Road Risk and Vulnerable Road User Working Paper

Working together, towards roads free from death and serious injury

MAYOR OF LONDON

TRANSPORT FOR LONDON
EVERY JOURNEY MATTERS

Contents

1 Purpose of the Document

The purpose of this document is to provide a summary of the work undertaken by Transport for London to further its understanding of the level of risk experienced by road users in London. This analysis in this document has helped to inform and determine the actions in *Safe Streets for London* (SSfL) and will continue to be influential in the ongoing delivery of the plan, and daughter documents of it, through reducing risk on London's roads.

The document is also intended as a resource for road safety practitioners, providing greater detail on the methods used by TfL, and to help practitioners determine how to focus actions and interventions arising from SSfL and their local priorities.

Section 3 provides an overview of the road user risk analysis. The aim of this analysis is to utilise existing data sources to understand the number of casualties experienced by different road user groups for every billion kilometres travelled on London's streets. By determining whether there are particular user groups who are at greater risk than others, or particular locations with a greater casualty rate than those around them, we can identify priority areas or groups for intervention. The priorities identified in this document are picked up as focal points for action in *Safe Streets for London*.

Pedestrians, pedal cyclists and motorcycle riders, who are vulnerable road users (VRUs), have been identified as a key target group and Section 4 of this document provides a more detailed analysis of the how they come to be injured on London's streets. This includes further analysis of risk and detailed *conflict analysis* which provides insight into the circumstances around collisions.

2 About the data

The analysis in this working paper was undertaken using existing datasets available to Transport for London. The primary sources of data were STATS19 for collision and casualty data and the London Travel Demand Survey (LTDS) for information on travel by different road user groups in London. By combining these datasets, it is possible to calculate road user risk, described in more detail in Section 3.1. To help explain the emerging trends, further data is drawn from previous TfL studies.

All the data sources are described in greater detail below.

2.1 STATS19

Road collisions on the public highway in Great Britain, reported to the police and which involve human injury or death, are recorded by police officers onto a STATS19 report form[1]. The form collects a wide variety of information about the collision (data types include time, date, location, road conditions etc) together with the vehicles and casualties involved and contributory factors to the collision (as interpreted by the police). The form is completed at either the scene of the collision, or when the collision is reported to the police.

The STATS19 data is the only national source to provide detailed information on collision circumstances, vehicles involved and resulting casualties and is the most detailed and reliable single source on collisions that can be used for longitudinal research in Great Britain. However, there are some important limitations to this dataset.

Firstly, it only records collisions which were reported to police. Not all collisions are reported because there are people who either do not know they should report injury collisions or decide not to do so[2]. Reporting rate varies by location, mode of travel and severity of injury[3]. This means there is some risk of reporting bias when using STATS19 to compare across such dimensions.

Secondly, many of the data items are down to the judgement of the police officer. This is particularly the case with contributory factors. The police officer has a selection of contributory factors of which they may choose up to six which they believe to be relevant to the collision. Certain factors are impossible or inappropriate to establish at the scene, particularly in cases when a casualty is seriously injured or killed or there are no witnesses. Contributory factors are also quite subjective and

[1] http://assets.dft.gov.uk/statistics/series/road-accidents-and-safety/stats19-road-accident-injury-statistics-report-form.pdf

[2] There are certain circumstances in which the accident does not need to be reported. For example, if correct documents are produced to an authorised person at the time of the accident, or details exchanged between involved parties, even if there is personal injury involved.

[3] Ward, H. and Robertson, S. and Lester, T. and Pedler, A. (2002) Reporting of road traffic accidents in London: matching police STATS19 with hospital accident and emergency department data. Transport Research Laboratory: London, UK.

their use may vary over time or between individual police officers. Furthermore, if a police officer does not attend the scene, this will affect their ability to assign factors.

STATS19 data is also used as the basis for other derived datasets such as conflict analysis and Traffic Accident Diary System (TADS).

2.2 London Travel Demand Survey (LTDS)

Travel demand data for this working paper is sourced from the LTDS. London residents account for about three-quarters of all travel in London. The personal (i.e. not including business trips, but including commuting trips) travel behaviour of Londoners over the age of five is surveyed in-depth annually through TfL's LTDS survey. Results from this survey provide essential information about how Londoners use the transport system - the reasons why they travel, when, where and how, and the ways in which their socio-demographic characteristics are related to the travel choices they make. It can therefore provide a unique window on the travel needs of Londoners, and their likely responses to a range of potential policies. The survey is organised on a rolling annual basis, with a sample size of about 8,000 London households each year. Interviews and one-day travel diaries are conducted with all members of each household. Data is available back to 2005/6.

The sampling approach described above means that LTDS does not include non commuting related business travel, travel by visitors to London, tourists, commuters from outside London, or any children under five.

2.3 Other data sources

In addition to the primary sources of data described above, there are many other sources of information on safety and travel on London's roads.

TfL and DfT collect transport data including speeds and flows of different vehicle types. As the availability of such data increases, it is becoming an increasingly valuable resource, not only to help understand the safety implications of different traffic conditions but also to measure network performance and to provide context for collision data.

Fatal collisions are investigated in great detail and the findings recorded in Police Fatal Collision Files. The police files include:

- Accident investigators' reports;
- Witness statements;
- Police summaries;
- Vehicle examiners' reports;
- Post-mortem reports;
- Scene photographs and plans; and
- Other expert evidence.

The data provides information to enable the study of the circumstances and contributory causes as well as the potential countermeasures.

In addition to ‘raw’ data, there is a wealth of published literature on road safety and past studies including those commissioned by TfL. In addition to the data sources mentioned above, these include observational studies of road user behaviour, interviews with road users and stakeholders and many other data collection methods.

3 Road User Risk in London

3.1 Calculating risk

Road safety analysts have traditionally focussed on casualty and collision numbers as key indicators of safety and to prioritise interventions. Figure 1 shows that as Killed and Seriously Injured casualties have reduced in the last two decades in absolute terms VRUs now represent a higher proportion of these casualties.

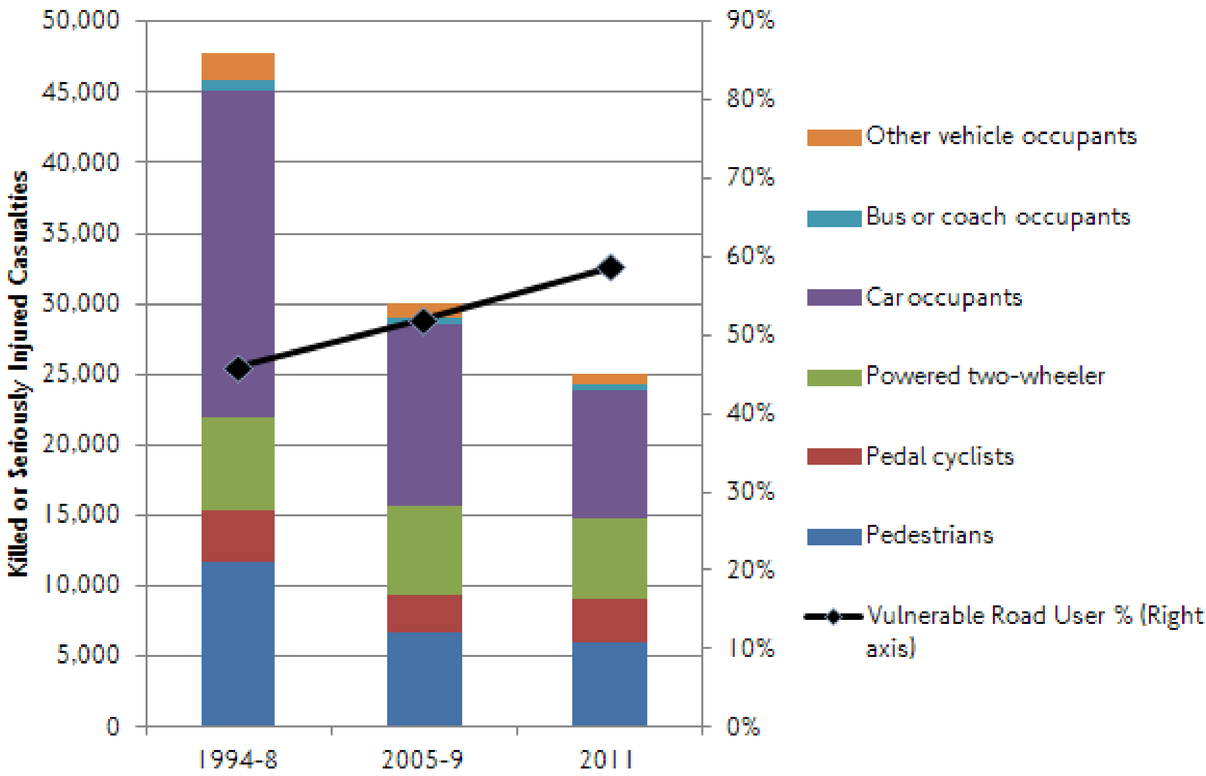


Figure 1. Killed and Seriously Injured casualties in London by road user category

Whilst it is important to focus on absolute numbers – as they directly reflect the suffering and loss of life associated with road collisions – it is also important to view those numbers in the context of overall travel patterns across the Capital. The findings from the following analysis informed the actions in SSfL and indentifies those groups most at risk of injury on London's streets.

The approach taken in this working paper has been to calculate the number of casualties per billion kilometres of travel, in other words, a casualty rate. The casualty rate provides an indication of the risk associated for different road user groups. Road users in a group experiencing 100 casualties per billion kilometres are at a lower risk than those in a group experiencing 1,000 per billion kilometres.

To calculate risk, collision and casualty data from STATS19 was combined with detailed journey data from the LTDS[4]. Using this combined dataset it is possible to calculate the average number of casualties per billion kilometres for a huge range of population groups, locations, user types and other factors. Note that because LTDS only covers personal (i.e. not for business) travel by London residents aged five and above, the combined dataset also has these limitations. Therefore the risk values quoted do not include business travel or travel by visitors to London, tourists or commuters from outside London.

The measurements of risk have a level of uncertainty and are therefore presented with a confidence interval (explained further on page 12). The reason for this uncertainty is two-fold. Firstly, collisions are statistically random occurrences; the more collisions we observe, the more confident we can be that we are observing an underlying trend and not a temporary fluctuation. Secondly, the LTDS is based on a sample of households; there will inevitably be some degree of error when inferring information about all of London from such a sample. The larger the number of journeys recorded for a particular mode or age, the more confidence we have in that data.

3.2 Applying risk data

The combined LTDS and STATS19 dataset has been used to calculate an average risk rate for the mode of travel, age, gender, ethnicity, location, time of day, day of week and month. All figures quoted are for the period April 2008 - March 2011 unless otherwise stated. By investigating patterns in risk across these factors, it is possible to answer questions such as “is driving at night more dangerous” or “is there a difference in risk experienced by male and female cyclists”. The ability to answer such questions is fundamental in taking an effective evidence-led approach to improving safety for road users in London. In this section, the key trends in risk are explored and priority groups are identified in this working paper.

3.3 Putting risk in perspective: Road user group risk-incidence quadrants

Levels of risk need to be applied to other information to identify groups, locations and behaviours for intervention. Considering how many casualties can be saved through interventions is also important. If a group has high risk but accounts for an extremely small number of casualties then, even if an intervention substantially reduces risk, the reduction in the number of casualties will be small. Nevertheless, the benefit to those individuals in this group may still justify intervention.

[4] Note that LTDS does not provide the specific route or distance of a journey, only the start and end and an approximate travel time. To calculate distance and partition it into geographic areas, a simple algorithm was developed which adjusts and scales the straight line distance between the start and end of a trip and splits each journeys distance across the geographic areas (boroughs).

Using an approach considering the levels of risk and the numbers of casualties, groups can be positioned in one of four quadrants, shown in Figure 2.

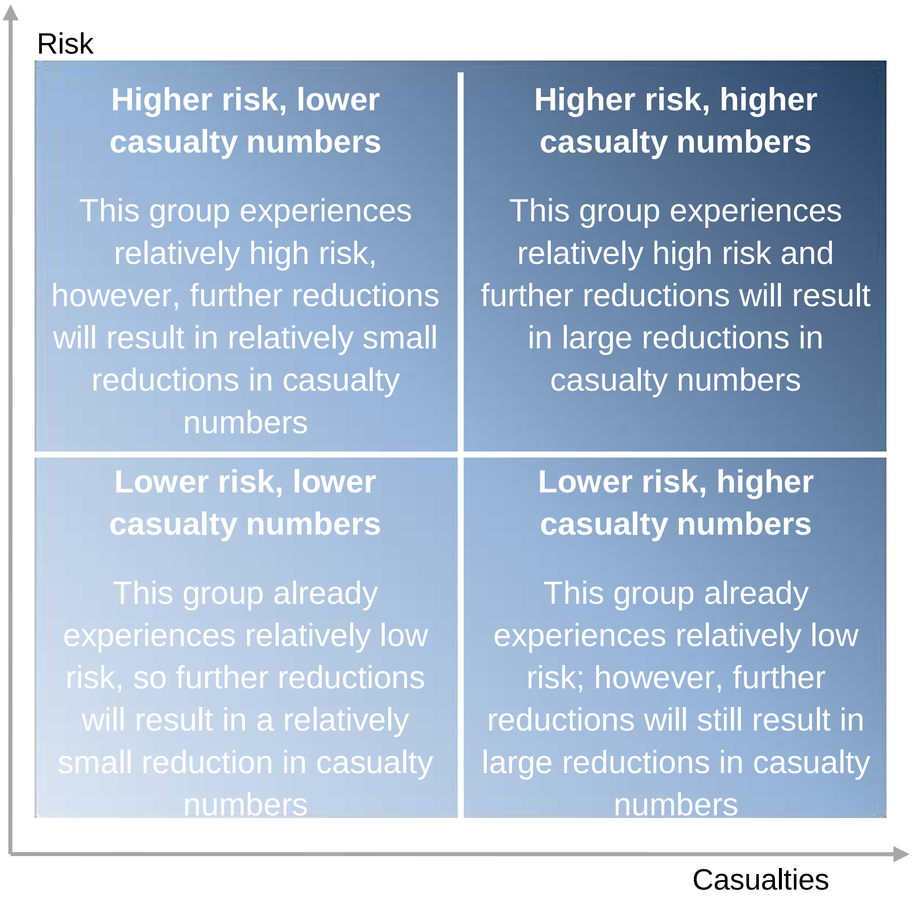


Figure 2. Risk and casualty numbers quadrants

3.4 Road user groups risk-incidence quadrants

Different road user groups experience very different levels of risk on London's roads as shown on risk-incidence quadrants in Figure 3. The vertical divider corresponds to the mean number of KSI casualties and the horizontal divider to the combined KSI casualty rate. Risk and KSI casualty numbers are highest in the top right hand corner of the chart and lowest in the bottom left.

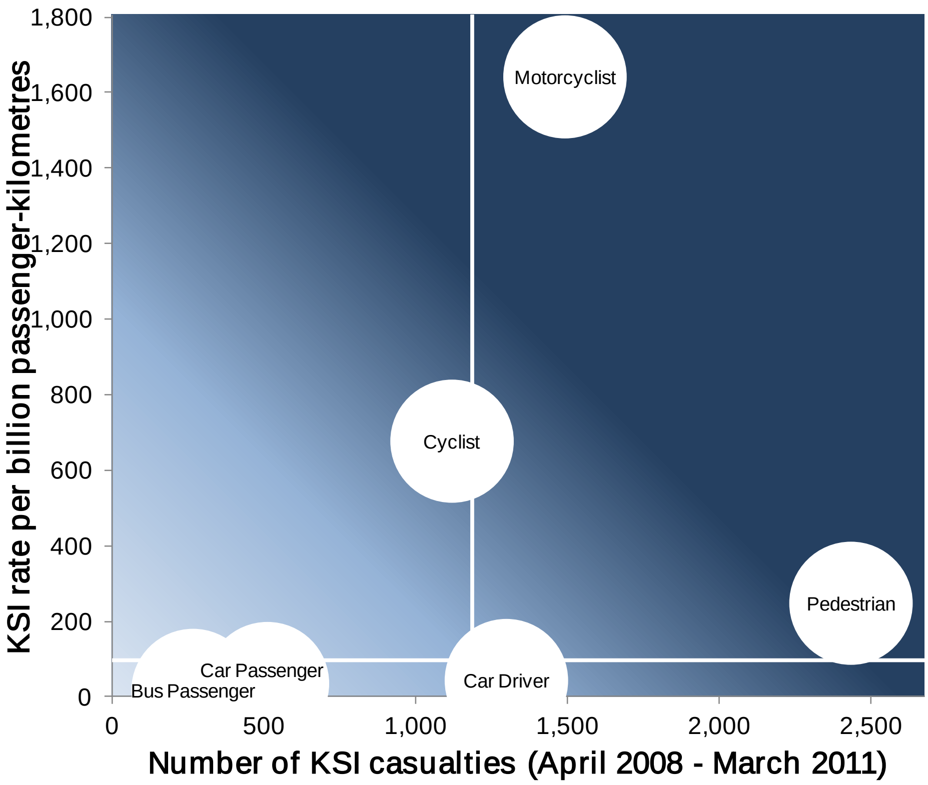


Figure 3. Risk-incidence plot for road user groups

Motorcyclists are most at risk, their risk of death or serious injury is one hundred times greater than that of bus passengers. It is notable that the three VRU modes are at highest risk, significantly higher than car and bus occupants.

Whilst it is clear that risk varies dramatically by mode, it is important to consider that a number of other factors correlate with modal choice. That is to say the difference between motorcyclists and car drivers is not purely their choice of vehicle; their mix of age, gender, ethnicity, travel purpose, route choice, and social and cultural factors may also be different. Furthermore, modal choice is typically intertwined with other personal choices or circumstances: home location, work location, economic status, physical health, childcare arrangements etc.

Further insight can be gained by analysing each user group independently and breaking the data down into age groups. This allows the creation of 'risk paths' showing how, for a particular road user group, risk and casualty numbers vary with age.

3.5 Risk paths by user group

Figure 4 shows risk paths presented on risk-incidence quadrants for six road user groups: pedestrians, cyclists, motorcyclists, car drivers, car passengers and bus passengers. Each risk path is presented on its own set of quadrants scaled to fit the data.

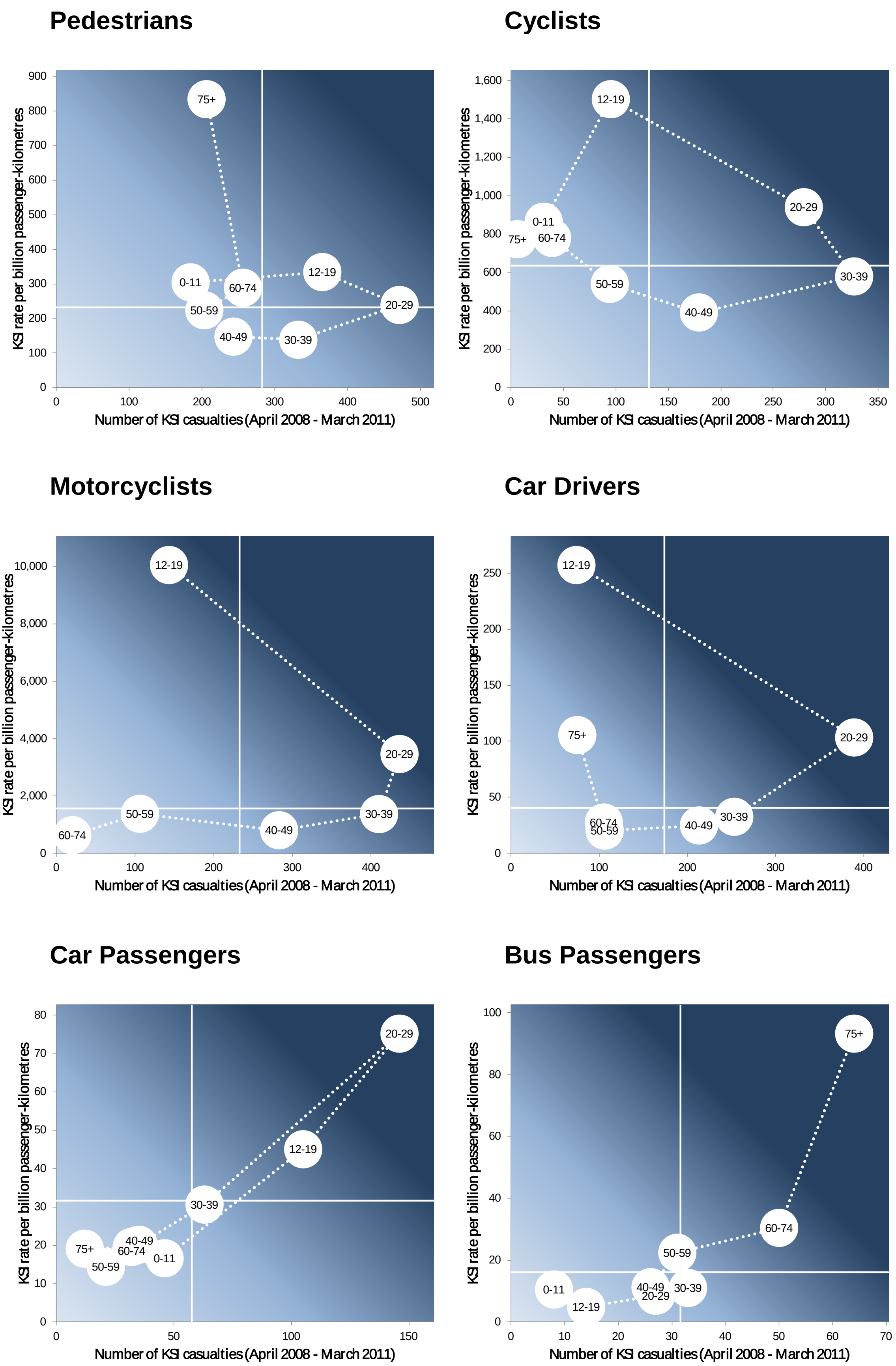


Figure 4. Risk paths for six road user groups based on KSI casualties

3.5.1 Interpretation of risk paths by user group

Pedestrians

The highest risk pedestrian group are pedestrians aged over 75. Children are at high risk by comparison to other pedestrians, and also account for moderately high casualty numbers, particularly in the 12-19 age group. The age group with most pedestrian casualties (and moderate levels of risk) is 20-29.

Cyclists

For cyclists, risk is highest for the 12-19 age group and casualty numbers are highest for the 30-39 age group. The 20-29 age group experiences high levels of risk relative to other cyclists as well as relatively high casualty numbers.

Motorcyclists

For motorcyclists, the 12-19 age group is at exceptionally high risk, but accounts for far fewer collisions than the 20-29 age group. This is largely explained by the fact that 12-15 year olds cannot legally ride a motorcycle on the road, but illustrates the importance of taking both risk and incidence into consideration

Car drivers

The shape of the risk path for car drivers is very similar to that for motorcyclists. The actual levels of risk, however, are lower. The highest risk for car drivers is experienced by the age group 12-19. The highest number of casualties occurs in the age group 20-29.

Car Passengers

20-29 year olds have both the highest risk and experience the highest number of casualties or any car passenger age group. This may be because passengers of this age group are more likely to be travelling with another young person as the driver.

Bus Passengers

For bus passengers, both risk and casualty numbers increase with age beyond 12-19, putting people over 60 in the highest priority quadrant relative to other bus users. Young children 0-11 account for few casualties, but are at slightly higher risk than older children.

3.6 Risk by road user group and age

3.6.1 Risk by mode and age data

Figure 5 shows the KSI risk by age for each road user group. The size of each bar represents the 90% confidence interval for that risk value. Figure 6 shows the same data, but instead of showing confidence intervals the area of the marker is proportional to the number of KSI casualties in each road user / age group – the larger the circle the greater the number of casualties.

The width of the bars in Figure 5 has no numerical meaning; they vary simply to allow overlapping bars to remain visible. Note also that both charts (and many other charts in this document) use a logarithmic vertical axis to allow the huge range of risk values to be conveniently displayed. On a logarithmic axis, a fixed distance on the page corresponds to a fixed multiple. For example, 100 and 1,000 are the same distance apart as 1 and 10 because they both differ by 10 times.

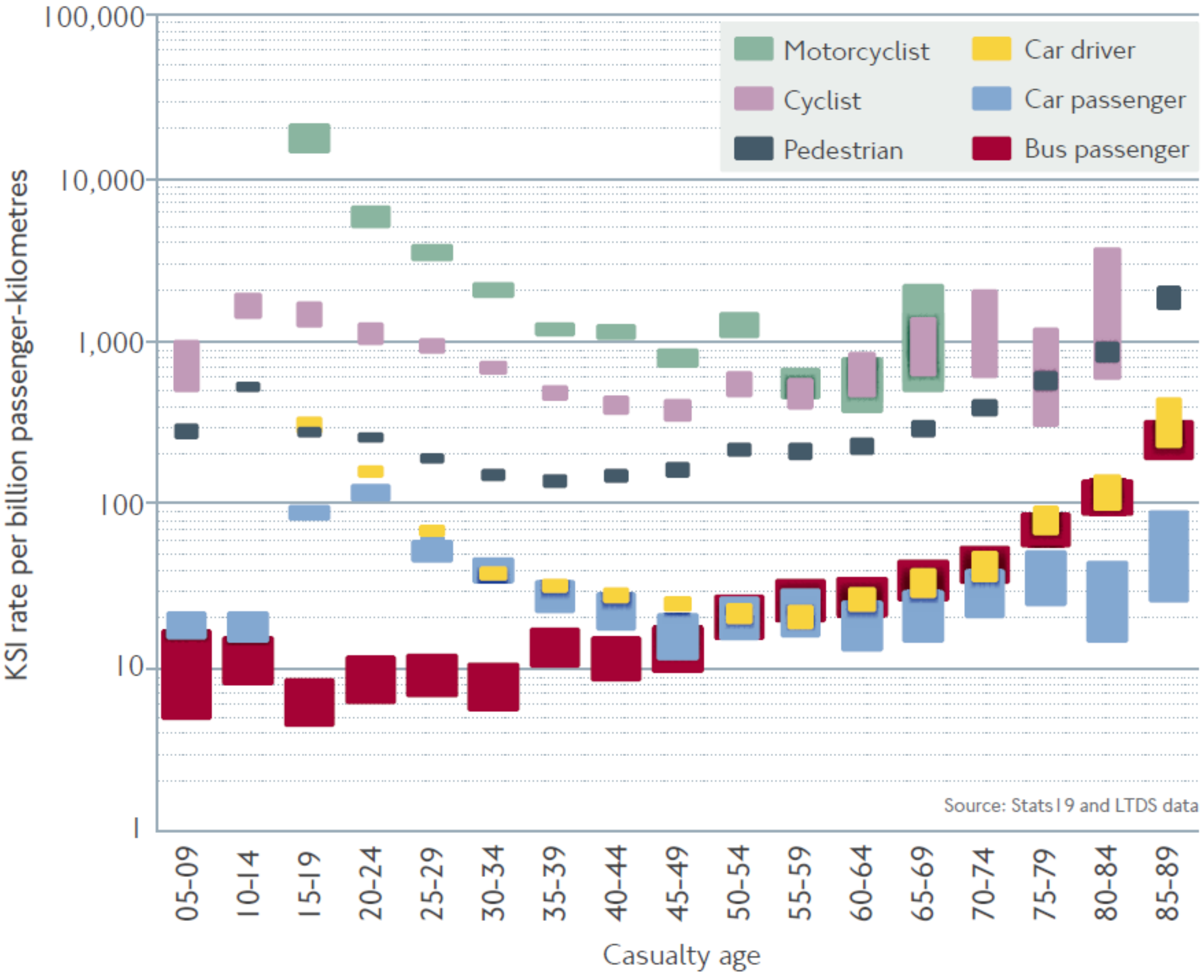


Figure 5. KSI casualty rate per billion kilometres by age for each – with confidence intervals

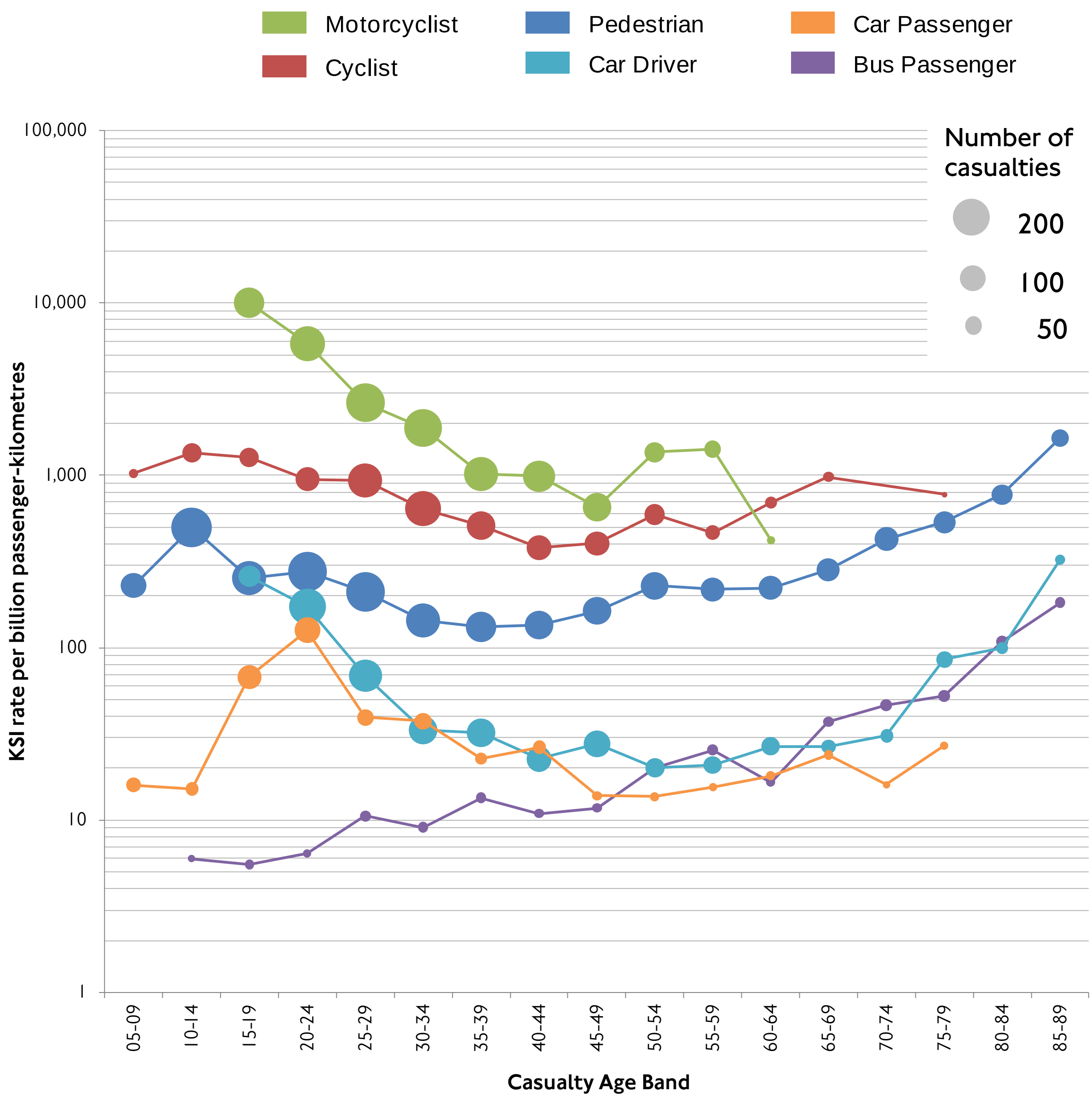


Figure 6. KSI casualty rate per billion kilometres by age for each – area of marker if proportional to the number of KSI casualties

3.6.2 Interpretation of risk by mode and age

Figure 5 and Figure 6 show:

- Risk for motorcyclists peaks in the 15-19 age band and then drops sharply with increasing age before levelling out. **Risk for 15-19 year old motorcyclists is ten times that of 40-44 year old motorcyclists**.
- The risk for 15-19 year old motorcyclists is exceptionally high: **almost ten times that of cyclists of the same age**.
- Risk for car drivers follows a U-shaped curve. Risk initially decreases sharply with age, gradually slowing until a minimum is reached in the 50-54 age band.

After this the trend is reversed. **Risk for 85-89 year old car drivers is the same as that for 15-19 year olds**.

- The risk for car drivers and car passengers is similar for ages between 30 and 69, but **for younger and older passengers, the risk is lower than for drivers of the same age**. Reasons for this could include; passengers are more likely to travel with a lower risk driver, or because lone driving is more risky in these age groups.
- The risk experienced by cyclists peaks in the 10-14 age band, **risk then steadily decreases through to the 45-49 age band where risk is approximately one third of that for 10-14 year olds**. For older cyclists, the confidence level in the data is low due to small numbers of journeys, but there appears to be a trend of increasing risk.
- Pedestrian risk decreases from 10-14 through to 35-39 but then increases at an accelerating rate, increasing very sharply beyond 70; **85-89 year old pedestrians are at over ten times the risk of 35-39 year olds and three times the risk of 10-14 year olds**.
- For under-50s, bus passenger journeys are the lowest risk of all modes. **Above 50 years old, risk for bus passengers increases, converging with that for car drivers and exceeding that for car passengers**.

3.7 Risk by time of day

3.7.1 Risk by time of day data

Figure 7 shows KSI risk by mode and time of day.

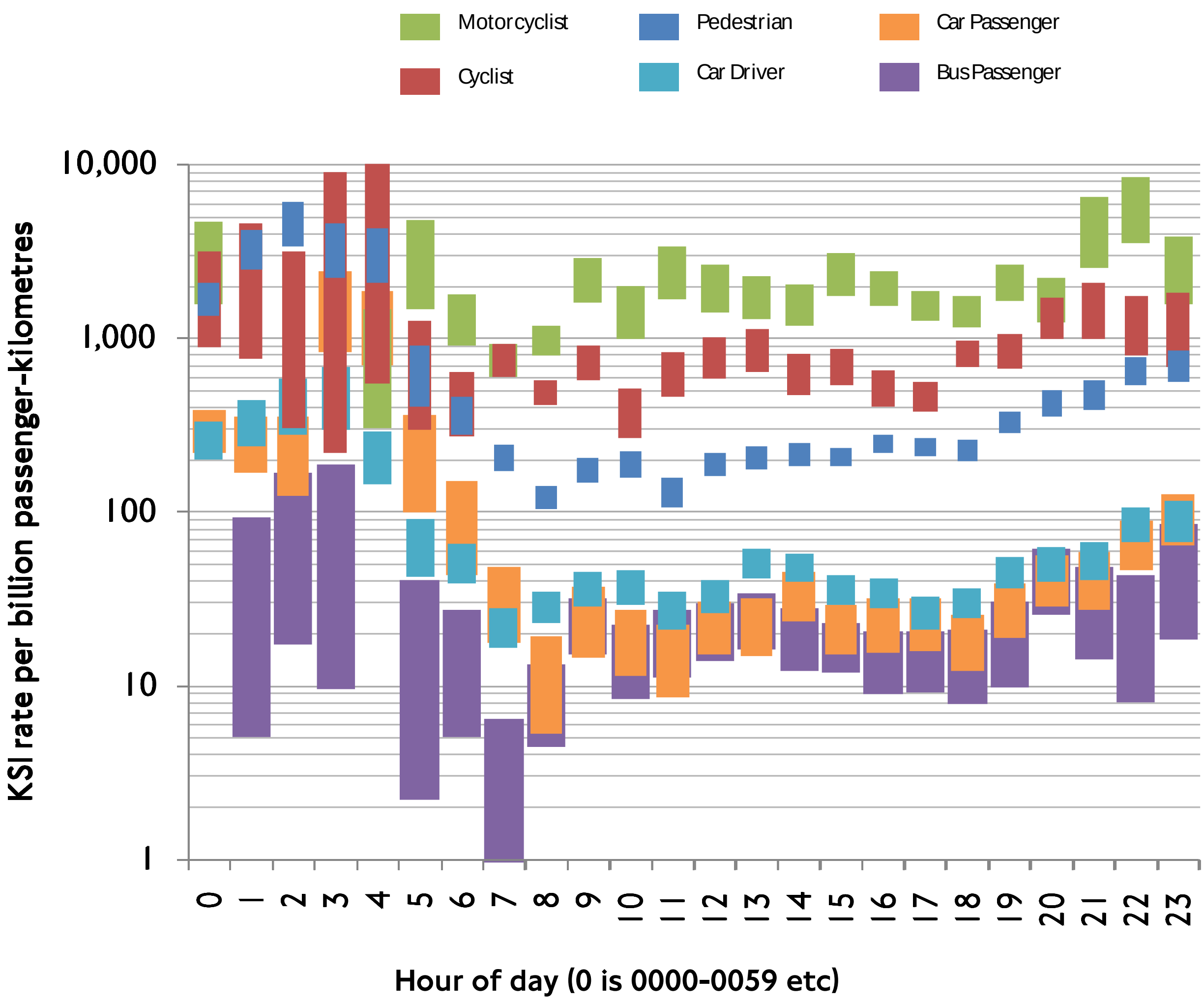


Figure 7. KSI casualty rate per billion kilometres by time of day for each mode

3.7.2 Interpretation of risk by time of day

Figure 7 shows that risk varies significantly by time of day with the early hours of the morning having the highest risk for all modes. In general, risk is at its lowest throughout the busiest times of day (0800-1900), steadily rising through the evening and then peaking at approximately 0200-0300. This trend is particularly apparent for pedestrians and car occupants. Travel by other modes is so infrequent during the night that it is not possible to infer risk with much precision.

- The risk of death or serious injury for pedestrians travelling 0200-0259 is almost 40 times greater than for pedestrians travelling 0800-0859
- The risk of death or serious injury for car drivers travelling 0300-0359 is over 20 times greater than for car drivers travelling 0700-0759

- Comparing Figure 7 to Figure 5, it can be seen that the risk for pedestrians (of all ages) at 0200-0259 is circa. 5,000-6,000 KSI/billion passenger kilometres, approximately the same as the risk of a 20-24 year old motorcyclist (for all times of day).

It can be seen in Figure 7 that the difference between night-time and daytime risk is far more pronounced for car passengers than it is for car drivers (i.e. the difference between the highest risk hour for car passengers and the lowest risk hour for car passengers is far greater than the difference between the highest and lowest risk hours for car drivers). There are wide confidence intervals in the evening peak for some modes. This is confirmed by calculating the ratio of risk overnight to that in the morning peak as shown in Table 1. Pedestrians also have a higher risk of injury at night compared to the daytime.

Table 1. Ratio of KSI risk overnight to morning peak for selected modes

Mode of travel	Ratio of KSI risk 0000-0659 to 0700-0959 (nearest integer)
Car Passenger	15
Pedestrian	8
Car Driver	5

3.8 Risk by road user group and gender

3.8.1 Risk by road user group and gender data

Figure 8 shows the risk of death or serious injury by road user group and gender. The height of the bar for each mode/gender represents a 90% confidence interval for the risk of that group. Where two bars do not overlap they represent significantly different levels of risk with 90% confidence. The number next to each bar is the total number of casualties in that category.

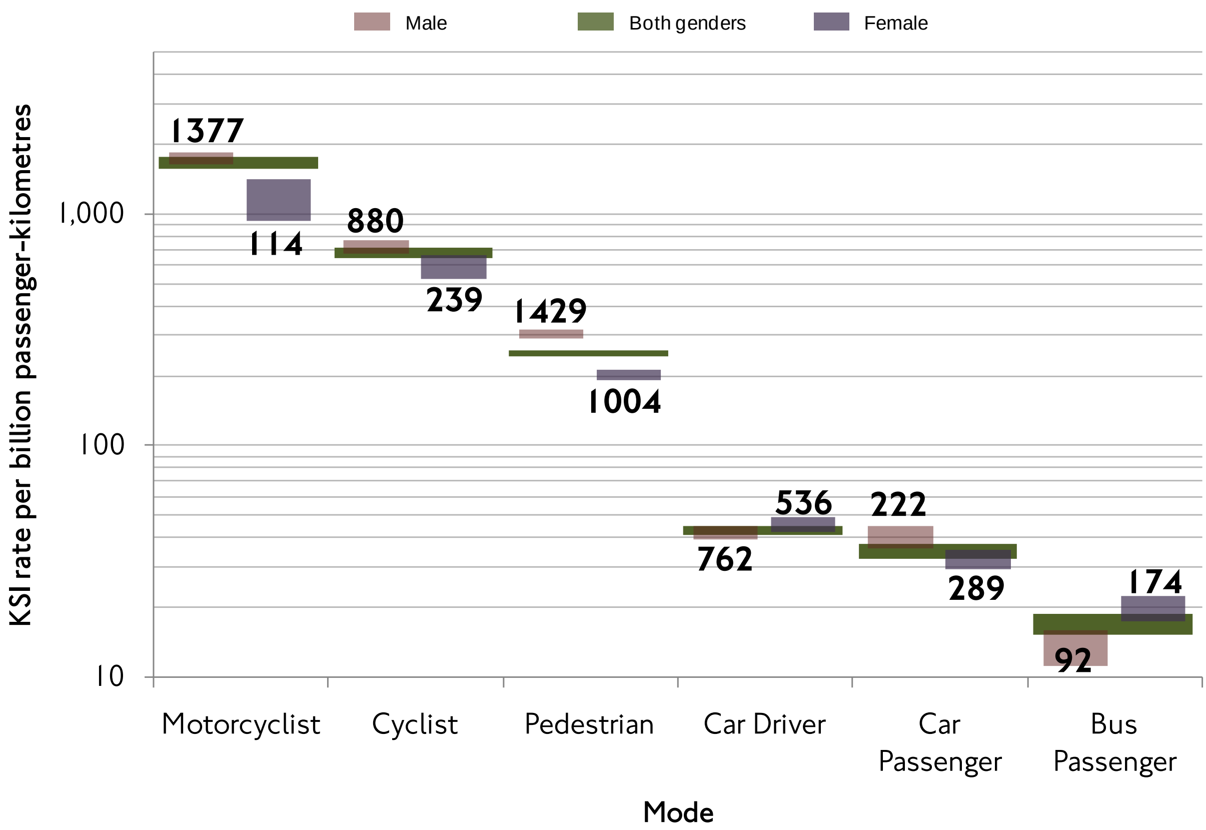


Figure 8. KSI casualties per billion vehicle kilometres by mode and gender

3.8.2 Interpretation of risk by mode and gender

The order of risk for the modes is the same for men and women, with motorcycle highest and bus passengers lowest, and in general the risk values are quite similar. Men are at somewhat higher risk than women across all the VRU modes. However the most notable difference between risk levels by gender is for pedestrians, where women experience risk levels two thirds of those for men.

Despite the apparent similarity of risk by mode for men and women, the overall casualty rate for men is almost double that of women: a far larger difference than in any of the individual modes. This difference can be largely explained by considering the differences in modal choice by gender.

Table 2 shows the proportion of travel undertaken by each mode for men and women (using the same LTDS data as used for the risk calculations). For example, 3.3% of travel undertaken by men is by pedal cycle.

Table 2. Proportion of distance travelled by each mode for men and women

Mode	Proportion of travel by men	Proportion of travel by women
Motorcyclist	2.1%	0.3%
Cyclist	3.3%	1.1%
Pedestrian	12.7%	13.1%
Car Driver	48.6%	30.9%
Car Passenger	14.8%	23.7%
Bus Passenger	18.6%	23.2%

Females undertake a far smaller amount of travel by the highest risk modes. Men account for approximately nine tenths of the distance travelled by motorcycle and three quarters of the distance travelled by pedal cycle.

3.9 Risk for black, Asian and minority ethnic road users

3.9.1 Risk for black, Asian and minority ethnic road users data

Figure 9 shows the risk by mode for BAME and non-BAME road user groups[5]. The height of the bar for each mode and gender represents a 90% confidence interval for the risk of that group. Where two bars do not overlap they represent significantly different levels of risk with 90% confidence. The number next to each bar is the total number of casualties in that category.

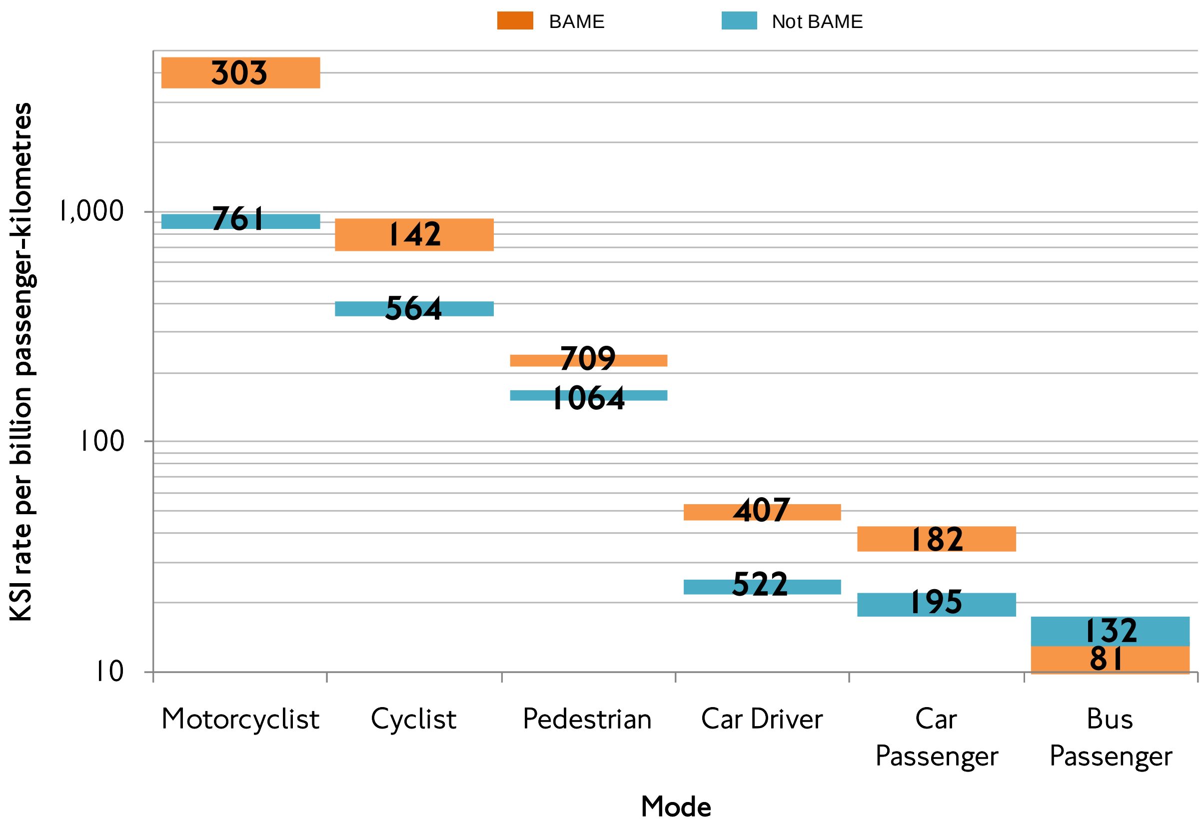


Figure 9. Risk by mode for BAME and non-BAME travellers, numbers on bars represent the total number of casualties

3.9.2 Interpretation of risk for black, Asian and minority ethnic road users

BAME individuals are at higher risk of death or serious injury than non-BAME individuals across every mode except bus. The largest difference is for motorcyclists where BAME individuals experience four times as many KSI casualties per billion kilometres as non-BAME individuals. BAME car occupants and cyclists are at approximately twice the risk of their non-BAME counterparts.

[5] There are a large number of casualties recorded with no ethnicity assigned in STATS19. These have not been included in this analysis, which may mean the absolute risk levels are not accurate. However, assuming there is no systematic bias in the reporting or non-reporting of ethnicity, the remaining data points (i.e. for which ethnicity is specified) can be used to make a comparison between BAME and non-BAME; clear trends emerge.

3.10 Priority groups for action

The analysis described above has identified groups for whom road safety improvements could be justified on the basis of risk, number of casualties, trend over time or a combination of these factors. These groups are:

- Pedestrians
    - Pedestrians aged 75 or over owing to higher levels of risk
    - Pedestrians under 20 owing to higher levels of risk
    - Pedestrians 20-29 owing to high casualty numbers

- Cyclists
    - Child and teenage cyclists owing to higher levels of risk
    - Cyclists aged 20-39 owing to high casualty numbers

- Motorcyclists
    - Motorcyclists under 30 owing to higher levels of risk
    - Motorcyclists aged under 30 owing to high casualty numbers

- Drivers and Passengers
    - Drivers under 30 owing to higher levels of risk and casualty numbers
    - Older drivers owing to higher levels of risk
    - Car passengers aged 20-29 owing to higher levels of risk and casualty numbers

Safe Streets for London sets out a range of actions intended to reduce road user risk with a particular focus on these priority groups.

It is clear from this analysis that VRUs are at greater risk of death or serious injury on London's roads than other user groups.

4 Focussing on Vulnerable Road Users

The following sections provide a more detailed analysis of VRU risk and the circumstances of serious or fatal VRU collisions. The following data and interpretation will be of use to TfL and other road safety practitioners in the delivery of initiatives to address VRU safety. The data assists in identifying locations, collision types and other factors to target to ensure that interventions achieve the greatest casualty reduction benefits possible.

4.1 Risk to vulnerable road users by London borough

The road environment varies substantially across London, as does the mix of road user types. To understand whether these geographical variations have an impact on risk, it is informative to calculate risk at a borough level.

4.1.1 Heatmaps of vulnerable road user risk

Figure 10 - Figure 12 show the KSI casualty rate by borough for each of the vulnerable road user groups. Note that the figures for cyclists and motorcyclists represented have an uncertainty of around +/-25 so apparent differences may not be statistically significant at a sufficient level to merit action. This is particularly the case for the borough of Bexley.

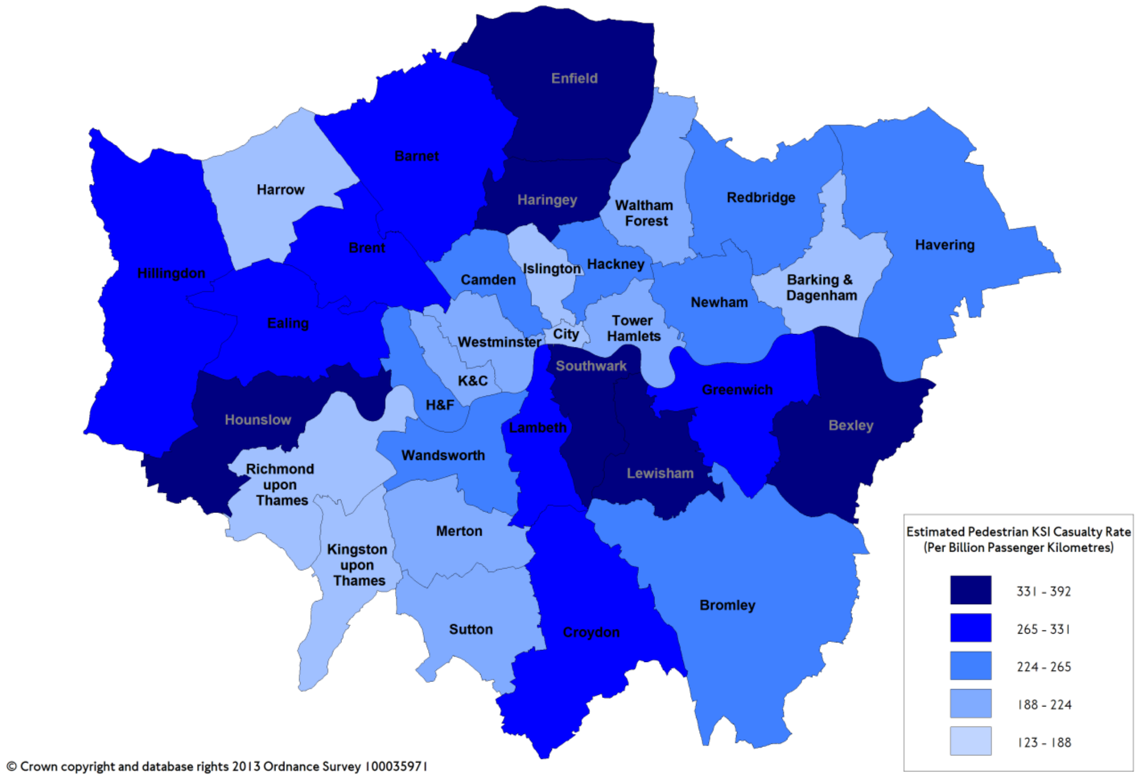


Figure 10. Heatmap showing KSI risk for pedestrians by borough (April 2008 to March 2011)

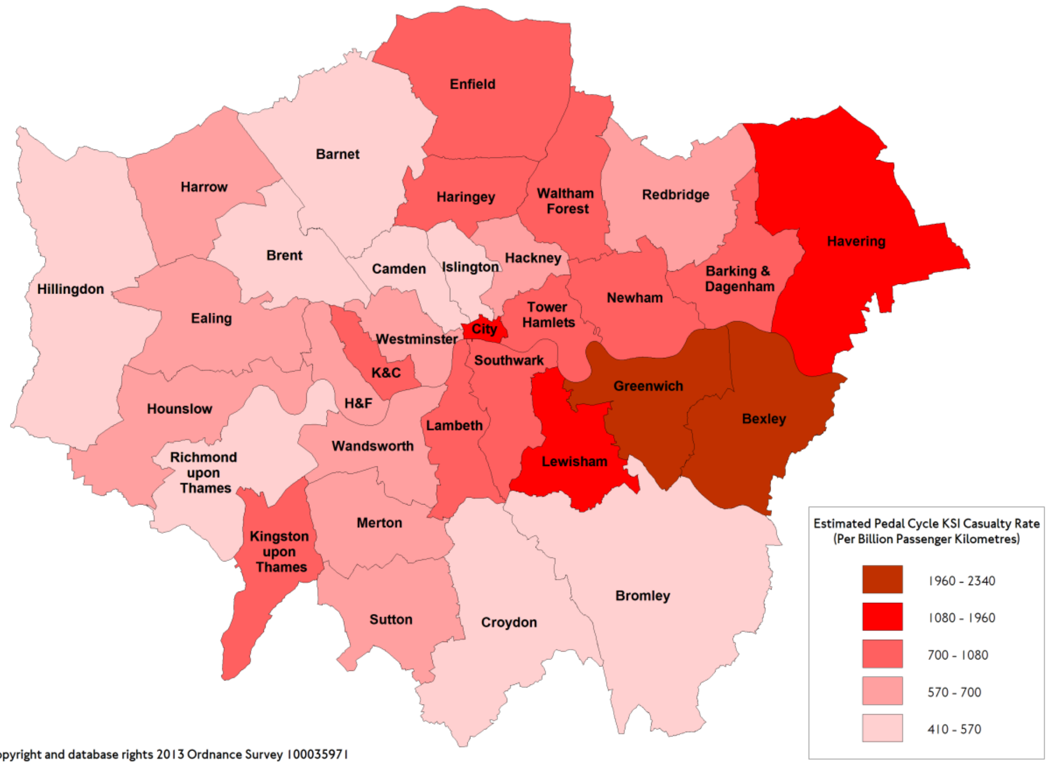


Figure 11. Heatmap showing KSI risk for cyclists by borough (April 2008 to March 2011)

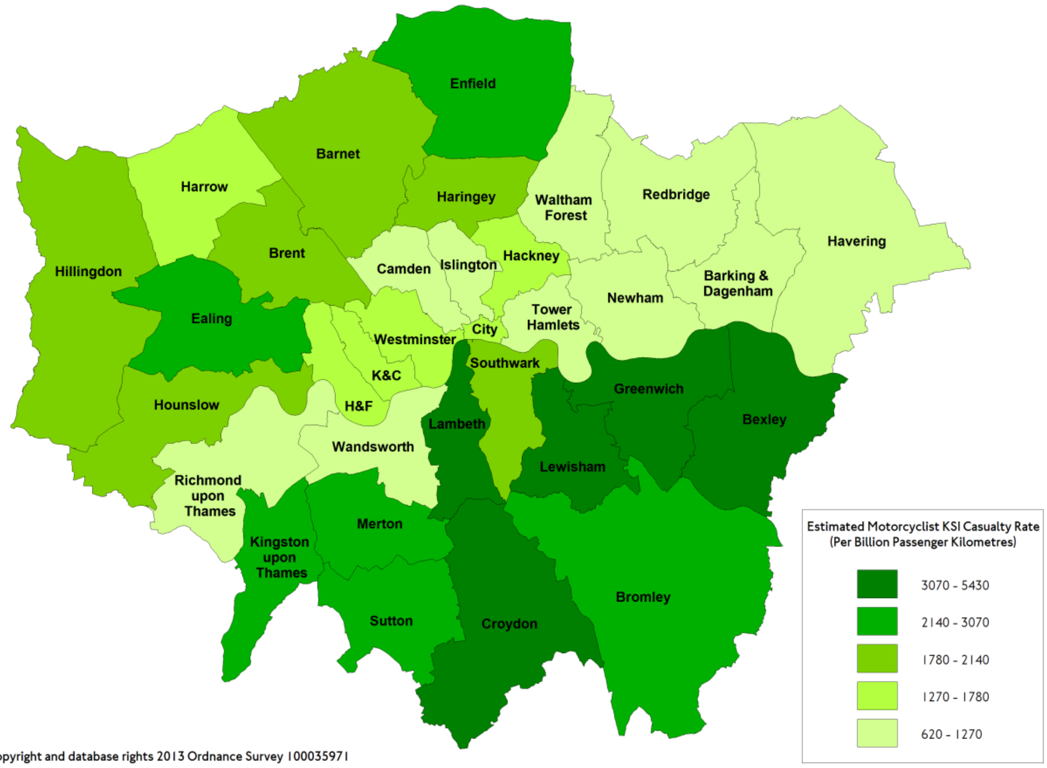


Figure 12. Heatmap showing KSI risk for motorcyclists by borough (April 2008 to March 2011)

4.1.2 A risk-incidence plot for vulnerable road users by borough

As discussed in Section 3, it is important to consider both risk and absolute casualty numbers in parallel when determining priorities for safety interventions. Figure 13 shows each London borough on a risk-incidence plot based on vulnerable road user data only. This plot shows that some boroughs have high casualty numbers with relatively low risk, whilst others have relatively high risk but fewer casualties. This highlights the need for interventions to be tailored to each borough to ensure that they are relevant and effective.

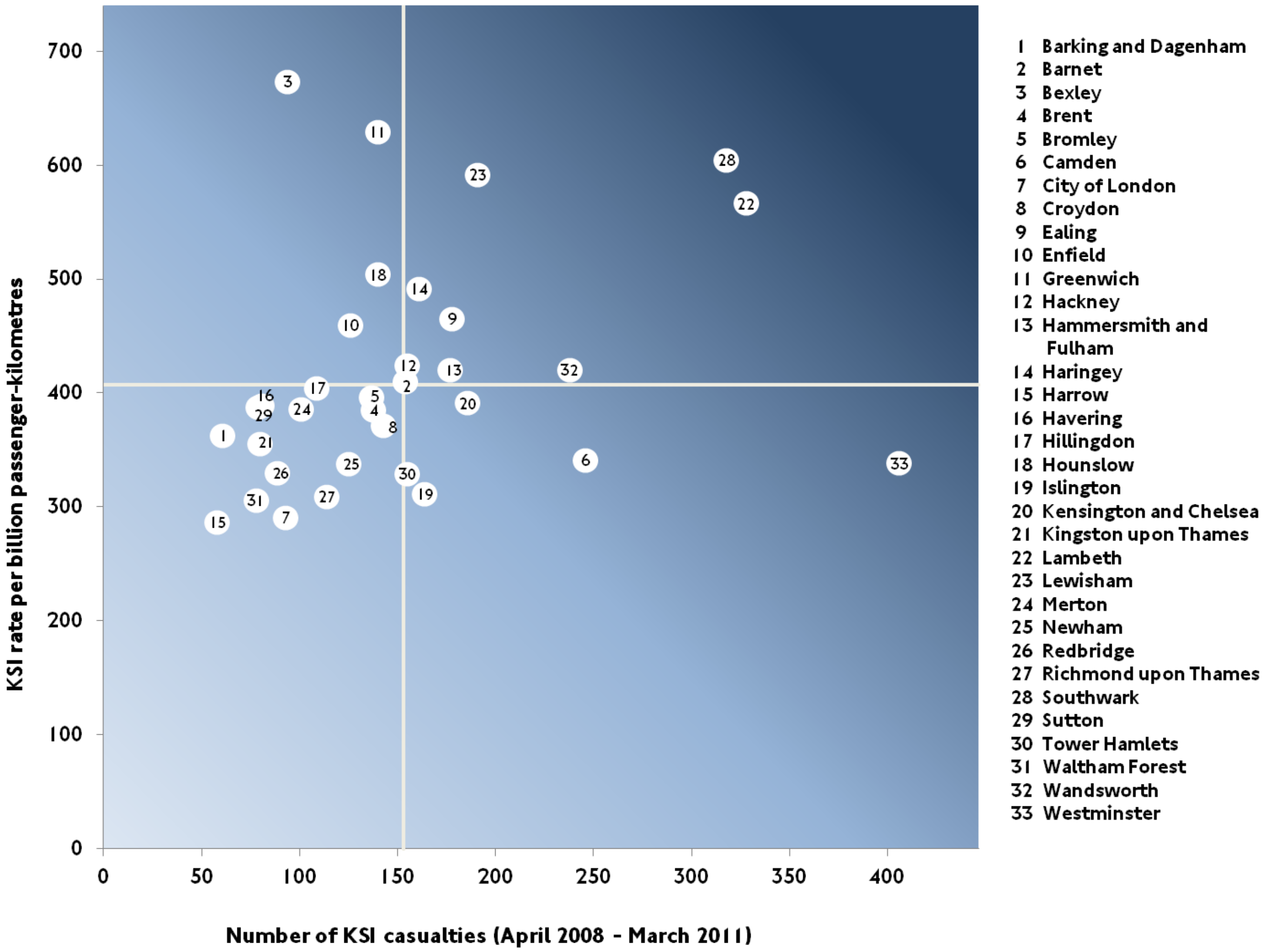


Figure 13. Risk-incidence plot by borough for vulnerable road users only

4.1.3 Normalised vulnerable road user risk

Whilst it is useful and convenient to calculate a single risk value for all VRU modes in each borough, a simple calculation of VRU casualties to VRU travel may not be the best measure for identifying trends as it does not account for differing mode share between boroughs. For example, two Boroughs with equal risk for motorcyclists, equal risk for cyclists and equal risk for pedestrians may have different VRU risk values if the share of travel between these modes is different. Whilst this is not technically incorrect, it may be misleading.

Figure 14 shows KSI risk by borough for vulnerable road users. For this chart, risk was calculated by mode and these figures aggregated, with each mode weighted by its average modal share across all boroughs. This has the effect of normalising the risk levels with respect to mode share, so the differences between boroughs on the chart are those NOT explained by differing modal share. The length of each bar represents a 90% confidence interval.

The confidence intervals on this chart are quite large, reflecting the fact that both collision and particularly exposure data is quite sparse once disaggregated to borough level. Most of the intervals overlap the ‘all London’ interval, suggesting that there is no significant evidence of a difference in risk. However, some boroughs do stand out as being above or below average, potentially meriting further investigation.

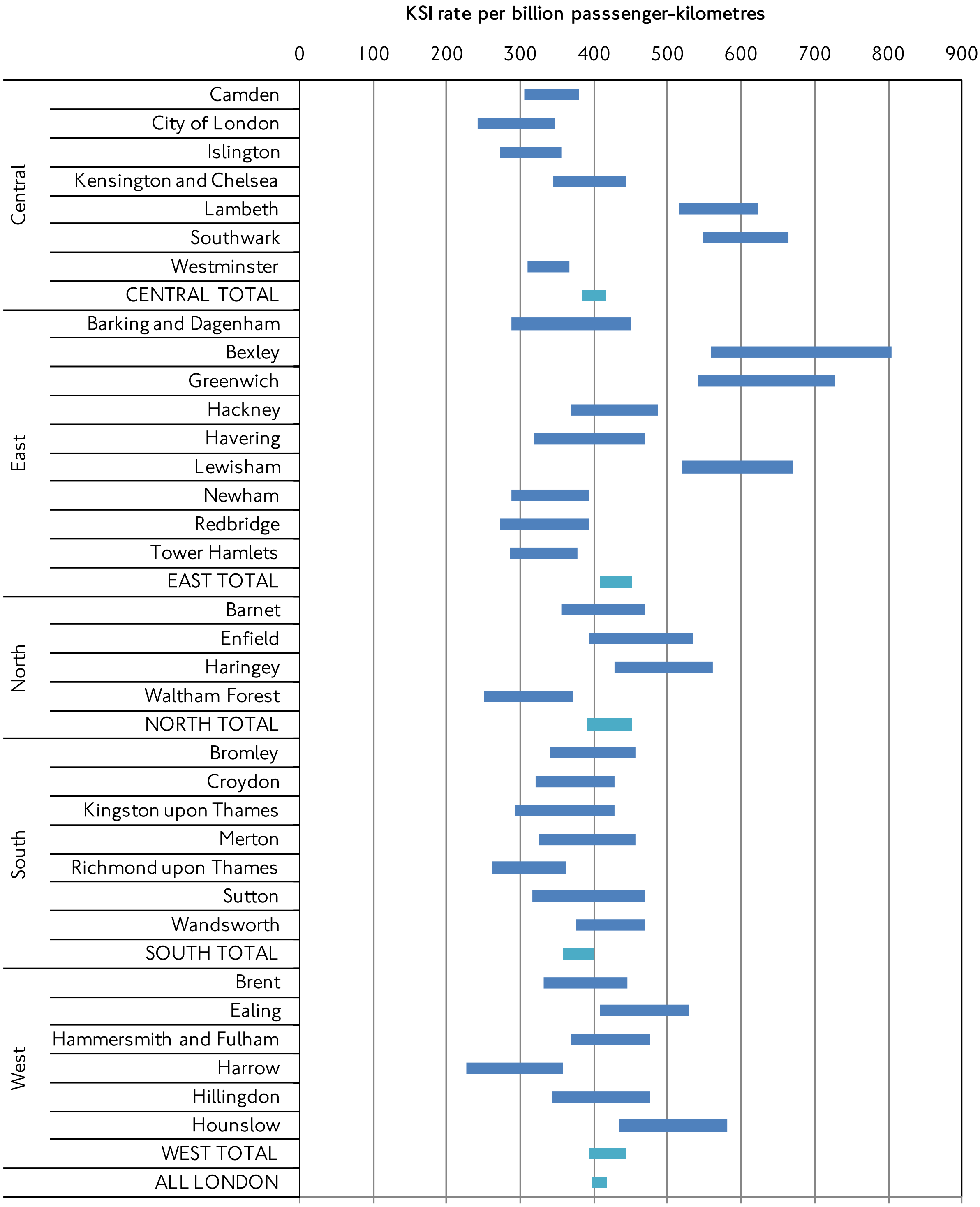


Figure 14. Risk by borough for vulnerable road users after normalisation to account for variation in mode share[6]

4.2 Understanding vulnerable road user conflicts

To effectively target safety interventions it is important to understand the scenarios and behaviours which are most frequently observed in collisions. Some insight into this can be derived from *conflict analysis*. This involves categorising collisions into conflict types: high-level descriptions of the movements of the parties involved drawn from multiple fields of the STATS19 dataset. By analysing the frequency of different conflict types it is possible to identify common types of conflict affecting certain groups. Often these can be associated with particular behaviours or on-road situations which can then be targeted with interventions.

The following sections include conflict analysis for vulnerable road users and a brief analysis of conflict type trends. The data shown is for the calendar year 2011 only.[7]

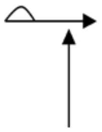
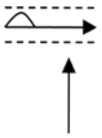
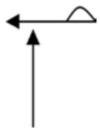
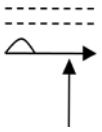
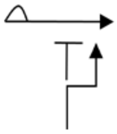
[7] The textual description in STATS19 is regarded as the definition of the conflict and may differ from the actual collision event.

4.2.1 Pedestrians

4.2.1.1 Conflict analysis

The five conflict types resulting in most KSIs to pedestrians are shown in Table 3.

Table 3. The five conflict types most commonly resulting in KSIs to pedestrians in 2011

Conflict Rank	Indicative Diagram	Description	Serious / % of total	Fatal / % of total
1		Vehicle going ahead, pedestrian crossing from nearside (not on formal crossing)	220 / 24%	16 / 26%
2		Vehicle going ahead, Crossing from nearside (on formal crossing)	128 / 14%	7 / 11%
3		Vehicle going ahead, pedestrian Crossing from offside (not on formal crossing)	87 / 10%	10 / 16%
4		Vehicle going ahead, pedestrian crossing from nearside near formal crossing	68 / 8%	6 / 10%
5		Vehicle overtaking stationary traffic, pedestrian crossing	49 / 5%	3 / 5%

4.2.1.2 Interpretation of conflict and collision data

Pedestrians are most commonly injured when crossing the road. The most common conflict is a collision between a vehicle and a pedestrian crossing the road (not on a formal crossing) from the vehicle's nearside.

Child Pedestrians

In general, conflicts for children and young people are not dissimilar to those for adults. The most notable difference being that child casualties occur less frequently at formal crossings. This may be a consequence of the type of roads used by children or a behavioural difference. Younger children are more likely to be injured in a collision where the vision of a driver or rider was blocked by stationary vehicles, e.g. if a child steps out between parked vehicles. Thirty-six per cent of collisions resulting in casualties aged 11 or less, and 28 per cent of collisions resulting in casualties aged 12 to 19 involved a contributory factor relating to driver or rider vision impaired by stationary vehicles. This compares with 17 per cent of collisions where casualties were aged 20 or over.

Older Pedestrians

Pedestrians aged 75 or over were found to be at the highest risk of all pedestrian age groups. Conflict analysis shows that whilst the two most common conflicts for elderly pedestrians are the same as for other adults, the occurrence of conflicts involving being struck by a vehicle which is turning or reversing is much higher amongst elderly people, although numbers are small.

Pedestrians aged between 20 and 29 and late night travel

Pedestrians aged 20-29 account for 40 per cent of KSI casualties occurring in the time period 2200-0559. Collisions in this period resulted in over a quarter of the serious injuries and five of the eight fatalities to 20-29 year olds in 2011. This is despite only 4 per cent of travel by 20-29 year olds taking place in this time period, showing that young pedestrians walking in the night time are at a higher risk of injury than during the daylight hours (see also analysis of risk by time of day in Section 3.7).

The role of alcohol in collisions involving pedestrians

Research[8] from London police records shows that many fatally injured pedestrians had consumed alcohol prior to being involved in the collision. This was a contributory factor in 46 of 198 (23 per cent) analysed fatal collisions from 2006-2010. Amongst 25-59 year olds, this rose to 33 of 74 (45 per cent). The research also showed that this factor is often under-reported in Stats 19 data.

Analysis of the location of collisions involving impaired pedestrians shows that, whilst they occur to some extent all over London, they tend to occur more in locations associated with a vibrant night time economy.

4.2.1.3 Speeding and pedestrian fatalities

Figure 15 shows the speeds of the vehicles which struck the pedestrians who died in collisions in the period 2006-2010. Each vertical bar presents a single fatality, the height of the bar represents the estimated travelling speed recorded by police. For example, if the travelling speed was estimated as 15-20mph the bar would run from 15mph to 20mph. The colour of the bar corresponds to the speed limit on the road on which the vehicle was travelling. The horizontal line of the same colour shows the speed limit on the vertical axis. The data points are ordered by the centre point of the vertical bar.

The vast majority of the collisions shown took place in 30mph limits. A significant minority (approximately one fifth) of the vehicles were exceeding the limit, some by very substantial margins.

[8] "Analysis of police collision files for pedestrian fatalities in London, 2006–10" Transport Research Laboratory, PPR620, published 2012

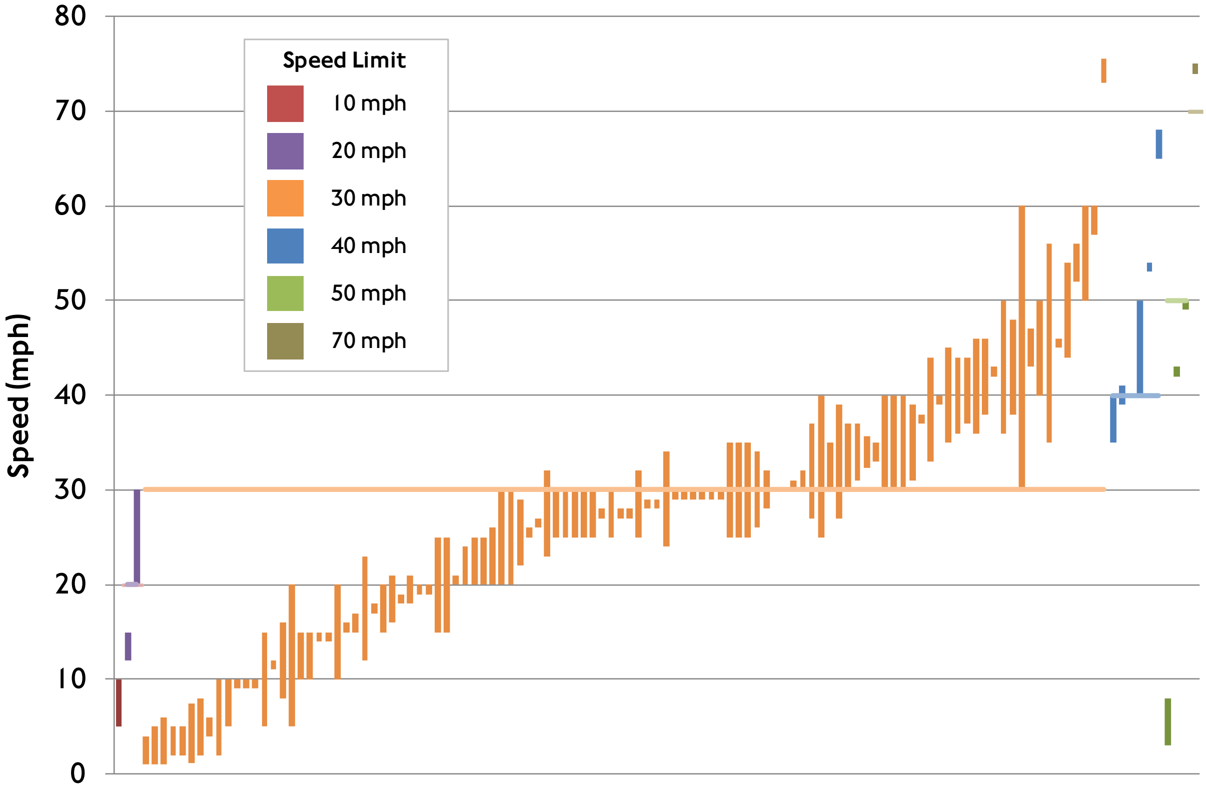


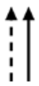
Figure 15. Speeds of vehicles which struck pedestrians who then died relative to the speed limit on the road on which they were travelling (includes the 122 of 197 vehicles for which speed was known, data covers 2006-2010). The length of the bar represents the range of estimated speed recorded by the police.

4.2.2 Cyclists

4.2.2.1 Conflict analysis

The five conflict types resulting in most KSIs to cyclists are shown in Table 4.

Table 4. The five conflict types most commonly resulting in KSIs to cyclists in 2011

Conflict Rank	Indicative Diagram	Description	Serious / % of total	Fatal / % of total
1		Other vehicle turns right across path of P/C	60 / 11%	2 / 6%
2		P/C and other vehicle travelling alongside each other.	61 / 11%	1 / 13%
3		P/C hits open door / swerves to avoid open door of other vehicle.	51 / 9%	1 / 6%
4		Other vehicle turns left across the path of P/C	47 / 8%	4 / 25%
5		Other vehicle disobeys junction control & turns right into path of P/C	42 / 8%	0 / 0%

4.2.2.2 Interpretation of conflict and collision data

Cyclists are most commonly injured as a result of other vehicles turning across their path and as a result of collisions with vehicles they are travelling alongside. Around 70 per cent of collisions in which a cyclist is seriously injured occur at or approaching a junction in 2011.

Cyclist Conflict with Heavy Goods Vehicles

In 2011, 21 cyclists were seriously injured and six killed in collisions with goods vehicles in excess of 3.5 tonnes. The most common type of conflict where a pedal cyclist was killed or seriously injured in a collision involving a large goods vehicle was where the large goods vehicle turned left across the path of the cyclist. This accounted for six serious injuries and four deaths.

Child and teenage cyclists

The conflicts for cyclists under 20 are notably different from those for older cyclists. The most common conflict amongst cyclists under 20 is “P/C rides off footway into path of other vehicle”. This is particularly common amongst child cyclists, with 7 of 18 serious injuries to cyclists under 16 being a result of this type of conflict.

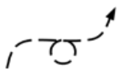
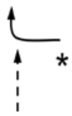
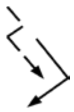
It is also more common for a cyclist under 20 to be seriously injured after disobeying a junction control or give way marking, this being the second most common contributory factor.

4.2.3 Motorcyclists

4.2.3.1 Conflict analysis

The five conflict types resulting in most KSIs to motorcyclists are shown in Table 5.

Table 5. The five conflict types most commonly resulting in KSIs to motorcyclists in 2011

Conflict Rank	Indicative Diagram	Description	Serious / % of total	Fatal / % of total
1		Other vehicle turns right across path of P2W	100 / 18%	6 / 20%
2		All “loss of control” conflicts*	76 / 13%	12 / 40%
3		Other vehicle disobeys junction control and turns right into path of P2W	60 / 11%	1 / 3%
4		Other vehicle u-turns into path of P2W	34 / 6%	3 / 10%
5		P2W performs overtaking manoeuvre into path of right turning vehicle	36 / 6%	0 / 0%

4.2.3.2 Interpretation of conflict and collision data

Riders are most commonly injured as a result of other vehicles turning across their path and as a result of loss of control. Whilst vehicles turning right across the path of motorcycles is the most frequent cause of serious collisions, the conflict resulting in most fatalities is the rider losing control independently of another vehicle (although they may go on to collide with another vehicle or object).

Conflicts involving turning and overtaking

Four of the five most common conflicts resulting in serious injury or death of motorcyclists involve another vehicle turning across the path of the motorcycle. Filtering, blocking the line of sight between the rider and drivers turning across or into the traffic, may be a factor in this. There is some evidence for this in the STATS19 data:

- In 25 per cent of all collisions with another vehicle in which a rider was seriously injured, the rider was recorded as overtaking[9] (can include nearside or offside stationery or moving vehicles).
- In 38 per cent of serious collisions where a vehicle U-turned into the path of the motorcycle, the motorcycle was overtaking or filtering[10] at the time.
- In serious collisions where another vehicle disobeyed a junction control, and turned right into the path of a motorcycle, the motorcycle was recorded as overtaking or filtering in 33 per cent of cases.

Young motorcyclists

It was shown in Section 3.6 that young motorcyclists are at the highest risk of all road users. There is also some difference in the type of collisions in which they are typically involved compared to older riders.

Younger rider collisions resulting in death or serious injury are more likely to involve “loss of control”. For motorcyclists under 30 years of age, the most common conflict type is “loss of control”, whereas “other vehicle turning right across the path of P2W” is the commonest conflict type when considering motorcyclists’ conflicts across all ages

The role of speed and loss of control in motorcycle collisions

Loss of control is the second most common cause of serious injuries and the most common cause of motorcyclists’ death in London (2011 data). Of collisions classed as the conflict type “Loss of control”, 38 per cent of serious collisions and 50 per cent of fatalities involved the motorcyclist being recorded as driving in excess of the speed limit or too fast for the conditions.

Figure 16 shows the speeds of fatally injured motorcyclists relative to the speed limit (2006-2010 data). Each vertical bar presents a single fatality; the height of the bar represents the estimated speed of the motorcyclist [11] recorded by the police as in Figure 15. It is clear that in a substantial majority of cases, the motorcyclist was exceeding the speed limit, often by a significant amount.

[9] Defined as the vehicle manoeuvre field in STATS19 containing the word “overtake” or “overtaking”
[10] Overtaking defined as above, filtering defined as the text “filter” appearing in the collision description
[11] Speed is estimated ‘at the start of the collision’ which can be interpreted as the moment the motorcyclist began to brake or the moment they were hit or lost control if they did not brake.

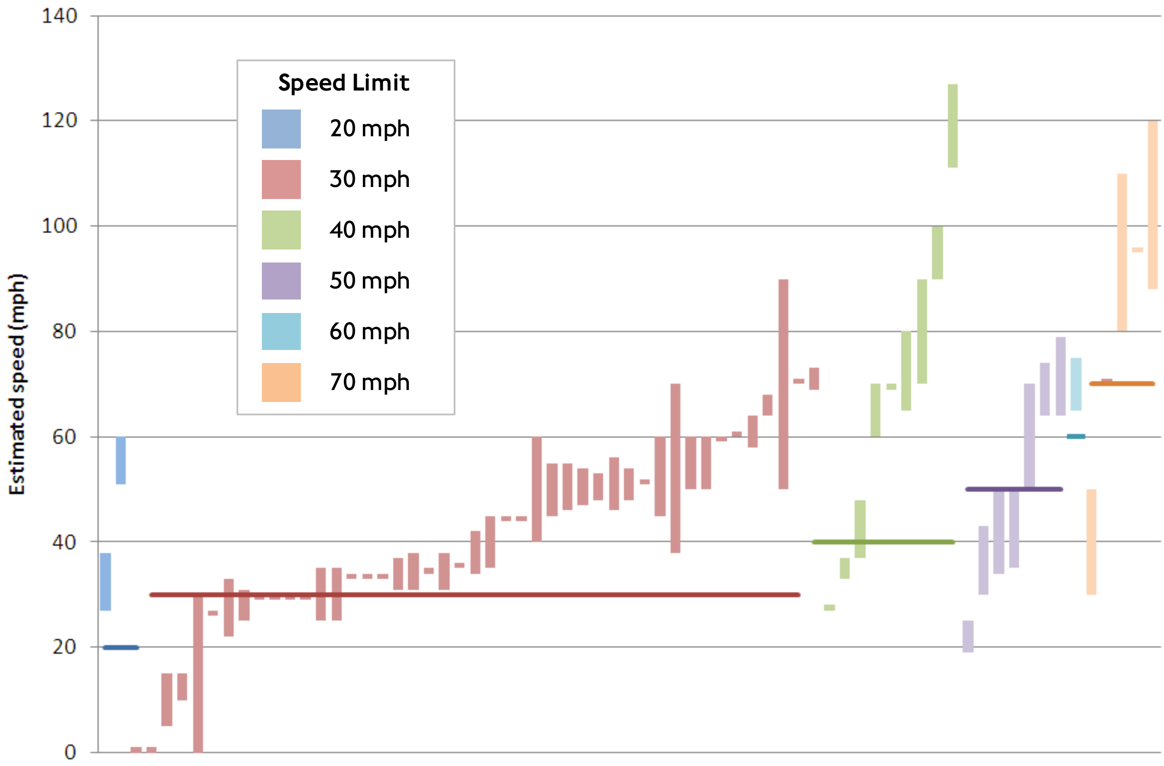


Figure 16. Speeds of motorcyclists killed in collisions in 2006-2010 relative to the speed limit on the road on which they were travelling (includes 69 of 94 fatalities). The length of the bar represents the range of estimated speed recorded by the police.

5 Conclusion

5.1 Priority groups for action

The data and analysis presented in this report is intended to assist TfL, the London boroughs, and other partners in the delivery of the *Safe Streets for London* plan to target road safety interventions towards those groups that are at greatest risk and so achieve the greatest casualty reduction benefits.

Analysis of the data by mode, age, gender and ethnic group shows a number of key priority groups for attention:

- Pedestrians
    - Pedestrians aged 75 or over owing to higher levels of risk
    - Pedestrians under 20 owing to higher levels of risk
    - Pedestrians 20-29 owing to high casualty numbers

- Cyclists
    - Child and teenage cyclists owing to higher levels of risk
    - Cyclists aged 20-39 owing to high casualty numbers

- Motorcyclists
    - Motorcyclists under 30 owing to higher levels of risk
    - Motorcyclists under 30 owing to high casualty numbers

- Drivers and Passengers
    - Drivers under 30 owing to higher levels of risk and casualty numbers
    - Older drivers owing to higher levels of risk
    - Car passengers aged 20-29 owing to higher levels of risk and casualty numbers

The SSfL has been informed by this data analysis and the actions contained within the Safe Roads, Vehicles and People sections all focus on achieving casualty reductions in the groups outlined above. However, in the ongoing delivery of the plan the analysis in this document will be use to ensure that road safety activity is suitably tailored and focussed on the priority groups.

The findings in this document present opportunities for more efficient ways of working, for example those boroughs that experience similar issues in terms of modal casualty trends could work together to share learnings or deliver partnership campaigns.

There are further opportunities to use MOSAIC and deprivation data to understand the impacts of demographic profiles, deprivation levels on casualty rates

5.2 Ongoing monitoring

TfL has committed to providing an annual report on progress in the achievement of casualty and collision reduction activity across London. The risk-based data analysis contained within this document will act as a valuable tool in the ongoing monitoring of risk for the priority groups outlined above.