# BEHAVIOUR OF SUV AND MPV-TYPE VEHICLES IN COLLISIONS WITH ROADSIDE SAFETY BARRIERS

**Roy Minton**
**Richard Cuerden**
TRL Limited
United Kingdom

Paper Number 07-0432

## ABSTRACT

Roadside safety barriers are designed to deflect errant vehicles back onto the carriageway, preventing them from encountering potentially dangerous off-road hazards or crossing into the opposing carriageway on dual carriageways. However, there are concerns that SUVs and MPVs, by virtue of their greater mass and height, may not be well catered for by the current design of safety barrier, which is tested to withstand an impact with a 1500kg standard car.

An analysis of National accident statistics (all police-reported injury accidents in Great Britain) is presented, which indicates that the occupants of these larger vehicles generally incur less severe injuries than occupants of standard cars. Only a small proportion of road accidents involve barrier strikes, and the involvement of a barrier is associated with increased likelihood of rollover and increased injury severity for occupants of all vehicle types. These increases in rollover incidence and injury severity are found to affect SUVs and MPVs much more than standard cars (rollover incidence rises by factors of 4 for cars, 7 for SUVs and 9 for MPVs).

However, detailed information on a small number of barrier strike accidents involving SUVs or MPVs taken from TRL's in-depth accident databases (10 cases in total) indicates that the barriers themselves may not be to blame. The barriers are found to exceed their design specification in a number of cases, and the cause of the accident is found in several cases to be difficulty in controlling these larger vehicles in extreme situations.

Despite the limitations of a lack of detail in the national accident statistics and a small number of cases for in-depth analysis, this study nevertheless offers a useful insight into an accident scenario in which SUVs and MPVs become less safe for their own occupants than standard cars.

## INTRODUCTION

Roadside safety barriers, also known as vehicle restraint systems, are designed to contain errant vehicles, preventing them from encountering potentially dangerous off-road hazards or crossing into the opposing carriageway on dual carriageways. However, there are concerns that Sports-Utility Vehicles (SUVs) and Multi-Purpose Vehicles (MPVs), by virtue of their greater mass and height, may not be well catered for by the current design of safety barrier in the UK, which is tested to withstand a 1500kg standard car impacting at 70mph (112kph) at an angle of 70$^o$.

In terms of sales, the UK market share of SUVs has grown from 3% to 6% over the 15 years from 1990, and that of MPVs has more than doubled to a peak of 22% in 2001, though this has dropped back to 20% in the last few years. However, proportionately more SUVs are involved in accidents, which may imply that there are more of them in the vehicle fleet. This could be explained by the fact that SUV-type vehicles have existed for a long time, whereas MPV numbers are growing from a much smaller base. As a result of this increasing market penetration, any problems associated with the crash characteristics of these vehicle types are likely to grow as time goes on.

We therefore set out to determine the nature of real world crashes involving these larger vehicles, to determine whether differences exist between their crash characteristics and those of standard cars, particularly when vehicle restraints are struck and, if so, to quantify the size of the problem. There is currently a shortage of information on vehicles of this type, which fall somewhere between cars and light goods vehicles (LGVs) in terms of size; indeed, some of the larger MPVs are little more than vans with windows and seats. However, in contrast to LGVs, which generally do not carry passengers, and which tend to be driven by professional drivers, the vehicles of interest are frequently used to transport families, so they have the potential to produce a greater number of casualties in any collision.

## MATERIALS AND METHODS

National road accident data for Great Britain (England, Scotland and Wales - GB) were analysed for the years 1995 to 2004 inclusive. All injury road crashes are required to be reported to the police, who compile a standard set of data about the crash circumstances, which is subsequently entered into the national Stats19 database. Only a fairly crude categorisation of vehicle types is possible from this data source, with most SUVs and MPVs being simply classed as “cars”. Our analysis subset was therefore defined as “all injury road accidents involving at least one car-type vehicle”. It is possible that some SUVs and MPVs may have been miscoded as a non-car vehicle type, and so might be excluded from the subset. However, since the most likely collision partner for any vehicle is a car, a large proportion of these miscoded vehicles would still be included because their collision partners would make the accident eligible.

Using vehicle registration marks (VRMs), this subset can then be linked to the national vehicle registration and licensing database, giving make and model information on the vehicles involved. By comparing this to a standard list of SUV and MPV makes and models drawn up for the purpose (see Appendix, Tables A1 & A2), these vehicle types could be identified in the road accident statistics. This process was not perfect, since errors at the data collection stage, either in recording the VRM, or in mixing up the VRMs between the vehicles in an accident could result in a blank record being returned or even the wrong make and model being assigned. Thus it is sometimes possible to see Porsche Carrera bicycles or Harley Davidson heavy goods vehicles involved in accidents. This problem was found to be worse in some years than others, but as far as could be ascertained, it never affected more than about 0.2% of vehicles. Sometimes the police do not see the vehicle involved and so do not record the VRM. This can happen in hit-and-run pedestrian accidents, where the vehicle is not traced, or possibly in some minor accidents which may only come to the attention of the police when the casualties attend hospital. Even when the linking was successful, the data from the licensing database was sometimes found to be incomplete, with only the make of the vehicle being available, so that it was not possible to say whether this was a standard car or an SUV or MPV. Because of this, five categories of vehicles were recognised in the analysis:

SUV: Make/model data available and identified from Table A1
MPV: Make/model data available and identified from Table A2
Car: Car-type vehicle, make/model data available and not an SUV or MPV
Other car: Car-type vehicle, make/model data not available or incomplete
Other vehicle: Any other vehicle, regardless of whether make/model data was available.

The “Other car” category doubtless contains some SUVs and MPVs, but they are not identifiable.

Another difficulty associated with this linking related to geographical bias. VRM-linked data has not always been available; the process was introduced in the early 1990s, involving data from just a few police force areas, and national coverage was not achieved until 1997. Data in our sample from 1995 and 1996 lacked information from several large urban police force areas and was noticeably anomalous as a result. These years have been excluded from the results presented here. For the remaining eight years, VRM-linked data was available for 80±2% of all accidents.

In each of the years studied, the overall sample sizes were of the order of 250,000 known cars, 6,500 SUVs and 3,500 MPVs.

## RESULTS AND DISCUSSION

### Driver Characteristics

For cars, the proportion of accident-involved vehicles with male drivers was found to exhibit a slight hint of a downward trend, from 63% to 61% over the study period. Both SUVs and MPVs had slightly higher proportions of male drivers, but with a more pronounced downward trend from 68% to 62%. SUVs were significantly different from cars in this respect in all years. There were also differences in the ages of the drivers, as shown in Figure 1 which, for each of the eight years in the study period, shows the numbers of each accident-involved vehicle type with drivers under 36 years old as a proportion of the total number of accident-involved vehicles of that type in that year:

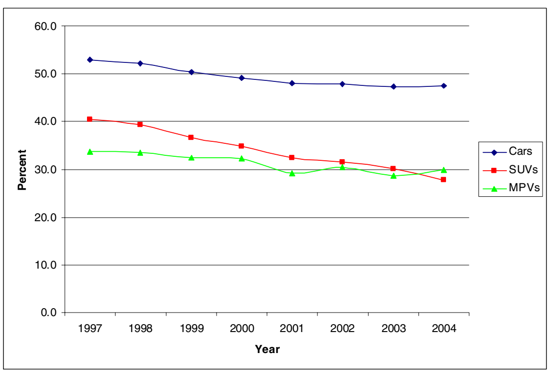


**Figure 1. Vehicles with drivers under 36 years old.**

The accident-involved car driving population appears to be getting older, with a downward trend in the number of drivers under 36 years old. Reasons for this could possibly include demographic changes in the age structure of the population, an improvement in the accident involvement rate of young drivers, or some other factor. The proportions for SUV and MPV drivers show similar downward trends, converging in 2003/04 at about 20 percentage points lower than cars, with just under 30% less than 36yrs, compared to just under 50% of car drivers. In general, this can probably be explained in terms of the drivers' financial and social situations, with cost and image value probably making a standard car more attractive to a young vehicle buyer. SUVs and MPVs are both significantly different from cars as regards driver age in each of the eight years studied.

**Injury Outcomes**

Figure 2 compares known standard cars with SUVs and MPVs for each of the eight years considered, with respect to the highest injury severity recorded for the vehicle occupants (vehicles which hit pedestrians are excluded). For each vehicle type, the percentages indicate the number of vehicles with killed or seriously injured occupants as a proportion of all accident-involved vehicles of that type in that year. See Appendix for definitions of injury severity terms.

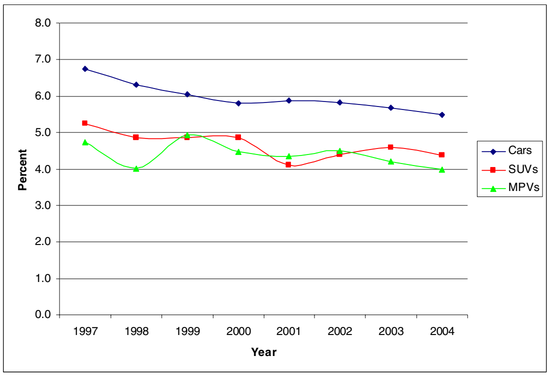


**Figure 2. Vehicles with killed or seriously injured occupants.**

The well-documented reduction in the rate of killed or seriously injured (KSI) occupants in GB over the study period is quite clear. The KSI rate in SUVs and MPVs is consistently lower than in cars (and this is statistically significant in each of the years considered), giving credence to the widely-held perception that these vehicles are safer for their occupants. Amalgamating the figures for all eight years, the KSI rates for SUVs and MPVs are both about 75% of the KSI rate for cars. The reason for this is probably related to the fact that the most likely collision partner is a smaller, lighter, standard car; incompatibility between cars and SUVs in particular is a well-recognised problem, with cars most likely to come off worse in any collision. This perception could change if the numbers of SUVs and MPVs were to rise to the point where the most likely collision partner is another SUV or MPV. Comparison of the three types of vehicle with respect to the numbers of uninjured occupants confirms that occupants of SUVs and MPVs are more likely to walk away from a crash uninjured than are car occupants.

**Accident circumstances**

Figure 3 is based on accidents involving pedestrians, where the pedestrian strike was the only impact which the vehicle experienced. Again, for each vehicle type, the figure shows the number of vehicles striking pedestrians as a proportion of all accident-involved vehicles of that type in that year.

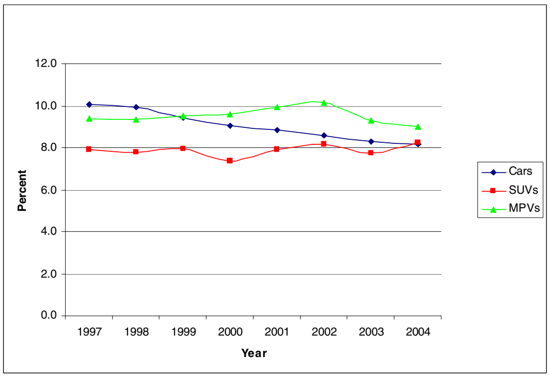


**Figure 3. Vehicles in pedestrian accidents (no other vehicle involved).**

There is a steady decline over the study period in the proportion which pedestrian/car accidents form of all car accidents, from about 10% to about 8%. Over the same period, pedestrian/SUV accidents as a proportion of all SUV accidents have remained fairly constant at about 8%, while the figures for MPVs have climbed from about 9.5% to 10% before dropping back to about 9% in 2003-04. Overall, the figures for MPVs are consistently higher than those for SUVs, and this may be a reflection of different road environments that these vehicle types are used in. It is interesting that neither SUVs nor MPVs are following the downward trend in pedestrian accidents seen for cars.

Figure 4 compares the three vehicle types with respect to the proportions which are involved in single-vehicle accidents (SVAs). It is interesting that the incidence of SVAs among cars rose by five percentage points to 20% over the eight years studied. Relative to cars, SUVs have historically had a higher proportion of SVAs, though they have converged over the last three years of the study period. MPVs, on the other hand, show a lower involvement rate in SVAs over the whole eight years, with no indication of likely convergence in the future.

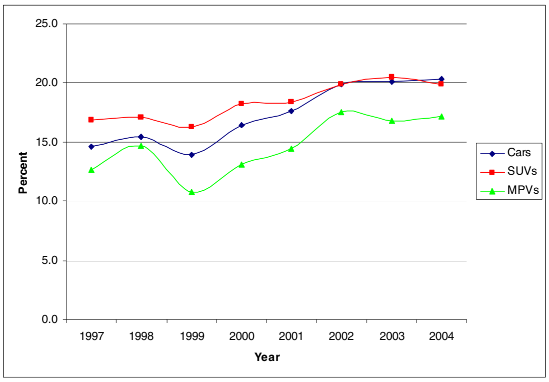


**Figure 4. Vehicles in single-vehicle accidents (no pedestrian involved).**

Figure 5 looks at vehicles which overturned during the accident. The data available are not sufficiently detailed to enable us to determine whether the rollover occurred before or after the first impact, nor whether the roll was the most injurious event.

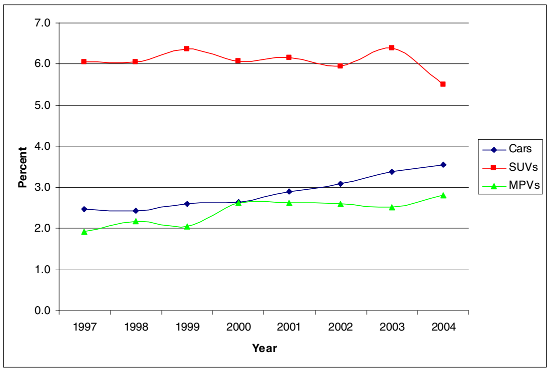


**Figure 5. Vehicles overturning.**

Clearly, SUVs are roughly twice as likely to overturn in an accident as cars are, although there is a rising trend among cars which is not seen for SUVs. These differences are statistically significant in each of the eight study years. MPVs, on the other hand, are slightly less likely to overturn than cars, but the differences are only significant in the final three years. Table 1 shows how injury outcome is affected by rollover.

**Table 1.**
**Overturning vehicles by occupant injury severity and vehicle type (no pedestrian involved)**

| Maximum severity in vehicle | Car | | SUV | | MPV | |
|---|---|---|---|---|---|---|
| | Number | % | Number | % | Number | % |
| Injured | 55973 | 97.1 | 3146 | 95.1 | 775 | 95.2 |
| Uninjured | 1662 | 2.9 | 162 | 4.9 | 39 | 4.8 |
| KSI | 12260 | 21.3 | 645 | 19.5 | 152 | 18.7 |
| Slight & uninjured | 45375 | 78.7 | 2663 | 80.5 | 662 | 81.3 |
| Totals | 57635 | 100 | 3308 | 100 | 814 | 100 |

Because rollover is a relatively rare occurrence, this table amalgamates the figures from the entire eight year period. Vehicles which struck pedestrians are excluded. Comparing this to Figure 1, we see that the KSI rate for all three vehicle types has, as might be expected, risen. The KSI rate for cars is 21% when rollover occurs, compared to an average of about 6% in Figure 1. However, SUVs and MPVs, are much more badly affected by rollover, with their KSI rates now much closer to those of cars, whereas previously their KSI rates were only about 75% of that for cars.

Figure 6 shows the proportion of vehicles which left the carriageway, either before or after impact. Cars show a rising trend from 2000 on, to such an extent that by 2004 a higher proportion of cars than SUVs leave the carriageway, whereas historically, SUVs were more likely to go off the road. MPVs appear to be much less likely to leave the carriageway than either cars or SUVs.

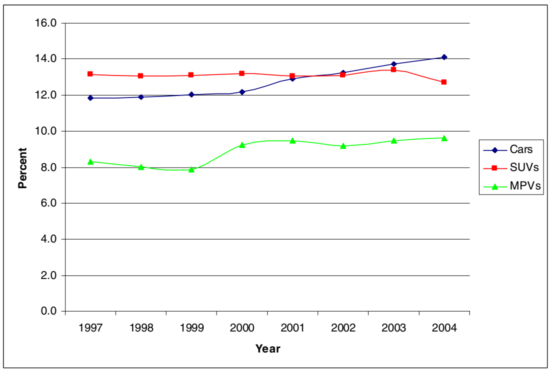


**Figure 6. Vehicles leaving the carriageway.**

The data available includes details of the objects struck by vehicles which left the carriageway. Although some 13% of cars and SUVs leave the carriageway, only about 10% strike anything in the process. Similarly, only about 7% of all MPVs strike anything off the carriageway. Table 2 gives details of the off-carriageway objects struck, using amalgamated data from all eight years.

**Table 2.**
**Vehicles by Off-Carriageway Object Struck and Vehicle Type**

| Object struck | Car | | SUV | | MPV | |
|---|---|---|---|---|---|---|
| | Number | % | Number | % | Number | % |
| Road sign/signal | 16514 | 8.5 | 359 | 7.1 | 180 | 9.0 |
| Lamp post | 20421 | 10.5 | 316 | 6.3 | 172 | 8.6 |
| Telegraph pole | 7022 | 3.6 | 162 | 3.2 | 60 | 3.0 |
| Tree | 28182 | 14.5 | 693 | 13.7 | 276 | 13.7 |
| Bus stop/shelter | 1220 | 0.6 | 20 | 0.4 | 10 | 0.5 |
| Central barrier | 14813 | 7.6 | 453 | 9.0 | 210 | 10.5 |
| Road side barrier | 14512 | 7.5 | 391 | 7.8 | 174 | 8.7 |
| Submerged | 225 | 0.1 | 7 | 0.1 | 2 | 0.1 |
| Entered ditch | 17473 | 9.0 | 638 | 12.7 | 216 | 10.8 |
| Other object | 73802 | 37.9 | 1986 | 39.4 | 701 | 34.9 |
| Not coded | 567 | 0.3 | 16 | 0.3 | 7 | 0.3 |
| Totals | 194751 | 100 | 5041 | 100 | 2008 | 100 |

The two barrier categories (central and road side) together account for about 15% of the off-carriageway objects struck by cars, the proportions being somewhat higher for SUVs and MPVs. Overall, however, less than 1.5% of all accident-involved vehicles strike safety barriers. This is a fairly small proportion, but Tables 3 and 4 demonstrate that barrier strikes, while being associated with significantly worse outcomes for all vehicle types, have a particularly adverse effect on SUVs and MPVs.

**Table 3.**
**Vehicles by overturning, barrier contact and vehicle type**

| Vehicle overturning | Car | | SUV | | MPV | |
|---|---|---|---|---|---|---|
| | Number | % | Number | % | Number | % |
| **No barrier strike** | | | | | | |
| Overturn | 57879 | 2.9 | 3316 | 6.1 | 818 | 2.5 |
| No overturn | 1966998 | 97.1 | 51442 | 93.9 | 31761 | 97.5 |
| Total | 2024877 | 100 | 54758 | 100 | 32579 | 100 |
| **Barrier strike** | | | | | | |
| Overturn | 3213 | 11.0 | 348 | 41.2 | 88 | 22.9 |
| No overturn | 26112 | 89.0 | 496 | 58.8 | 296 | 77.1 |
| Total | 29325 | 100 | 844 | 100 | 384 | 100 |

**Table 4.**
**Vehicles by occupant injury severity, barrier contact and vehicle type**

| Vehicle overturning | Car | | SUV | | MPV | |
|---|---|---|---|---|---|---|
| | Number | % | Number | % | Number | % |
| **No barrier strike** | | | | | | |
| KSI | 109880 | 6.0 | 2327 | 4.6 | 1278 | 4.4 |
| Slight & uninjured | 1725611 | 94.0 | 47975 | 95.4 | 28094 | 95.6 |
| Total | 1835491 | 100 | 50302 | 100 | 29372 | 100 |
| **Barrier strike** | | | | | | |
| KSI | 3566 | 12.2 | 134 | 16.0 | 45 | 11.7 |
| Slight & uninjured | 25570 | 87.8 | 703 | 84.0 | 339 | 88.3 |
| Total | 29136 | 100 | 837 | 100 | 384 | 100 |

The top half of table 3 is similar to Figure 5, and shows SUVs being more than twice as likely as cars to roll over in accidents generally, with MPVs being slightly less likely than cars to roll. The lower half of the table is based on the subset of vehicles which struck barriers, and shows a more than three-fold increase in rollover incidence for cars. This is likely to be related to the fact that barriers are generally installed on high-speed roads, where any impact is more likely to result in the vehicle overturning. However, the figures for SUVs and MPVs indicate that these vehicle types are much more badly affected in these circumstances, with rollover incidence increasing by factors of nearly 7 for SUVs and 9 for MPVs. These differences are statistically significant for all three vehicle types.

We have already seen (Table 1) that the KSI rate is particularly badly affected by rollover for SUVs and MPVs. Table 4 gives the injury outcome data for vehicles striking barriers, whether they overturned or not. Again, this uses amalgamated data from all eight years, and excludes vehicles striking pedestrians.

The top half of Table 4 gives information similar to that in Figure 2 – that is, the KSI rate for SUVs and MPVs is about 75% of that for cars. The lower half of the table gives the results for barrier strike crashes and shows that, in these circumstances, SUVs become significantly less safe than cars in terms of the KSI rate, while MPVs become only slightly safer than cars. These results are consistent with Tables 1 and 3 above, where overturning was shown to have a disproportionately deleterious effect on injury outcome for SUVs and MPVs compared to cars, and the incidence of overturning was also shown to be disproportionately higher for SUVs and MPVs when a barrier was involved.

## CASE STUDIES

In addition to the analysis of national statistics presented above, a small number of police reports on cases where an SUV or MPV had hit a barrier were available for detailed study. These cases were drawn from a collection of some 30,000 police reports on fatal accidents held by TRL, spanning the years 1986 to 2005. Table 4 indicates that there were 179 KSI cases over the study period, and of these, 23 involved a fatality. The police reports on ten of these cases were available. The results of these case studies, in most cases, indicated that the barriers themselves were not the cause of the problem. In a number of cases, the barriers out-performed their specification in retaining these heavier vehicles on their own carriageway. There was no compelling evidence to indicate that the barriers were instrumental in causing the vehicles to roll over. In a number of cases, the barrier strike was only a glancing blow, and the loss of control and rollover could be attributed to over-reaction by the driver in terms of steering input in an attempt to regain the carriageway proper. In other cases, the vehicle was already completely out of control before the barrier strike. High speed was a factor in most of the cases, and the overall conclusion was that the problem lay in drivers' inability to control their vehicles at high speeds in extreme situations.

Only one case gave cause for concern. Here a stepped approach to a barrier was felt to have been instrumental in launching an SUV over the barrier into the opposing carriageway. This occurred despite the barrier being higher than normal specification would allow. It may be that such a stepped approach would be better avoided if possible.

## CONCLUSIONS

1. There are significant differences between SUVs and MPVs and cars in terms of their accident characteristics. These can be summarised as follows:

a. SUVs and MPVs are slightly more likely to be driven by males than cars are, and the average age of these drivers is significantly greater than that of car drivers.

b. MPVs are more likely than cars to have accidents involving pedestrians. SUVs have historically shown the opposite tendency, but they have converged with cars in this respect recently. MPVs are less likely than cars to have single-vehicle accidents, but both cars and MPVs show a rising trend over time. SUVs have historically been more likely than cars to be involved in SVAs, but again they have converged in recent years.

c. Occupants of Group vehicles are significantly less likely to be killed or seriously injured and more likely to be uninjured compared to car occupants.

d. SUVs are significantly more likely to overturn during an accident than are cars. MPVs in recent years have shown a slight tendency in the opposite direction.

e. Historically, SUVs have been more likely than cars to leave the carriageway, but a rising trend among cars has resulted in the opposite being the case in recent years. MPVs are significantly less likely to leave the carriageway than is the case for cars.

f. Less than 1.5% of all the accident-involved vehicles studied hit safety barriers when they leave the carriageway.

g. Barrier impacts are associated with increased incidence of rollover and higher injury severity outcome for all vehicle types, but disproportionately so for SUVs and MPVs.

2. Analysis of a small sample of cases from TRL's Fatal Accident File collection has indicated:

a. In most of the crashes the barrier out-performed its specification in terms of the mass of the striking vehicle and the speed and angle of approach.

b. It appears that the increased injury severity associated with SUVs and MPVs involved in barrier strikes may be a function of difficulties in controlling these vehicles in extreme situations, regardless of whether or not they struck a barrier. In several cases the barrier merely contained an already out-of-control vehicle.

c. Only one case gave cause for concern. Here a stepped approach to a barrier was felt to have been instrumental in launching an SUV over the barrier into the opposing carriageway. This occurred despite the barrier being higher than normal specification would allow. This was more a shortcoming in the associated infrastructure than in the barrier itself.

## ACKNOWLEDGEMENTS

The authors wish to acknowledge the support of the UK Highways Agency in carrying out this project, which was funded under the Framework Project Task Number 3/372-R37.

Police fatal accident reports are supplied to TRL Limited on a routine basis by most police forces in England and Wales when they are no longer required for legal processes. Their collection and cataloguing is funded by the United Kingdom Department for Transport (DfT) (Road Safety Division).

Summaries of National Stats19 injury accident data are published annually by the United Kingdom Department for Transport (DfT) in the Road Casualties Great Britain series.

## APPENDIX

**Police Injury Severity** – In this paper, the UK government's definitions of injury severity (Fatal (Killed), Serious or Slight) are used.

'Fatal' injury includes only those where death occurs in less than 30 days as a result of the accident. Fatal does not include death from natural causes or suicide.

Examples of 'Serious' injury are:

- Fracture of bone
- Internal injury
- Severe cuts
- Crushing
- Burns (excluding friction burns)
- Concussion
- Severe general shock requiring hospital treatment
- Detention in hospital as an in-patient, either immediately or later
- Injuries to casualties who die 30 or more days after the accident from injuries sustained in that accident

Examples of 'Slight' injuries are:

- Sprains, not necessarily requiring medical treatment
- Neck whiplash injury
- Bruises
- Slight cuts
- Slight shock requiring roadside attention

**Table A1.**
**SUV Makes and Models**

| Make | Model | Make | Model |
|---|---|---|---|
| Acura | MDX | Mazda | Tribute |
| ARO | | Mercedes | G-Class |
| Asia | Rocsta | Mercedes | ML-Class |
| BMW | X5 | Mitsubishi | Challenger |
| Cadillac | Escalade | Mitsubishi | Montero |
| Chevrolet GMC | Blazer | Mitsubishi | Pajero |
| Chevrolet GMC | Silverado | Mitsubishi | Pajero Io |
| Chevrolet GMC | Tahoe | Mitsubishi | Pajero Mini |
| Chevrolet GMC | Vega | Mitsubishi | Pajero Pinin |
| Daewoo | Korando | Mitsubishi | Shogun |
| Daewoo | Musso | Mitsubishi | Shogun Pinin |
| Daihatsu | Fourtrak | Mitsubishi | Shogun Sport |
| Daihatsu | Sportrak | Nissan | Navara |
| Daihatsu | Terios | Nissan | Patrol |
| Dodge (USA) | Durango | Nissan | Safari |
| Dodge (USA) | Ram | Nissan | Terrano |
| Ford | Explorer | Nissan | X-Trail |
| Ford | F150 | Porsche | Cayenne |
| Ford | Maverick | Rover | Range Rover |
| Ford | Ranger | Ssangyong | Korando |
| Honda | CR-V | Ssangyong | Musso |
| Honda | HR-V | Ssangyong | Rexton |
| Hyundai | Santa Fe | Subaru | Forester |
| Hyundai | Terracan | Subaru | Legacy Outback |
| Infiniti | QX4 | Suzuki | Escudo |
| Isuzu | Bighorn | Suzuki | Grand Vitara |
| Isuzu | Mu | Suzuki | Jimny |
| Isuzu | Trooper | Suzuki | Samurai |
| Jeep | Cherokee | Suzuki | SJ |
| Jeep | Grand Cherokee | Suzuki | Vitara |
| Jeep | Wrangler | Tata | Safari |
| Kia | Sorento | Toyota | 4Runner |
| Kia | Sportage | Toyota | Harrier |
| Land Rover | 109 | Toyota | Hilux |
| Land Rover | 110 | Toyota | Landcruiser |
| Land Rover | 127 | Toyota | Landcruiser Amazon |
| Land Rover | 88 | Toyota | Landcruiser Colorado |
| Land Rover | 90 | Toyota | Rav4 |
| Land Rover | Defender | UMM | |
| Land Rover | Discovery | Vauxhall | Frontera |
| Land Rover | Freelander | Vauxhall | Monterey |
| Land Rover | Range Rover | Volkswagen | Touareg |
| Lexus | RX300 | Volvo | XC90 |

**Table A2.**
**MPV Makes and Models**

| Make | Model | Make | Model |
|---|---|---|---|
| Chrysler | Grand Voyager | Mitsubishi | Space Star |
| Chrysler | PT Cruiser | Mitsubishi | Space Wagon |
| Chrysler | Town & Country | Mitsubishi | Town Box |
| Chrysler | Voyager | Nissan | Almera Tino |
| Citroen | Berlingo | Nissan | Prairie |
| Citroen | C8 | Nissan | Serena |
| Citroen | Synergie | Opel | Agila |
| Citroen | Xsara Picasso | Opel | Zafira |
| Daewoo | Tacuma | Peugeot | 806 |
| Daihatsu | Delta | Peugeot | 807 |
| Daihatsu | Grand Move | Peugeot | Partner Combi |
| Daihatsu | Move | Renault | Avantime |
| Fiat | Doblo | Renault | Caravelle |
| Fiat | Multipla | Renault | Espace |
| Fiat | Ulysse | Renault | Grand Espace |
| Ford | Fiesta Courier | Renault | Kangoo |
| Ford | Focus | Renault | Megane Scenic |
| Ford | Galaxy | Seat | Alhambra |
| Ford | Tourneo | Seat | Terra |
| Honda | Odyssey | Suzuki | Wagon R+ |
| Honda | Shuttle | Toyota | Avensis Verso |
| Honda | Stepwagon | Toyota | Corolla Verso |
| Honda | Stream | Toyota | Estima |
| Hyundai | Atoz | Toyota | Granvia |
| Hyundai | Matrix | Toyota | Ipsum |
| Hyundai | Trajet | Toyota | Lucida |
| Kia | Carens | Toyota | Picnic |
| Kia | Sedona | Toyota | Previa |
| Mazda | MPV | Toyota | Space Cruiser |
| Mercedes | Vaneo | Toyota | Yaris Verso |
| Mercedes | V-class | Vauxhall | Agila |
| Mitsubishi | Chariot | Vauxhall | Meriva |
| Mitsubishi | Delica | Vauxhall | Sintra |
| Mitsubishi | Dion | Vauxhall | Zafira |
| Mitsubishi | Minica | Volkswagen | Caravelle |
| Mitsubishi | Mirage | Volkswagen | Microbus |
| Mitsubishi | RVR | Volkswagen | Sharan |
| Mitsubishi | Space Runner | Volkswagen | Touran |