed limit – if adhered to – should represent a decent chance of survival and also a low risk of severe injury if an accident occurs. In built up residential areas where there are likely to be young children, and there is a risk of injuries to vulnerable road users, RoSPA believes that 20mph represents the best compromise between mobility and risk.

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