



Killed or Seriously Injured (KSI) casualties on East Sussex roads

Public Health Briefing

June 2015

Public Health Intelligence Team

Division of Public Health, Adult Social Care and Health

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Killed or Seriously Injured (KSI) casualties on East Sussex roads

1. Introduction

A person injured in a road traffic accident is recorded as seriously or slightly injured by the police on the basis of information available within a short time of the accident. This generally will not reflect the results of a medical examination, but may be influenced according to whether the casualty is hospitalised or not. Hospitalisation procedures will vary regionally.¹ Collisions have wider implications than personal injury. For example, they can have a detrimental impact on the economy. In order to calculate the value of prevention, the Department for Transport (DfT) calculated the cost of a fatal casualty (including lost output, medical and ambulance costs and human cost) to be approximately £1.69 million, with serious injury approximately £189,519. From this, the DfT puts an average value on the prevention of a collision at £96,706 (2009 prices all road types)². This is based on lost output, medical and ambulance costs, human costs, police costs, insurance and property damage and includes an allowance for damage only collisions³.

2. Killed and Seriously Injured in East Sussex

In 2013 there were a total of 1,298 accidents reported involving 2,435 vehicles and 1,795 casualties. Of the total casualties reported, 322 (18%) were serious and 17 (1%) were fatal. The rate in East Sussex peaked in 2006-2008 (76.7 per 100,000 population) but steadily reduced from that period to 2010-2012 (58.5 per 100,000 population), however for each period from 2003-05 rates in East Sussex have remained higher than the England average (Figure 1). The latest period, 2011-2013 has seen a slight increase of 1% (59.3 per 100,000 population).

Figure 1: Killed and seriously injured (KSI) on England's roads (rate per 100,000 population), local authorities in East Sussex, 2003 to 2013

Area	2003-05	2004-06	2005-07	2006-08	2007-09	2008-10	2009-11	2010-12	2011-13
England	59.9	56.3	54.3	51.3	48.1	44.3	41.9	40.5	39.7
East Sussex	71.3	71.8	74.1	76.7	74.9	71.0	63.2	58.5	59.3
Eastbourne	44.5	48.1	52.0	53.3	49.9	46.3	40.9	41.3	41.3
Hastings	67.0	58.2	60.9	54.1	59.5	53.3	50.2	44.4	47.2
Lewes	57.2	64.7	72.9	75.1	71.4	64.6	58.0	50.9	49.0
Rother	91.3	93.8	99.2	99.0	89.0	84.1	76.9	73.8	76.1
Wealden	88.7	86.9	82.2	93.0	94.6	94.3	80.9	74.1	75.0

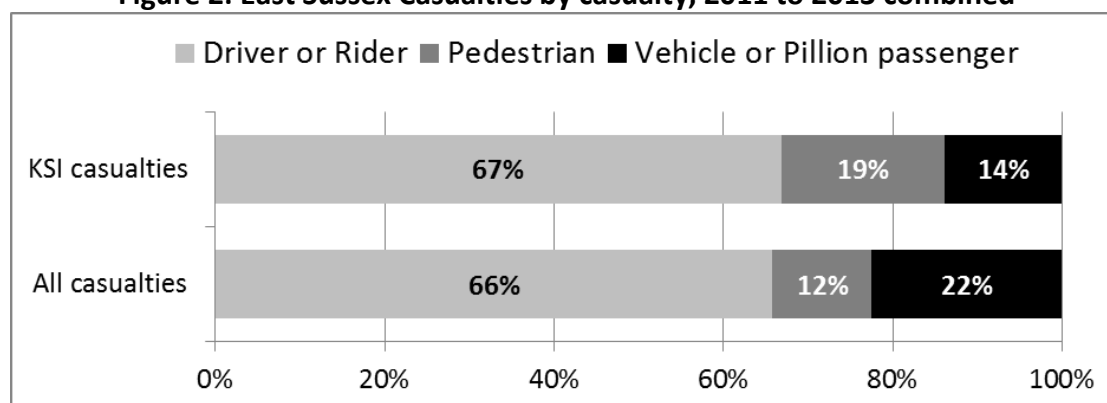
KEY	Significantly worse than England	Not significantly different to England	Significantly better than England
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Source: Public Health Outcomes Framework, Public Health England, 2015

3. Who is involved in KSI's

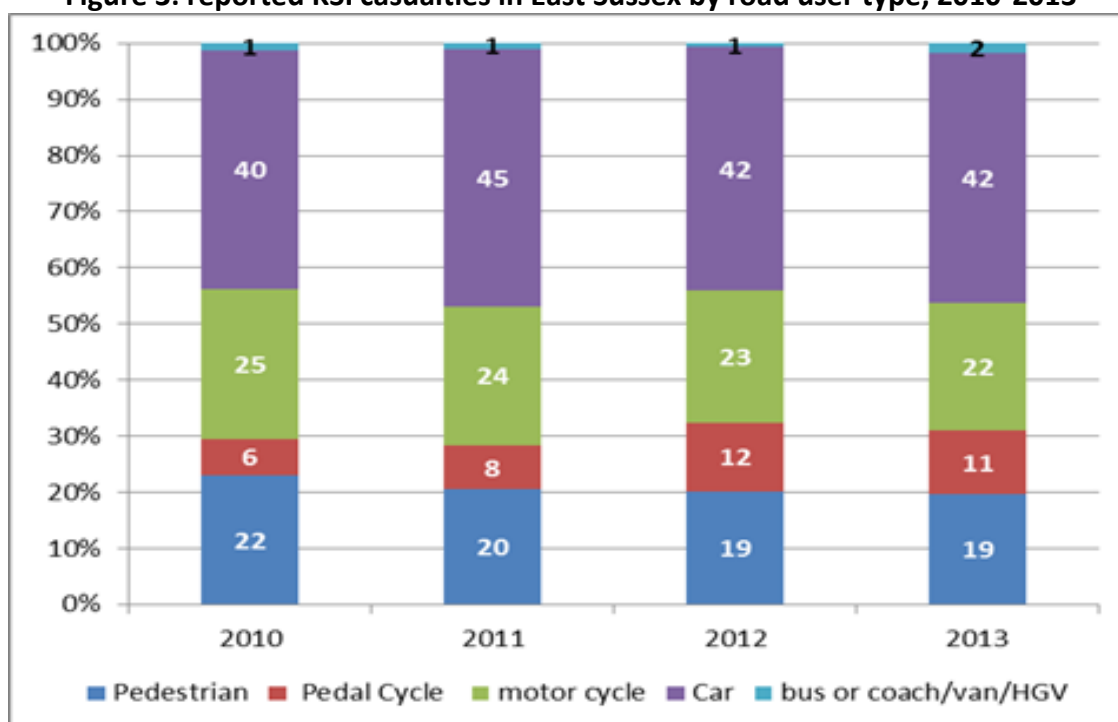
Rates of KSI are higher in some population groups than others. 70% of KSI casualties in East Sussex in 2011 to 2013 were male, and males were greater in number than females for all age groups except for those aged over 75 years. Younger and middle aged persons are the age group with the greatest number KSI with 24% of all KSI casualties aged 15-24 years and 23% aged 40-54 years. 67% of KSI casualties in 2011 to 2013 were drivers or riders, 19% were pedestrians and 14% were vehicle or pillion passengers (Figure 2).

Figure 2: East Sussex Casualties by casualty, 2011 to 2013 combined



Source: STATS19 data, Sussex Safer Roads Partnership, 2015

Figure 3: reported KSI casualties in East Sussex by road user type, 2010-2013



Source: DfT, 2014

In East Sussex between 2010 and 2013 there has been an overall decline in the percentage of pedestrian and motor cyclists KSIs while KSIs involving pedal cycles and cars have increased slightly (figure 3). Numbers of fatalities are too small to analyse in relation to road

user type, but as a percentage of all KSIs there has been a decline over this period from 6.6% to 5%. However, numbers are small so these percentages should be read with caution⁴

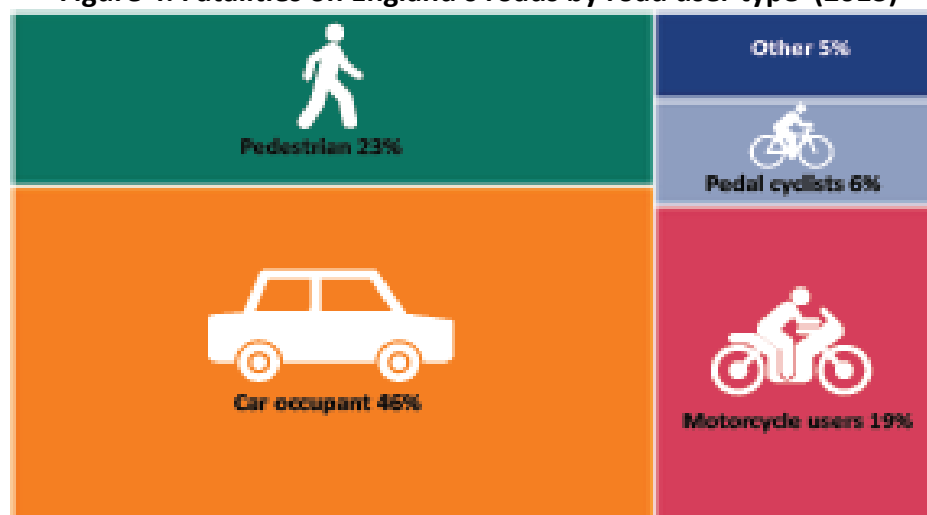
3.1 Groups more vulnerable to risk of road casualty

Road traffic accidents disproportionately affect certain population groups. For instance, males⁵, those living in more deprived areas^{6,7,8}, children and older people⁹, and those misusing drugs and alcohol¹⁰. There is a well-established association between socioeconomic status (SES) and risk of road accidents, with the lowest SES group in England and Wales being five times more likely to be injured in accidents compared with those in higher SES groups.¹¹ Research also shows over a quarter of pedestrian injuries in children occur in the most deprived wards¹², with the main factor behind this being exposure to danger rather than individual behaviour. For instance, high-speed traffic is disproportionately located in lower SES neighbourhoods.

The UK also has one of the highest child pedestrian casualty rates within Europe. Research suggests that for children, the risk of accidents is higher in faster traffic environments because their eyes are not developed enough yet to be able to judge speeds over 20mph¹³. Nationally between 2008 and 2012 police reports show 2,316 children and young people under the age of 25 years died, 35,783 were seriously injured and 322,613 were casualties on the roads in England. Among pedestrians in the 5 to 9 years age group, the rate of fatal and serious injuries to children living in the 20% most deprived areas is nine times higher than to children in the 20% least deprived (24 killed or seriously injured (KSI) per 100,000 and 2.6 per 100,000 respectively).

As in previous years, car users made up the biggest share of road deaths in 2013 (46%), with vulnerable road users (pedestrians, pedal cyclists, motorcyclists) collectively making up a further 49% (Figure 4).

Figure 4: Fatalities on England's roads by road user type (2013)



Source: DfT, 2014

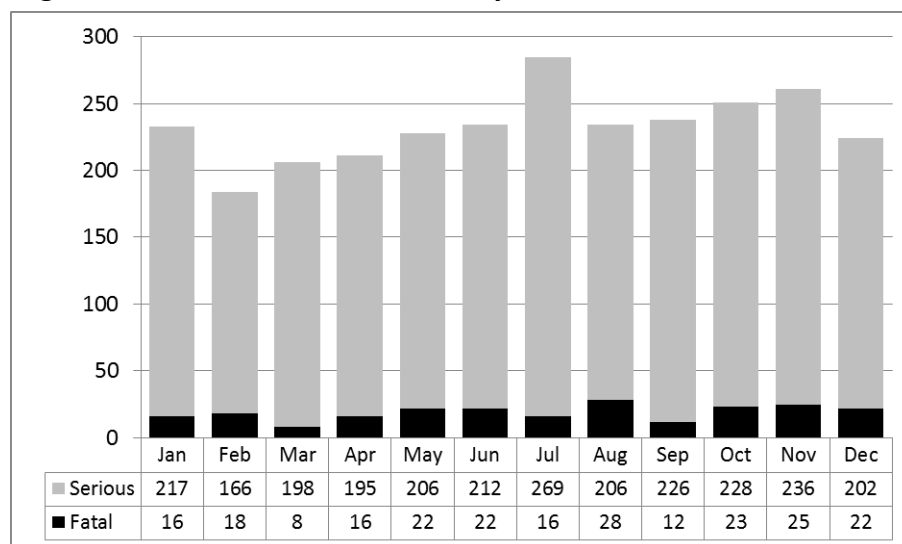
All four main casualty groups have seen a reduction in the fatality rate over the past decade, with car occupants seeing the biggest overall improvement in fatality rate. However, when

taking serious injury into account only car occupants have seen a continuous year on year decrease since 2005 while pedal cyclists have increased 14%

4. When do KSIs occur?

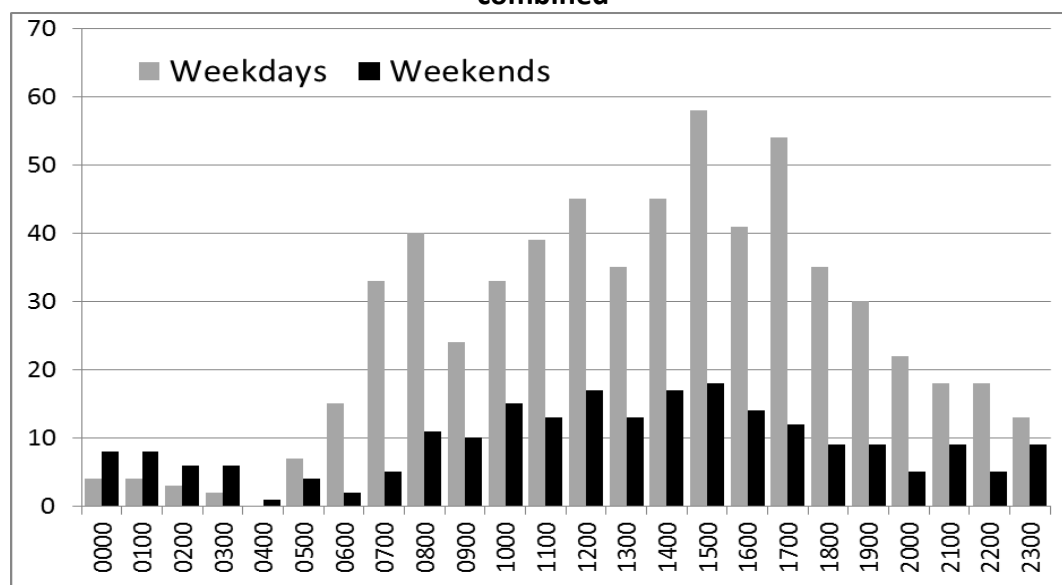
Between 2005 and 2013 July was the month that saw the greatest number of KSI casualties on East Sussex roads and Tuesday was the day of the week that saw the greatest number of KSI casualties on East Sussex roads (Figure 5).

Figure 5: East Sussex KSI collisions by month, 2005 to 2013 combined



Source: STATS19 data, Sussex Safer Roads Partnership, 2015

Figure 6: East Sussex KSI collisions by time for weekdays and weekends, 2011 to 2013 combined



Source: STATS19 data, Sussex Safer Roads Partnership, 2015

Collisions are more likely to happen on weekdays and during working hours with peaks at school and work leaving times (Figure 6).

5. Where do KSI's occur?

Figure 7 indicates that KSIs are not evenly distributed across the county with concentration of KSIs in urban areas

Figure 7: Location of KSI's in East Sussex 2011 to 2013

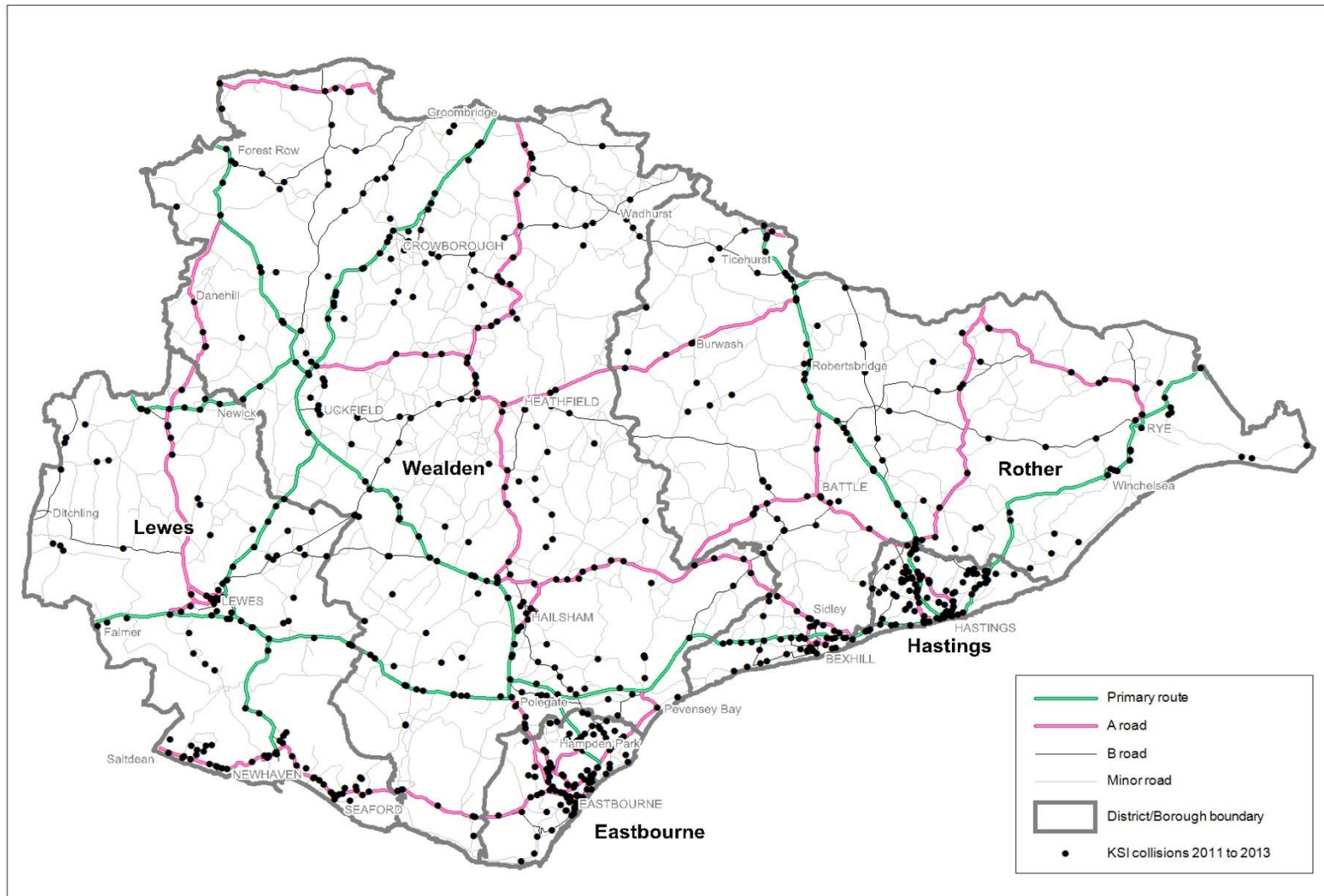
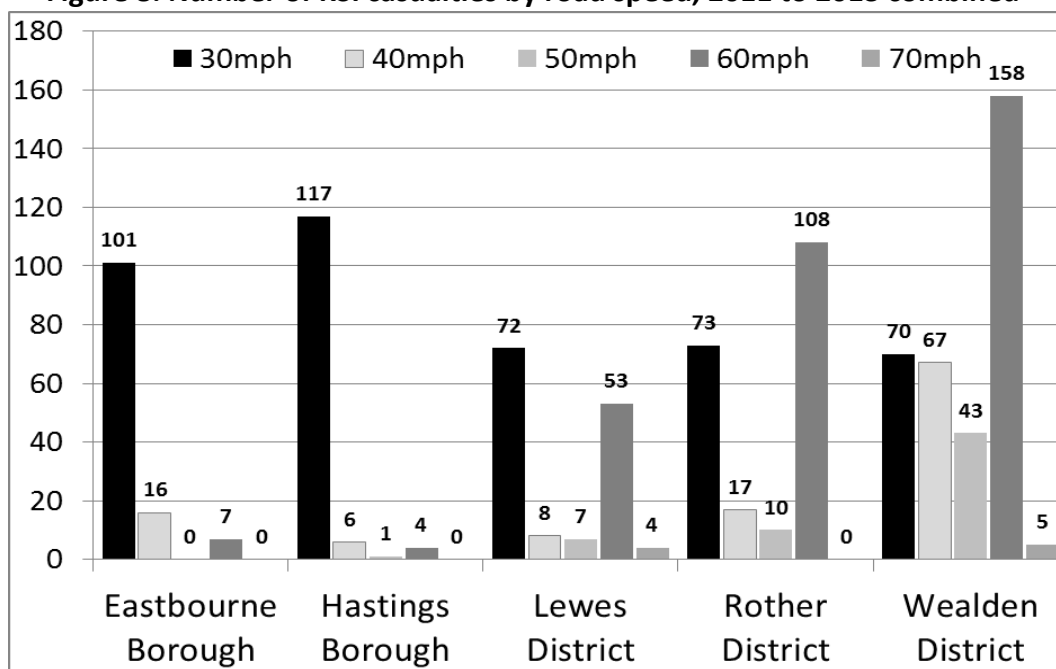


Figure 8: Number of KSI casualties by road speed, 2011 to 2013 combined

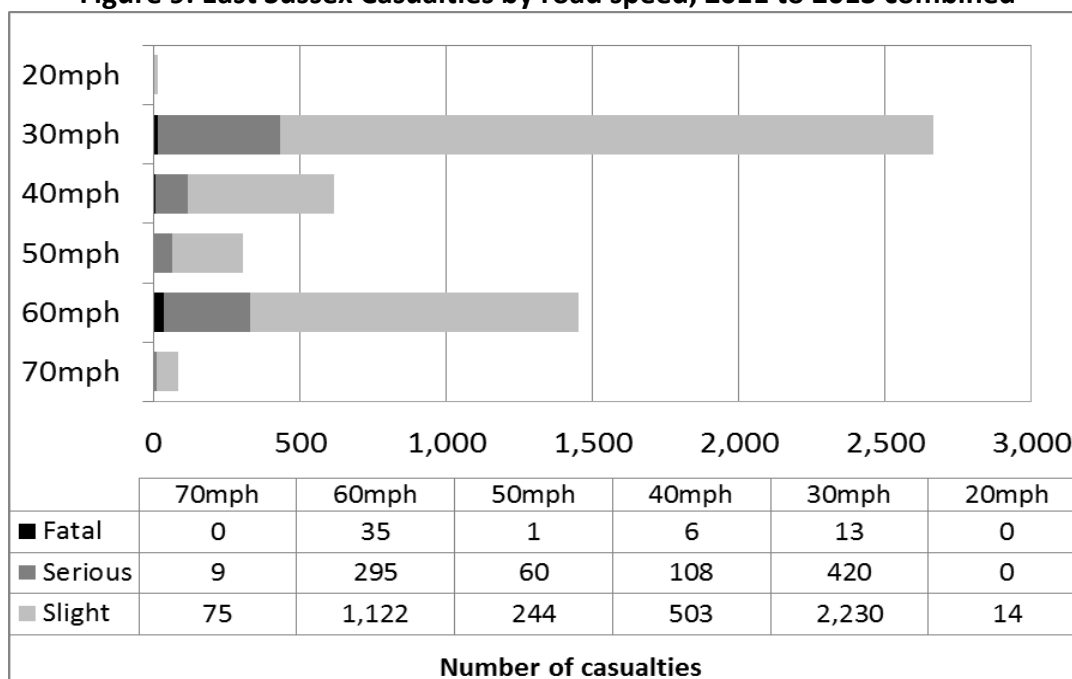


Source: STATS19 data, Sussex Safer Roads Partnership, 2015

KSIs in rural areas of the county are more likely to occur on roads with a higher speed limit, in particular 60mph plus and in urban areas on roads with a lower speed limit (figure 8).

Overall between 2011 and 2013 across the county around half of KSIs (46%) occur on roads with a speed limit of 30mph and 35% on 60mph roads, 12% on 40mph roads, 6% on 50mph roads and 1% on 70mph roads (figure 9).

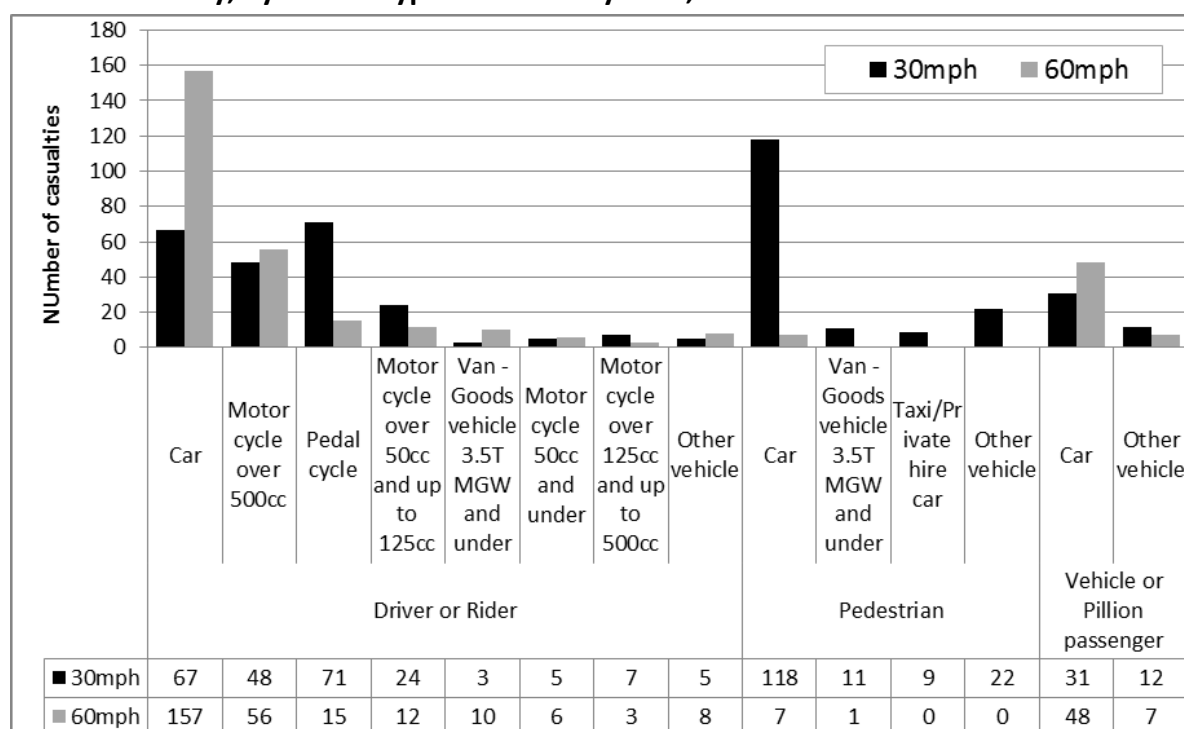
Figure 9: East Sussex Casualties by road speed, 2011 to 2013 combined



Source: STATS19 data, Sussex Safer Roads Partnership, 2015

For KSI casualties on 30mph roads between 2011 and 2013, 27% were pedestrians hit by a car, 16% were cyclists, 15% car drivers and 11% motorcycle riders (500cc+). These groups combined accounted for 85% of all casualties on 30mph roads. Pedestrians hit by a car tend to be younger particularly 10-19 year old and older 65 year plus age group. Cyclists in all age groups are involved in KSIs with higher levels in 15 to 24 and 45 to 54 age groups with significantly more male cyclists involved in KSI's.

Figure 10: East Sussex Number of KSI casualties for accidents in 30mph and 60mph areas only, by vehicle type and casualty class, 2011 to 2013 combined.



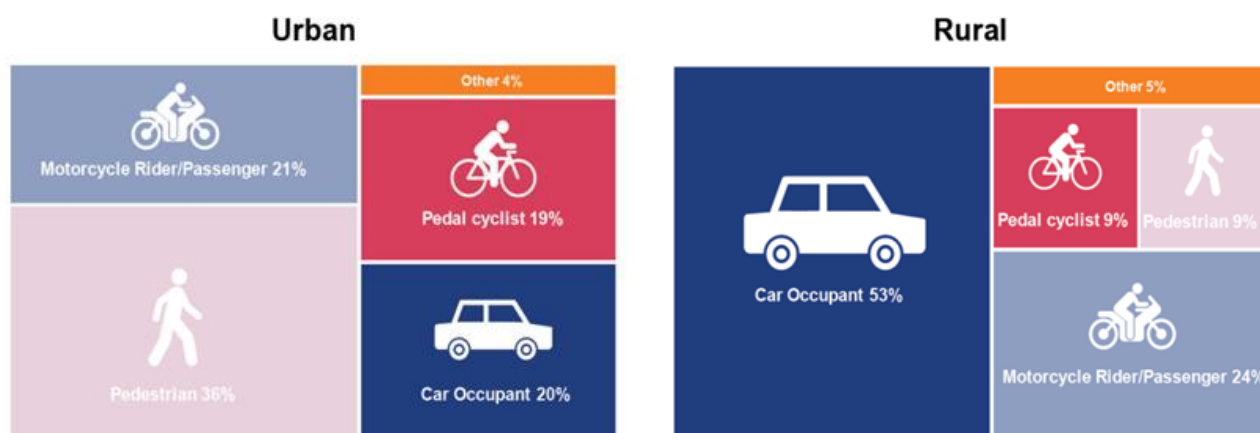
Source: STATS19 data, Sussex Safer Roads Partnership, 2015

For KSI casualties on 60mph roads between 2011 and 2013, 48% were car drivers, 17% motorcycle riders (500cc+) and 15% car passengers. These groups combined accounted for 85% of all casualties on 60 mph roads.

5.1 Rurality, road type and KSIs

In recent years, national non-motorway traffic has been split evenly between rural and urban roads. However, the two road types show markedly different casualty patterns. Whilst accidents are more likely on urban roads, accidents on rural roads are more likely to be fatal. Deaths are disproportionately likely to occur on rural roads (in 2013 rural roads carried 53% traffic but accounted for two thirds of road deaths). This equates to 1.7x increased risk on rural roads and 2x (2%) risk of fatal injury compared to urban roads. In contrast serious and slight injuries are more likely to occur on urban roads (43% traffic but 53% serious injury and almost two thirds of slight injuries).

Figure 11: Killed or Seriously injured casualties on urban and rural roads by road user type, GB, 2013



Source: DfT, 2014

Casualty types also differ between road user type (figure 11) with pedestrians accounting for a third of KSIs on urban roads compared to one in ten on rural roads. Over half KSIs on rural roads are car occupants.

6. Contributory factors for injury severity

There are many variables in a road traffic accident that will affect the injury severity of the people involved. These include factors related to the casualty (age, gender, biomechanical tolerance, seat-belt wearing, etc.), factors related to the vehicle (size, shape, impact speed, effectiveness of absorbing impact energy, etc.), and factors related to the wider environment (characteristics of the object hit, weather etc.). In addition to this, improvements in vehicle designs, the age/reliability of motor vehicles, emergency response procedures and medical treatments, and reductions in drink-and drug-related traffic accidents have contributed to reducing casualties during the last decade.¹⁴

The Department for Transport reports that decreases in casualty trends, both in likelihood and severity, are likely to be driven by a combination of: road safety education; improved vehicle and highway technology; reduction in speeds (evidence shows increased speed limit compliance and decreased average free-flow speeds) and improved post-accident care (e.g. major trauma centres).¹⁵

6.1 The effect of speed on injury severity

Speed is a major risk factor for road traffic collisions and the likelihood of severe injury is increased in relation to the speed of the traffic, with statistics from the Department of Transport suggesting excessive speed contributes to 12% of all injury collisions.¹⁶

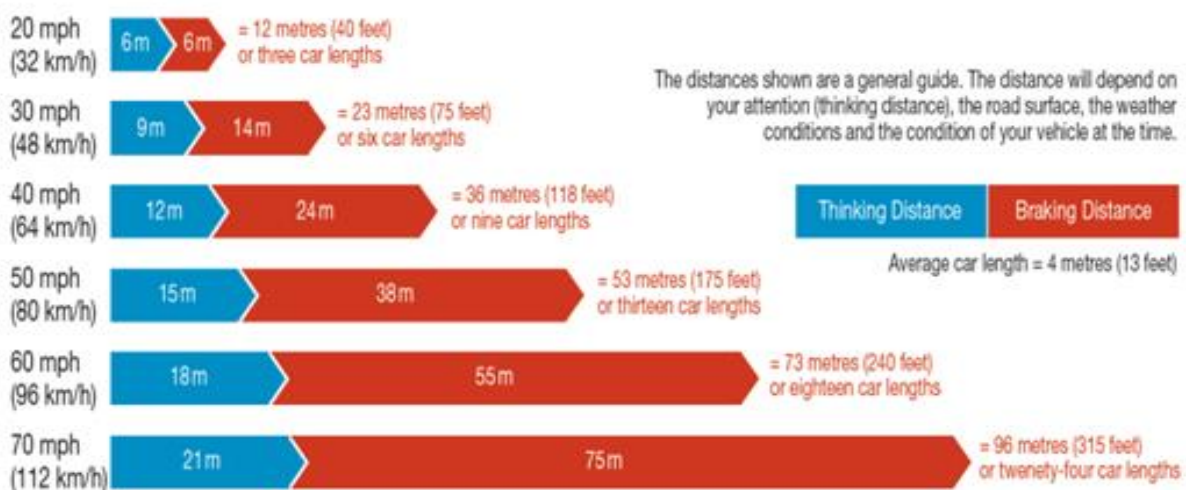
Irrespective of whether speed is a direct contributory factor to a collision, the collision severity is highly correlated with the vehicle speed at the moment of impact, due to higher momentum. On impact the majority of the change in speed will be incurred by any lighter crash 'opponent' – often the vulnerable road user or lighter vehicle. It is for this reason that even minor changes in impact speed can increase the risk of serious injury especially to

pedestrians.¹⁷ For vehicle-on-vehicle impacts, the change in velocity of the vehicles involved is generally accepted as the measure of speed that is most closely linked to injury severity.

Speed also has significant consequences for the environment and road safety, which are particularly felt in urban areas. Fast-moving motor vehicle are hazardous for pedestrians and cyclists; noise and fumes are a nuisance for both road users and others; and speeding traffic in residential streets can change their character from 'places' to 'thoroughfares'. On poorly laid-out rural roads excessive speeds increase the frequency and seriousness of crashes.¹⁸

Research shows that speed is a contributory factor in 27% of deaths from road accidents in Britain, with stopping distances trebling between 30 mph and 60 mph (Figure 12).¹⁹ Stopping distances also depend on the condition of the road. For example, at 37 mph the stopping distance required on a wet road is more than 25% greater than on a dry road.²⁰

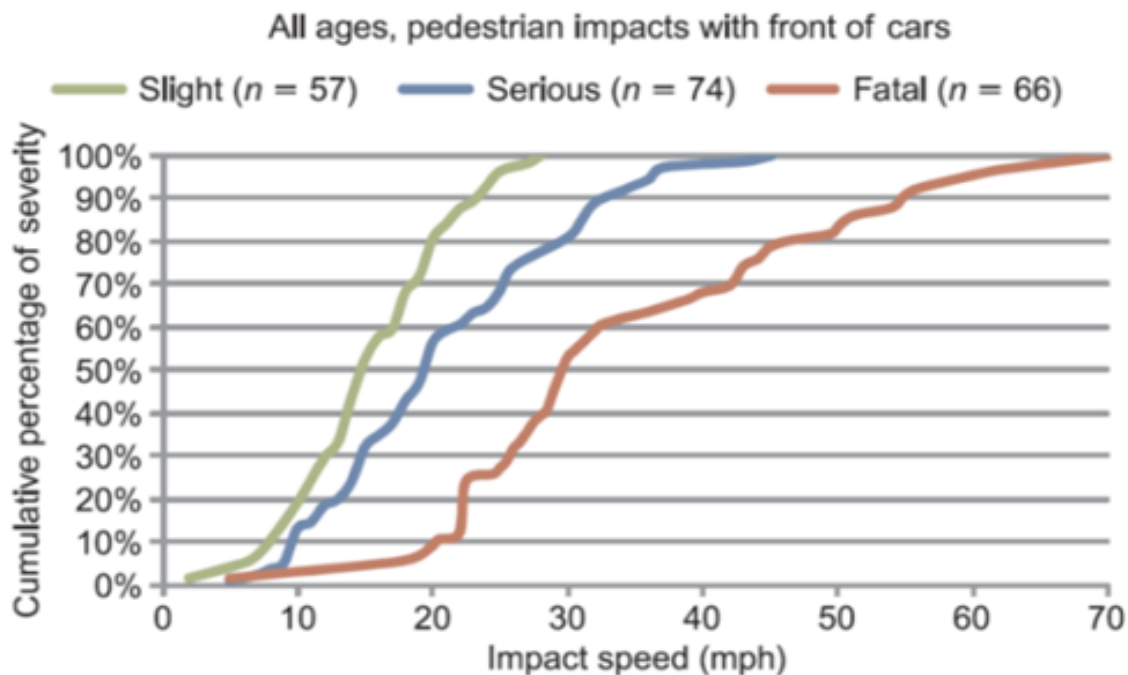
Figure 12: Stopping distance at different speeds (including reaction time of around one second)



Source: Directgov (2011)

Speed also affects the drivers visual field, which reduces as speed increases. For example at 25 mph a driver has a 100 degree field of vision, which reduces to around 30 degrees at over 80 mph.²¹ A 1.1km per hour reduction in average speed results in a 3% reduction in the number of accidents,²² rising to 6% in urban areas²³, but also a reduction in the severity of accidents, particularly for vulnerable road users such as pedestrians and cyclists.²⁴ Pedestrians have a 95% chance of surviving crashes at 20 mph (32 km/h) or less but less than a 50% chance of surviving a crash at speeds around 30 mph (48 km/h).^{25,26}

Figure 13: Impact of speed on severity of injury in pedestrians



A recent review of in-depth data from Great Britain for 2000-2009²⁷ found approximately half of the fatally injured pedestrians in the dataset were hit by the front of a car at an impact speed of 30 mph or less, compared to about 80% of serious injuries and all slight injuries (Figure 13). The review also found half of drivers fatally injured in a frontal impact were in an impact with a velocity change of 34 mph or less, compared to 24 mph or less for side impact, indicating that the risk of fatality dramatically increases for both pedestrian and car drivers at speeds of over 20 mph, and of serious injury at approximately 10 mph.

7. What can be done to address high rates of KSI?

7.1 National Guidance

7.1.1 National Institute for Health and Care Excellence (NICE)

In 2010, NICE published guidance on preventing unintentional injuries among under 15s²⁸ which contains strategic and workforce development recommendations for a variety of stakeholders, to support the implementation of tailored local approaches. A key recommendation is that partners including highway authorities, road safety partnerships, local authority children's services and local safeguarding children boards work together to co-ordinate unintentional injury prevention activities across local areas. The guidance also includes a number of recommendations focussing specifically on road safety:

- Maintaining and managing road safety partnerships and ensuring they draw on all available information to plan road injury reduction programmes.
- Carrying out local road safety reviews and consultations at least every three years and use to inform local initiatives.
- Aligning local child road safety policies across partners to ensure consistency in prevention.

- Promoting and enforcing speed reduction using signage, road design and engineering measures, as well as education and media campaigns to promote the benefits of safety initiatives – including 20 mph speed limits and zones. Where compliance is poor work with the police to educate and where necessary carry out enforcement activities.
- Involving the police in driver education initiatives and activities to reduce traffic speed.

Accompanying NICE guidance looking at preventing unintentional road injuries among under-15s: road design²⁹ includes recommendations on:

- How health professionals and local highways authorities can co-ordinate work to make the road environment safer
- Engineering measures to reduce vehicle speeds, in line with Department for Transport guidance
- Making routes commonly used by children and young people safer.

7.1.2 Public Health England

A 2014 report by Public Health England³⁰ identifies the increased risk to children and young people under the age of 25 years of road traffic injuries and the main actions that can be taken by local authorities and partners to impact on reducing injuries and deaths for this vulnerable group:

- Encouraging safe and active travel for children before and after school, as the largest numbers of child injuries occur between 8-9am and 3-7pm.
- Introducing 20 mph limits in priority areas as part of a safe system approach to road safety (which acknowledges humans make errors in traffic and road design is fundamental to preventing these errors). This should be supported with education, publicity, road engineering and enforcement.
- Developing a co-ordinated approach with strong local partnerships for prevention of traffic injury.

Drawing on what currently works in local areas, the report proposes a four step model to help build robust injury prevention strategies, identifying: the current local picture of road safety need; identifying an overall vision and coproduced plan to tackle traffic injury; establishing capacity and activities based on national evidence of effective action; and setting up monitoring and performance indicators to evaluate if actions are effective locally.

7.1.3 Department for Transport

The Department for Transport 2011 Strategic Framework for Road Safety³¹ includes a number of key themes for road safety:

- Making it easier for road users to do the right thing and going with the grain of human behaviour
- Better education and training for children and learner and inexperienced drivers
- Remedial education for those who make mistakes and for low level offences where this is more effective than financial penalties and penalty points

- Tougher enforcement for the small minority of motorists who deliberately chose to drive dangerously
- Extending this approach to cover all dangerous and careless offences, not just focused on speeding
- Taking action based on cost benefit analysis
- More local and community decision making from decentralisation and providing local information to citizens to enable them to challenge priorities
- Supporting and building capability by working with the road safety community on better tools to support road safety professionals.

7.2 Effective Interventions to reduce KSIs

In 2011 the Department for Transport (DfT) published an evaluation of local road safety initiatives across 14 local authorities (five county councils, four unitary councils, three metropolitan districts and two London Boroughs)³². Key areas of good practice include:

- **Good organisation** – across organisational structure, colocation of staff, and partnership working to ensure a safe system approach to area and route based interventions have all contributed to integrated interventions, enhanced knowledge and engagement of road users in relation to attitudes of risk behaviour. The safe system approach has involved a shift towards route-and area-based road safety investment, promoting a more holistic approach to delivery. This means assessment of road user risks is more embedded in road safety practice which has generated a wider understanding of causality and contributory factors in road traffic accidents, better targeted investment and intervention, and investment in road user engagement.
- **Strong partnerships** - Three adjacent local authorities worked in formal partnership to achieve a 40% reduction in motorcycle KSIs by 2009, compared with the 1994–98 baseline. This included: the more efficient production and dissemination of publicity material (coordinated through a single supplier); co-ordinated awareness campaigns; free training for a range of experience/skills, with nearly 200 motorcyclists trained during the first year; and the definition of priority motorcyclist routes, with enhanced signing for drivers.
- **Good use of evidence** – Multiple datasets were used to identify, define and mitigate risks for pedestrians, with information sources including Road Safety Audits, STATS19 data, consultation and engagement, and data from sustainable transport teams. Resulting interventions included: high visibility shopping bags for elderly pedestrians; pedestrian training at schools, including encouraging schools to take ownership of delivery; direct signalised crossing facilities to follow pedestrian desire lines; area-based speed limits, 20 mph zones and traffic calming; and information/education for children stratified by age (pre-school – targeting parent responsibilities; school age).
- **Effective marketing** - targeted social marketing interventions (particularly when preceded by consultative engagement activities such as social research) have been effective at changing the behaviour of specific at-risk road user groups. Engaging with local road users and communities throughout the design, delivery

and implementation of road safety engineering schemes has enhanced the support of local residents and politicians.

A key overall finding of the evaluation process was that the case study local authorities have highlighted that a clear understanding of local community and road user requirements can contribute to the design of comprehensive area-based treatments.

The Transport for London Road Safety Action Plan for 2020 uses the Haddon Matrix³³, (first developed over thirty years ago in the United States and later adopted by the World Health Organisation³⁴) as a framework for identifying the factors, other than the road user, which contribute to traffic collisions and injuries. The matrix divides a traffic collision into three phases: pre-crash, during the collision and post-crash: These are considered in relation to human, vehicle and environmental factors (Figure 14), allowing focus to be directed towards effective interventions to reduce casualty numbers and severities across each phase of a collision.

Figure 14: Indicative Haddon's Matrix

	Factor		
	Human	Vehicles and equipment	Environment
Pre-crash (crash prevention)	• Training • Education • Police enforcement (mobile phone use, drink and drugs) • Campaigns	• Road worthiness • In-vehicle recorders • Black box technology • Intelligent speed assistance • Brake assist • Anti-lock braking • Proximity sensors • Additional mirrors	• Road design • Road lighting • Safety cameras • Markings • Maintenance • Speed limits/zones • Pedestrian facilities
Crash (injury prevention during crash)	• Use of seat belts and other restraints	• Occupant restraints • Airbags • Crash-protective design • Personal protective equipment • Booster seats and baby carriers • Helmets	• Crash-protective objects • Roadside barriers • Anti-skid surfaces
Post-crash (life-sustaining)	• First aid • Access to medical care • Rehabilitation	• Ease of access • Fire risk • Cutting tools • E-call	• Quality of rescue facilities • Proximity to medical facilities and emergency services • Traffic congestion

Source: TFL, 2013

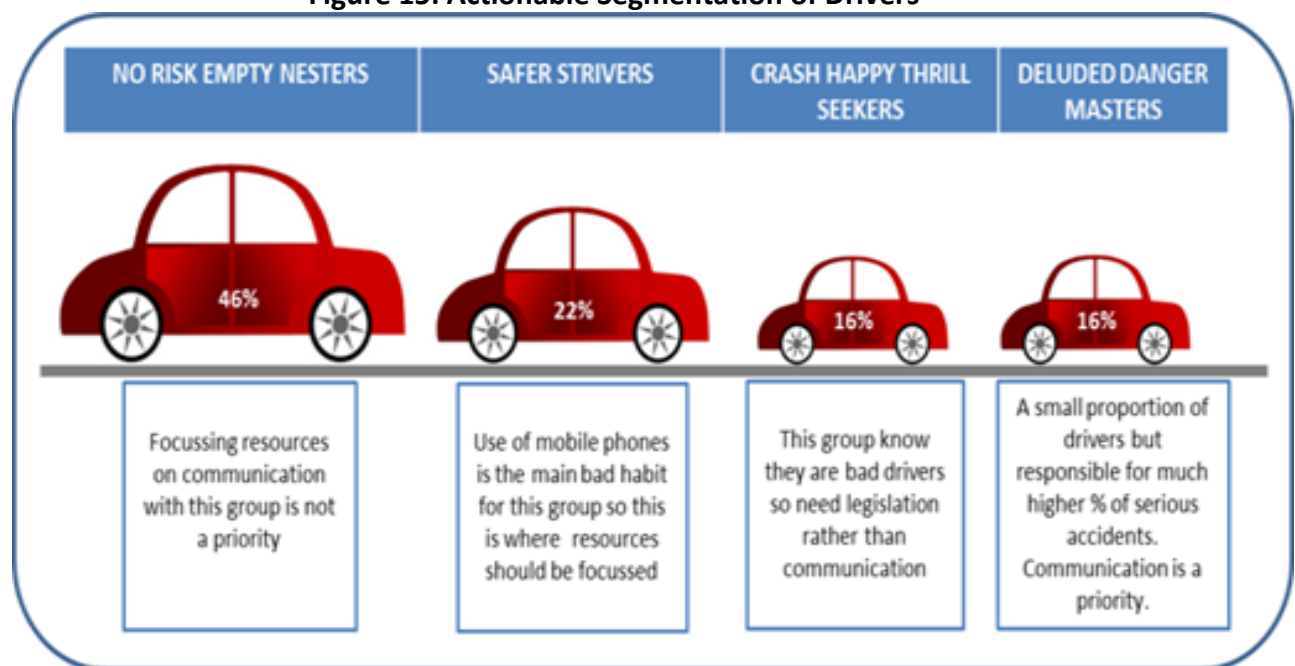
However, it needs to be noted that some of these interventions are tried and tested, while others are more innovative or less widely used and in order to select interventions sufficient local information is needed to understand what is occurring and why

7.2.1 Road Safety

The most recent UK social marketing road safety campaign is the DfT's THINK! which ran from 2000 to 2010 and, in combination with engineering and enforcement measures, contributed to meeting or exceeding DfT's road safety targets, with a 40% reduction in KSI and a 59% reduction in child KSI. However, an evaluation in 2009 of one of the THINK! Campaigns found that attitudes to speeding had not changed significantly pre and post campaign, indicating that a short-term campaign in isolation from other physical or enforcement initiatives will have little impact on driver attitudes to speeding.³⁵ The Think Road Safety Campaign argues that drivers are not a homogenous group and attitudes towards road safety are not purely a function of life stage: values, lifestyles and attitudes to risk all influence driving behaviour.

Four key groups emerged: no risk empty nesters; safer strivers; crash happy thrill seekers and deluded danger masters (figure 15). Understanding of these groups is needed for behaviour change by: building knowledge and awareness of the issue and choices available; nudging good behaviours by making it easier to do the right thing; understand and remove barriers, unknowns and complexities; change attitudes, values and beliefs³⁶

Figure 15: Actionable Segmentation of Drivers



Source: Adapted from Think Road Safety Campaign

7.2.2 Interventions on rural roads

In 2007 the DfT initiated a “rural road demonstration project”³⁷ to develop good practice to reduce KSIs on rural roads. The project looked for innovative interventions to address specific issues in Devon, Lincolnshire, Norfolk and Northamptonshire, and key findings included:

- Strategic planting at village entries reduced traffic speed (mean speed tended to reduce by about 1.5 per cent). (Norfolk)

- It appears that the removal of vegetation in order to remove roadside obstacles had the effect of increasing vehicles speeds. Although fairly slight, there was a clear shift of more vehicles driving at higher speeds. This result was statistically significant. (Norfolk)
- When reducing the speed limit from 60mph to 50mph on certain road sections, the 85th percentile vehicle speeds fell by around 3 mph. (Lincolnshire).
- A programme of enhanced verge maintenance on sections of the B1188 and A15 in Lincolnshire saw an increase in both vehicle speeds and collisions.

7.2.3 Interventions to reduce driving speed

7.2.3.1 Traffic Calming and Road Infrastructure

Road infrastructure developments and changes are important for reinforcing speed limits with road improvements designed in such a way to support the speed limit and ensure that if an accident does occur the network is ‘forgiving’ (where possible).³⁸ Traffic calming is defined as measures to reduce speed and hence improve safety, especially for vulnerable road users, including reduced speed limits or reduced speed zones (using road humps, mini roundabouts, cushions, school crossing patrols and marked paths for cyclists etc. to reduce traffic speed)³⁹. Speed humps are the most widely used form of traffic calming. Traffic calming measures have been found to reduce injuries in particular amongst children^{40,41,42}.

Traffic calming measures may also contribute to the reduction of health inequalities by encouraging the uptake of physical activity. For example more walking and cycling due to better road/pavement design and thus increased perceptions of safety, thereby overcoming some current barriers to active transport.⁴³ However, road infrastructure changes can take time and money, and there are some more temporary measures that can be used as a quick win, such as bollards and road marking. When infrastructure cannot be upgraded at reasonable costs to the standard required for the speed limit the appropriate action will be to reduce the speed limit.⁴⁴ However, evidence suggests that the success of traffic calming schemes may be limited or even have counter intuitive effects if these schemes do no focus on changes in the mentality of both drivers and residents towards roads and speed.⁴⁵

7.2.3.2 20mph speed limits

Guidance from the Department for Transport⁴⁶ outlines that considerations for setting local speed limits should include:

- A study of crashes, their severity, causes and frequency, together with a survey of traffic speeds, presence of vulnerable road users and consideration of concerns of local residents to indicate appropriateness of existing speed limit for the type of road. The reasons for a limit need to be apparent.
- Compliance with air quality limits in choice of speed limit where air quality limits are in danger of being exceeded (speed limits may not always be the solution).
- Consideration of whether the collision rate can be improved or wider quality of life objectives can be achieved through other speed management measures..

- Reasons for non-compliance of speed limit where poor compliance is evident. Enforcement should be considered only after the other measures and jointly with the police force.

Traffic authorities can, introduce 20mph speed limits or zones where mean speeds at or below 24 mph are already achieved over a number of roads and on: major streets where there are – or could be - significant numbers of journeys on foot, and/or where pedal cycle movements that outweighs the disadvantage of longer journey times for motorised traffic; and residential streets in cities, towns and villages, particularly where the streets are being used by people on foot and on bicycles, there is community support and the characteristics of the street are suitable. Where they do so, general compliance needs to be achievable without an excessive reliance on enforcement⁴⁷.

Many traffic authorities are now implementing 20 mph zones and 20 mph speed limits, and this is encouraged and supported by the Department for Transport (DfT). A 20mph zone uses traffic calming measures to slow vehicles down to speeds below the limit, and in this way the zone becomes “self-enforcing”. A 20mph limit is an area where the speed limit has been reduced to 20mph but there are no physical measures to reduce vehicle speeds within the areas other than repeater signs, thus 20mph limits are more cost effective to introduce over wider areas than 20mph zones. 20mph zones, particularly in residential areas significantly decrease the risk of being injured in a collision by reducing vehicle speeds^{48,49,50}. The Department for Transport⁵¹ has recently advocated 20 mph zones or limits in primarily residential areas and in towns or cities where pedestrians and cyclists are highly concentrated, such as around schools.

7.2.3.3 20mph sign-only initiatives (no additional traffic calming)

There are now 12m people living in cities in the UK where a 20mph limit is agreed for most lit streets, including Manchester, Oxford, Cambridge, Edinburgh, Liverpool, Bristol, Lancaster, York, Brighton and Hove and many London Boroughs.⁵² A trial in Scotland of 20 mph limits without traffic calming measures at 78 sites found reductions in speed and casualties, concluding that such limits offer a low cost option for promoting road safety.⁵³

There is little evidence available on the impact of reducing the default speed limit in residential areas across a town or city without traffic calming,⁵⁴ however the evidence that exists suggests that signs-only 20mph schemes need to be surrounded by sophisticated messages, incentives and sanctions to achieve lasting behaviour change.⁵⁵ Many drivers are ignoring sign-only 20mph limits which is why there is increasing interest in the potential application of socially derived behaviour change techniques (“soft” measures) such as social marketing to encourage drivers to lower speed.

7.2.3.4 Effectiveness of 20 mph limits

Evidence on 20mph limits is generally positive and typically there are small reductions in speed following their introduction, but being a more recent introduction to the UK, most schemes have so far only had a short follow-up period. However, 20mph limits are becoming more widespread across the UK, not only for speeding reasons but also to create healthier environments.⁵⁶ Evidence indicates 20mph limits and zones:

- **Reduce Road Traffic Accidents** – National evidence shows a correlation between the introduction of 20mph traffic zones and a reduction in road casualties,⁵⁷ with little adverse effect on surrounding areas⁵⁸. Research suggests that if speed limits were reduced to 20mph there would be a 67% reduction in child deaths and injuries a year⁵⁹, and if coupled with traffic calming measures they would be more effective in terms of casualty and speed reduction.⁶⁰ In Hull, a 20 mph limit is in place on a quarter of roads and overall injuries have declined by 60%, while child pedestrian injuries have declined by 74% with a 69% reduction in child cyclist crashes.⁶¹
- **Reduce Carbon Emissions** - Evidence suggests 20mph limits alongside traffic calming measures improve traffic flow which positively impacts on carbon emissions by allowing drivers to travel at a more constant speed, accelerate and decelerate less frequently and spend less time stationary.^{62,63}
- **Increase Physical Activity** - 20mph limits may positively contribute to increases in walking and cycling through making the roads safer and more accessible to cyclists⁶⁴.
- **Increase Mental Health** - Post-traumatic stress from motor vehicle accidents is an under-reported mental health effect of transport, with up to a quarter of survivors having psychiatric problems one year after an accident, and one third having clinically significant symptoms 18 months after. By reducing the risk of road accidents, 20mph speed limits and zones will have a positive impact on mental health⁶⁵.
- **Benefit communities** and strengthen social networks⁶⁶.

A 2014 systematic review of published evidence on the health effects of 20 mph limits supports these findings of 20 mph limits reducing accidents, injuries, traffic speed and volume, as well as increasing the perception of safety. The review also found evidence that such schemes were positively received by residents and road users. However, the impact on increased physical activity as a result was thought to be less clear, and none of the reviews studied focussed on impact of 20 mph on health inequalities⁶⁷. Limitations of a 20mph speed limit zone include: effectiveness on roads where speeds are not already low; initial financial cost implications; lack of police enforcement and negative public perception⁶⁸.

Latest guidance from the Royal Society for the Prevention of Accidents and Public Health England⁶⁹ recommends that local authorities should take advantages of opportunities to lower speed limits, and that evaluation of these schemes and monitoring of the outcomes will indicate if further work is needed to reduce traffic speeds. Other supportive interventions could be introduced alongside 20mph zones or limits and road safety education or publicity campaigns play an essential role in this.

7.2.4 Education

Speed limits should not be changed or introduced without adequate education and training about why the change has been made as research has shown speed awareness courses in particular to be effective in reducing reoffending rates⁷⁰. This is a recent shift in thinking as

previously educational interventions were assumed to be effective whereas now the burden of proof has shifted and educational interventions must demonstrate their effectiveness⁷¹.

7.2.5 “Soft” measures

Many drivers are ignoring sign-only 20mph limits which is why there is increasing interest in the potential application of socially derived behaviour change techniques (“soft” measures) such as social marketing to encourage drivers to lower speed. Research indicates behaviour change can be effectively influenced through⁷²:

- Education - Strong initial enforcement creates a powerful statement of intent: “everyone is serious about this” alongside a well-funded social norm campaign: “80% of people support 20 mph limits”
- Running positive information and PR stories in the media
- Engagement - Supporting appropriate community ‘behaviour change’ activities and create a feeling of confidence that there is a positive social consensus
- Encouragement - Using more, clear signs and reminders, with vehicle activated signs (particularly those with rewards such as smiley faces) thought to be effective but can have limited appeal-time.)
- Enforcement and enlightenment - Alongside community consensus in the majority of pilot areas is the need for there to be a visible enforcement strategy and greater leadership and vision from the Council and police, including visible organisational policies enforcing compliance for those in work vehicles, and more visible enforcement from the police force^{73, 74, 75}.

The literature shows that:

- Social norms can affect drivers’ speed choice. Research indicates that social norms are important influences on driver behaviour and can influence the choice of speed, for example, to match the perceived speed of others^{76,77,78,79,80,81};
- Organisational culture is important for influencing driver speed choice with compliance more likely where there is a strong culture of safety or zero tolerance towards speeding offences;
- Mass media/social advertising campaigns require high levels of resourcing and need to be sustained over a long period of time and coupled with engineering and enforcement changes to achieve behaviour change. The use of psychological models to underpin messages can be more effective than using fear tactics. Such messages should be positive, myth-busting, norming and should challenge the “just in my back yard” mentality⁸²;
- Opportunities for driver education are effective in raising awareness about the risks of speeding and offering practical solutions, but are limited in the UK and are not available for speeding in a 20mph area⁸³;
- Community interventions such as Community Speed Watch (volunteers carry out speed checks on their local roads) are reasonably well-established in rural areas but are less proven in urban areas where residents are concerned about potential confrontational situations with neighbours³⁷.

Analysis of 20mph scheme implementation in six locations (Graz (Austria), Portsmouth, Oxford, Warrington, Lancashire and Bristol) highlights that inadequate resource is given to the soft measures, or the measures that convince people they should adhere to 20mph. Overall evaluation of these areas suggests the scope for improved performance through the use of socially based behaviour change measures is considerable⁸⁴.

7.2.6 Compliance

Guidance suggests that there could be tougher enforcement measures with police involvement for those who choose to drive dangerously, and specifically where there is poor compliance with other methods of ensuring road safety as outlined above.⁸⁵ Research sponsored by the Government Office North West demonstrates that speed enforcement detection devices can reduce road traffic accidents (RTAs), stating that there is also evidence that increased policing for drink driving can have a beneficial effect on RTAs and fatalities.⁸⁶ Evidence and guidance⁸⁷ suggest the most effective interventions to reduce driving speed use a triangulation of methods: speed limits; signage and physical changes; aesthetically pleasing street design to promote feelings of safety; acknowledgement of drivers' needs; social marketing and publicity campaigns; and enforcement.^{88 89}

Wider benefits of interventions to address KSI's

Traffic speed also has important indirect benefits on health such as perception of road danger discouraging walking and cycling, two of the most important kinds of physical activity. This perception restricts social interactions, affects the quality of life, and can induce feelings of stress, particularly among older people.⁹⁰ Figure 16 illustrates the potential health-related outcomes from policy interventions:

Figure 16: Potential health-related outcomes from policy interventions

POLICY INTERVENTION	Promoting physical activity	Reducing crashes and road traffic injury	Reducing Air Pollution	Reducing Noise Pollution	Reducing greenhouse gas emissions	Increasing social inclusion	Improving access
Promotion of safe walking and cycling	+	+	+	+	+	+	+
Investment in infrastructure for safer walking and cycling	+	+	+	+	+	+	+
Travel planning and accessibility planning	+	+	+	+	+	+	+
Traffic-calming and speed reduction in residential areas	+	+	+	+	+	+	+
Enforcement of speed limits/ speed management	+	+	+	+	+	+	+
Reducing transport demand (e.g. promoting telecommunication)	+	+	+	+	+	+	+
Congestion charging (road pricing) and parking charges	+	+	+	+	+	+	+
Cleaner fuels and more efficient vehicles	0	0	+	0	+	+	0
Noise reduction	0	0	0	+	0	+	0
Safer cars (including safety for pedestrians)	+	+	0	0	0	+	0
Enforcement (e.g. seatbelts/ child restraints)	+	+	0	0	0	+	0
+ Policy intervention likely to lead to positive health related outcomes 0 Policy intervention not likely to lead to health related outcomes							

Source: SEPHO, 2008, adapted from Racioppi, 2004

Breen⁹¹ neatly summarises the main health benefits of road injury prevention schemes:

“The health sector bears a large part of the socioeconomic burden of road injury. It would benefit from better road injury prevention in terms of fewer hospital admissions, reduced severity of injuries and, in the event of safer conditions for pedestrians and cyclists, health benefits from more walking and cycling.”

The 2010 Marmot report “Fair Society, Healthy Lives”⁹² states that Lowering speed limits improves quality and access for active travel and improves safety for pedestrians and cyclists. The effects of road injuries on wider public health burdens is expected to become increasingly important in coming years as the transport infrastructure is further developed

Conclusion

Rates of people Killed and Seriously Injured on the roads in East Sussex have been higher than the England average for many years. The features of KSIs are different across the county with rural areas having higher proportion of KSIs on higher speed roads involving car occupants and urban areas having a higher proportion of accidents on 30mph roads involving pedestrians. Actions to address KSIs will necessarily need to be adapted according to the specific causality and factors which impact on severity of outcome influencing factors e.g. speed.

1 www.parliament.uk (accessed Oct 2014) Select committee on Transport Eleventh Report: Progress towards the 2010 targets

2 The Accidents Sub-Objective, TAG Unit 3.4.1, April 2011. Department for Transport. Transport Analysis Guidance (TAG)

3 Transport for London (2013) Safe Streets for London. The Road Safety Action Plan for London 2020

4 Department for Transport August 2014) Reported KSI casualties by region, local authority and road user type, England, 2013 Table RAS30043

5 Department for Transport. Reported road casualties. Great Britain: 2008. London: Transport Statistics, 2009.

6 World Health Organization. Socioeconomic differences in injury risks. A review of the findings and a discussion of potential countermeasures. Geneva: World Health Organization, 2009.

7 Wood J et al (2006) Where wealth means health. Illustrating inequality in the North West. Liverpool: Centre for Public Health,

8 Edwards P et al. Serious injuries in children: variation by area deprivation and settlement type. Archives of Disease in Childhood, 2008, 93:485-489.

9 Lyons RA et al. Socioeconomic variation in injury in children and older people: a population based study. Injury Prevention, 2003

10 Ogden EJ, Moskowitz H. Effects of alcohol and other drugs on driver performance. Traffic Injury Prevention, 2004, 5(3):185-198.

11 ROSPA. (2012) 20 mph zones and speed limits.

12 NICE. Preventing unintentional road injuries among under-15s.

NICE Public Health Guidance 31, 2010. guidance.nice.org.uk/ph31.

<http://www.nice.org.uk/guidance/ph31/resources/guidance-preventingunintentional-road-injuries-among-under15s-pdf>.

13 Wang, J., Poulter, D. R. and Purcell, C. (2011), Reduced Sensitivity to Visual Looming Inflates the Risk Posed by Speeding Vehicles when Children Try to Cross the Road, *Psychological Science*, 22, 4, 429–434. <http://pss.sagepub.com/content/22/4/429.abstract>

14 Department for Transport (Sept 2014) Reported Road Casualties Great Britain: 2013 Annual Report

15 Department for Transport (Sept 2014) Reported Road Casualties Great Britain: 2013 Annual Report

16 South East Public Health Observatory (SEPHO) (2008) Choosing Health in the South East: Road Transport and Health

17 RAC foundation (2012) Speed Limits: A review of the Evidence

18 RAC foundation (2012) Speed Limits: A review of the Evidence

19 RAC foundation (2012) Speed Limits: A review of the Evidence

20 OECD/ECMT (Organisation for Economic Cooperation and Development/European Conference of Ministers for Transport) (2006) Speed Management.

21 OECD/ECMT (Organisation for Economic Cooperation and Development/European Conference of Ministers for Transport) (2006) Speed Management.

22 World Health Organisation (2000) Transport, Environment and Health

23 Taylor, Lynam and Baruya, (2000) The Effects of Drivers' Speed on the Frequency of Road Accidents

24 World Health Organisation (2000) Transport, Environment and Health

25 Breen, J. (2004) Education and Debate: Road Safety Advocacy. In *British Medical Journal*, 2004; 328:888–90

26 RoadPeace 20 mph default speed limit: good for children, cyclists and the planet, by RoadPeace Website: Dedicated to supporting road crash victims.

27 Department for Transport (Sept 2010) Road safety Web Publication No. 16 – Relationship between Speed and Risk of Fatal Injury: Pedestrians and Car Occupants

28 NICE. Strategies to prevent unintentional road injuries among under-15s.. (2010) NICE Public Health Guidance 29, 2010.

29 NICE. Preventing unintentional road injuries among under-15s: road design. NICE Public Health Guidance 31, 2010. guidance.nice.org.uk/ph31.

30 Public Health England (2014) Reducing unintentional injuries on the roads among children and young people under 25 years

31 Department for Transport (2011) Strategic Framework for Road Safety May 2011

32 Department for Transport (2011) Road Safety research report no 124 – delivery of local road safety

33 Haddon Jr W. The changing approach to the epidemiology, prevention, and amelioration of trauma: the transition to approaches etiologically rather than descriptively. *American Journal of Public Health*, 1968, 58:1431–1438.

34 World Health Organisation (2004) World report on road traffic injury prevention

35 Department for Transport (2009) THINK! Road Safety Campaign Evaluation Post Stage: 'Live With It' speed campaign and Motorcycle campaign, BMRB Social Research, April 2009

36 Gina Banns Social marketing and behaviour change presentation. Oxford Social Marketing

37 Department for Transport (Dec 2010) Taking on the rural road safety challenge

38 Department for Transport. Local transport note 01/07. Report, 2007. London: The Stationery Office (TSO).

39 Department for Transport. (2012) Setting local speed limits. Draft report

40 Towner E, Mytton J. The prevention of unintentional injuries in children. *Paediatrics and Child Health*, 2009, 19:517–521.

41 Jones SJ et al. Traffic calming policy can reduce inequalities in child pedestrian injuries: database study. *Injury Prevention*, 2005

42 Bunn F et al. Area-wide traffic calming for preventing traffic related injuries. *Cochrane Database of Systematic Reviews*, 2003. Issue 1, Art. No. CD003110. DOI: 10.1002/14651858.CD003110.

43 Carver A, Timperio A, Crawford D. Playing it safe: the influence of neighbourhood safety on children's physical activity—a review. *Health Place* 2008;14(2):217–27.

44 RAC foundation (2012) Speed Limits: A review of the Evidence

45 Cairns et al (Sept 2014) Go slow: an umbrella review of the effects of 20 mph zones and limits on health and health inequalities. In *Journal of Public Health*

46 Department for Transport. (2012) Setting local speed limits.

47 Department for Transport. (2012) Setting local speed limits.

48 Bunn F, et al. Area-wide traffic calming for preventing traffic related injuries. *Cochrane Database of Systematic Reviews*.

49 Dorling D. (2014) 20mph Speed Limits for Cars in Residential Areas by Shops and Schools, in "If You Could do Just One Thing. . . : Nine Local Actions to Reduce Health Inequalities". London: British Academy, 2014

50 Morrison D, Petticrew M, Thomson H. What are the most effective ways of improving population health through transport interventions? Evidence from systematic reviews. *J Epidemiol Community Health*, 2003;57:327–33.

51 Department for Transport. (2012) Setting local speed limits. Draft report, 2012.

52 http://www.20splentyforus.org.uk/its_time_for_20.htm

53 Burns A, Johnstone N, Macdonald N. 20mph speed reduction initiative. Scottish Executive Central Research Unit, 2001.

54 Pilkington (2009) Lowering the default speed limit in residential areas: opportunities for policy influence and the role of public health professionals

55 Toy (2012) Delivering soft measures to support signs-only 20mph limits Report on research findings. University of Bristol

56 ROSPA and PHE (2013) Delivering Accident Prevention at local level in the new public health system Part 2: Accident prevention in practice Case Study 20mph zones and speed limits

57 Grundy, C., Steinbach, R., Edwards, P., Green, J., Armstrong, B., Wilkinson, P. (2009) Effect of 20 mph traffic speed zones on road injuries in London, 1986-2006: controlled interrupted time series analysis, in *British Medical Journal* 2009;339:b4469 doi:10.1136/bmj.b4469.

58 Department of Environment, Transport and the Regions (1996) Review of traffic calming schemes in 20 mph zones. London: DETR,

59 Health Development Agency, (2003) Prevention and reduction of accidental injury in children and older people

60 Atkins (2009) Interim Evaluation of the Implementation of 20 mph Speed Limits in Portsmouth, a report commissioned by the Department for Transport.

61 House of Commons Transport Committee (2008) Ending the Scandal of Complacency: Road Safety beyond 2010. Eleventh Report of Session 2007-08

62 London Assembly (2009) Transport Committee Braking Point: 20mph Speed Limits in London. Greater London Authority.

63 Department for Transport (2009) Calls for Comments on revision of DfT's speed limit circular. Road user safety division, December

64 London Assembly (2009) Transport Committee Braking Point: 20mph Speed Limits in London. Greater London Authority.

65 World Health Organisation (2009) Health Effects of Transport

66 Hart J and Pankhurst G., 2011. Driven to excess: Impacts of motor vehicles on the quality of life of residents of three streets in Bristol, UK. *World Transport Policy and Practice*, 17/2: 12-30

67 Cairns et al (Sept 2014) Go slow: an umbrella review of the effects of 20 mph zones and limits on health and health inequalities. In *Journal of Public Health*

68 Department for Transport and Parliamentary Under Secretary of State, 2013. *Setting local speed limits* (Ref: DfT 01/2013). London:DfT

69 ROSPA and PHE (2013) Delivering Accident Prevention at local level in the new public health system Part 2: Accident prevention in practice Case Study 20mph zones and speed limits

70 Fylan et al (2006) Effective Interventions for Speeding Motorists. Road Safety Research Report No 66. DfT

71 McKenna (2010) Education in Road Safety: Are we Getting it Right? RAC Foundation

72 Toy (2012) Delivering soft measures to support signs-only 20mph limits Report on research findings. University of Bristol

73 Toy (2012) 20mph: The word on the street.

74 Tapp (2012) How can social marketing help the 20mph cause. Bristol Social Marketing Centre

75 Mackie A. Urban speed management methods. TRL 363. Crowthorne: Transport Research Laboratory. 1998.

76 Arthur R M (2011) Examining Traffic Flow and Speed Data: Determining Imitative Behavior,"Traffic Injury Prevention,

77 Fleiter J L, Lennon A and WatsonB (2010) How do other people influence your driving speed? Exploring the 'who' and the 'how' of social influences on speeding from a qualitative perspective, *Transportation Research Part F* 13 (2010) 49–62

78 Aberg L, Larsen L, Glad A and Beilinson L (1997) Observed Vehicle Speed and Drivers' Perceived Speed of Others, *Applied Psychology: An International Review*, 46 (3). 287-302

79 Fuller, R., Bates, H., Gormley, M. and Hannigan, B. (2008) The Conditions for Inappropriate Speed: A review of the literature 1995–2006. Department for Transport

80 Transport Scotland (2013) Prolific Illegal Driving Behaviour: A Qualitative Study

81 Fleiter, Lennon and Watson (2010) How do other people influence your driving speed? Exploring the 'who' and the 'how' of social influences on speeding from a qualitative perspective *Transportation Research Part F* 13 (2010) 49–62

82 Toy (2012) Social Marketing of 20mph presentation. Sustrans

83 Toy (2012) Delivering soft measures to support signs-only 20mph limits Report on research findings. University of Bristol

84 Toy, Tapp and Musselwhite (2013) Can social marketing make 20mph the new norm?

85 NICE. Preventing unintentional road injuries among under-15s: road design. NICE Public Health Guidance 31, 2010. guidance.nice.org.uk/ph31.

86 Wood et al (2010) Road Traffic Accidents – A review of evidence for prevention from the UK focal point for violence and injury prevention

87 Department for Transport (2013) Setting local Speed limits – Circular 01/2013

88 Cairns et al (Sept 2014) Go slow: an umbrella review of the effects of 20 mph zones and limits on health and health inequalities. In *Journal of Public Health*

89 Wood et al (2010) Road Traffic Accidents – A review of evidence for prevention from the UK focal point for violence and injury prevention

90 Crombie, H. (2002) the impact of transport and road traffic speed on health. Health Development Agency, 2002.

91 Breen, J. (2004) Education and Debate: Road Safety Advocacy. In *British Medical Journal*, 2004; 328:888–90

92 Marmot, M. (2010) Fair Society, Healthy Lives: The Marmot Review. Strategic review of Health Inequalities in England post 2010.