PUBLISHED PROJECT REPORT PPR663

Investigating the reduction in fatal accidents in Great Britain from 2007-2010

Louise Lloyd, Caroline Reeves, Jeremy Broughton and Jennifer Scoons

Prepared for: Surrey County Council, Road Safety
Project Ref: 11111955

Quality approved:
Su Buttress
(Project Manager)

Jeremy Broughton
(Technical Referee)
Disclaimer

This report has been produced by the Transport Research Laboratory under a contract with Surrey County Council. Any views expressed in this report are not necessarily those of Surrey County Council.

The information contained herein is the property of TRL Limited and does not necessarily reflect the views or policies of the customer for whom this report was prepared. Whilst every effort has been made to ensure that the matter presented in this report is relevant, accurate and up-to-date, TRL Limited cannot accept any liability for any error or omission, or reliance on part or all of the content in another context.

When purchased in hard copy, this publication is printed on paper that is FSC (Forest Stewardship Council) and TCF (Totally Chlorine Free) registered.
# Contents

1 Introduction 3
   1.1 Motivation 3
   1.2 Aim and research hypotheses 4
   1.3 Current research 4
   1.4 Research structure 5

2 Data sources 6
   2.1 Exposure data 6
   2.2 Accident and injury data 7

3 Overview 9

4 Road user type 10
   4.1 Casualty trends by road user type 10
   4.2 Vehicle occupants 10
   4.3 Vulnerable road users 12

5 Demographics 14
   5.1 Age and gender of casualties 14
   5.2 Age and gender of drivers 16
   5.3 Socio demographic analyses 18

6 Environment 21
   6.1 Seasonal patterns 21
   6.2 Road type 23

7 Car design 25
   7.1 Car accident types 25
   7.2 Car body types 26
   7.3 Car age 28
   7.4 Car secondary safety for car drivers 30
   7.5 Car secondary safety for pedestrians 33

8 Behaviours 36
   8.1 Drink driving 36
   8.2 Speeding 38
   8.3 Seatbelt wearing 39
   8.4 Drivers’ use of mobile phones 40
   8.5 Summary 41

9 Contributory factors 42
10  Injuries 44
11  Economy 49
12  Foreign Comparisons 51
  12.1  European Union 51
    12.1.1  Overview 51
    12.1.2  Fatalities by mode of transport 53
  12.2  International analysis 55
13  Surrey data 57
  13.1  Casualty trends in Surrey and the South East 57
    13.1.1  Road users 58
    13.1.2  Casualty age 59
    13.1.3  Road type 60
    13.1.4  Deprivation 60
    13.1.5  Driver age and sex 61
    13.1.6  Contributory factors 61
  13.2  Surrey population 63
    13.2.1  Road use 63
    13.2.2  Demographics 64
    13.2.3  Alcohol consumption 66
  13.3  Summary 66
14  Conclusions 67
  14.1  Overview 67
    14.1.1  Aim 67
    14.1.2  Temporal observations 67
    14.1.3  Road user groups 67
    14.1.4  Car design 69
    14.1.5  Behaviours 69
    14.1.6  Economy 70
    14.1.7  Weather 70
    14.1.8  Injuries 70
    14.1.9  Other possibilities 71
    14.1.10  Hypotheses 71
  14.2  Discussion 72
15  Bibliography 73
1 Introduction

1.1 Motivation
The number of fatalities on British roads fell markedly from 2007 to 2010. Figure 1 presents the logarithm of the annual number to show the year-on-year changes, and it is clear that apart from a reduction from 1990-1992 this reduction is far greater than any seen over the previous decades. This is clearly “good news”, but there is little understanding of the reasons for this success. Without this understanding, there can be little confidence that the reductions will not be reversed, at least in part, and data for 2011 show that this has happened.

Figure 1: Fatality trend in Great Britain, 1960-2010

One might expect that the number of serious road accident casualties would change broadly in line with the number of fatal casualties, and Figure 2 shows that this did happen until about 1998. Over the next few years, however, the number of serious casualties continued to fall while the number of fatal casualties changed far less; indeed, it actually rose in 2003. Thus, the rapid reduction in fatal casualties from 2008 has simply caught up with the more sustained reduction in serious casualties.
1.2 Aim and research hypotheses

The aim of this research was to investigate the causes of the major reduction in the number of road accident fatalities in Great Britain between 2007 and 2010.

Our study plan was heavily influenced by a series of research hypotheses. These hypotheses were driven by results from the international literature review (summarised in Section 1.3), previous research and expert knowledge. As the research commenced the hypotheses developed to encompass new ideas stemming from the research.

Research hypotheses

The change in fatal accident trend is due to:

- A change in the amount of traffic;
- Developments in vehicle safety;
- Weather patterns;
- Economic recession.

1.3 Current research

A literature review was undertaken to collate any existing analytical methods for investigating reasons for the rapid reductions in the number of fatal road accidents experienced by other countries in recent years. We reviewed reports from the Netherlands and the United States which have both seen steep declines in fatality rates in recent years.

Fatalities in motor vehicle crashes in the United States rose to a peak of 43,510 in 2005 but was then followed by a steep decrease, with the number of road fatalities reducing by 22% from 2005-09. Researchers at the US Department of Transportation and University of Michigan Transportation Research Institute have studied the trends in fatalities from a number of different angles. The results and conclusions from these reports are discussed in Section 12; for now we concentrate on their methods.
Longthorne, Subramanian, & Chen (2010) carry out an exploratory analysis of the Fatality Analysis Reporting System (FARS) across a number of variables including road user type, crash type and age of driver. They also investigate historical economic patterns and relate these to the road fatality trends. Sivak & Schoettle (2010) compare distributions for variables in FARS for 2008 relative to 2005. From this they identified collisions which showed the largest reductions over the period. Crucially, in both papers, the investigations also included observing changes in exposure data to attempt to explain the patterns in accident trends. Sivak & Schoettle (2011) study whether the recent trend has been affected by the frequency or severity of crashes (or both). They investigate the difference in the number of all crashes and fatal crashes by examining the changes from 2005 to 2009, using the change in all crashes to represent changes in frequency, and the difference between the change in the fatal crashes and all crashes to represent the change in severity.

In the Netherlands, the number and rate of road fatalities suddenly dropped in 2004 and further declined from 2005 to 2007. Some exploratory accident and exposure analysis (Weijermars, Goldenbeld, Bos, & Bijleveld, 2008) revealed particular road user groups and crash types to have been particularly affected in this changing trend. The authors use a log linear time series modelling analysis to evaluate the trends and include an intervention in the model to quantify the size of this change in trend statistically.

1.4 Research structure

Based on our research hypotheses and results from the literature our research has been structured into six tasks:

1. Exploratory accident analysis: including STATS19, MAST and Coroners data.
2. Exposure data evaluation: including identifying trends in traffic, vehicle use, driver demographics, and economic factors.
5. Road accident injury statistics.
6. Trends in fatalities in other countries.

We have combined the relevant and significant results from our research in the following report.
## 2 Data sources

### 2.1 Exposure data

Data from 2000 to 2010 have been analysed to see whether changes in mode and distance travelled have contributed to the fatality reduction. The Department for Transport (DfT) National traffic estimates and DVLA counts of registered vehicles have been used to calculate accident rates and for modelling rates. Other exposure and explanatory\(^1\) data sources have been used to explain some of the differences observed.

**National traffic estimates**

The DfT collects and analyses traffic counts on a large selection of roads in Great Britain. These counts are combined with road network lengths in order to estimate the total vehicle kilometres travelled each year. Overall, there are approximately 50,000km of Motorway and A roads and 338,000km of minor roads. Traffic densities vary considerably over different types of roads, different areas and different vehicle types, so detailed data are collected automatically and manually at a large number of sites across Great Britain. Specifically, traffic flow, measured in vehicle kilometres, is the product of the average daily flow (calculated from the traffic count) and the length of the road on which the daily flow was based. Due to the nature of the counting mechanisms, traffic flow can be approximately disaggregated by time, month, road type, region, and vehicle type.

The data used in this research is vehicle flow from 2000 to 2011 on different road types, by different vehicle types.

**Registered vehicle data**

The Driver and Vehicle Licensing Agency (DVLA) holds information on each registered vehicle in the UK, including the make and model of the vehicle and its year of registration. This ‘make and model’ information can be used to categorise the UK car fleet into six subgroups by car size: minis and super minis, small, medium and large saloons, 4x4s and people carriers and sports cars.

These data are used in this research to classify the vehicles that were involved in STATS19 accidents. In addition, the number of registered cars by car type, age and year from 2000-2010 has been used as an exposure measure.

**National Travel Survey**

The National Travel Survey (NTS) is a continuous household survey collecting interview and travel diary data on personal travel in Great Britain. Detailed diary data are collected for each journey travelled in a week including information on mode types, distance, cost and time. Interviews are conducted with people in their homes to collect other factors such as car availability, driving licence holding and access to key services (Department for Transport, 2011). An important aspect of the NTS is that it allows the volume of

---

\(^1\) Exposure data measures how much a person or group of people have been exposed to the risk of a road accident, for example, how many kilometres they have travelled. Explanatory data may suggest (explain) a reason for a change in accident trends, but is not necessarily a measure of exposure. For example, the economic measure of GDP may be explanatory data but is not a measure of exposure to accident risk.
pedestrian travel by road to be estimated each year, in addition to providing more detail than the traffic census about travel by vehicle.

Data from 2002 to 2010 have been used in this research, which covers approximately 8,000 households and 19,000 individuals per year.

**Other exposure and explanatory data**

Transport Statistics Great Britain (Department for Transport, 2012) contains tabulations of transport statistics across all modes. This includes data from the Driving Standards Agency (DSA) on licence holders, vehicle speed data and average journey time from traffic surveys across the road network, freight movements, vehicle testing results from the Vehicle and Operator Services Agency (VOSA), offence data from the Ministry of Justice and the Home Office and expenditure on roads.

Where traffic data are not available as an exposure measure, for example for disaggregated age and gender of road users, population is used as an alternative. This assumes that each population group is equally exposed which is unlikely to be true, but it is believed to be a better measure of exposure than none.

The Gross Domestic Product (GDP) is a measure of the UK’s economic activity. The data used in this research is seasonally adjusted chain volume GDP. These data have been retrieved from the Gross Domestic Product Preliminary Estimate (Office for National Statistics, 2012).

**2.2 Accident and injury data**

**STATS19**

STATS19 is the system for recording personal injury road accident data reported to the police in Great Britain. The hierarchical database comprises details of the accident circumstances, together with data on the vehicles and casualties involved in the collision. The data is collected by Police Officers and also includes the officer's subjective view of the contributing factors, or possible reasons why the accident occurred. The information collected helps to prioritise resources for road safety including infrastructure investment, enforcement strategies and Government policies. We have used data from 2000-2010.

**HES**

The Hospital Episode Statistics data warehouse contains detailed demographic, injury and treatment data for patients treated in NHS hospitals in England. We have used 326,338 biennial records from 2000 to 2011 of inpatients who were admitted as the result of a road transport related accident, who are classified as sustaining an injury and who survive to the end of the episode.

**MAST**

The MAST dataset links the national STATS19 accident data to Mosaic sectors. Mosaic classifies households into 15 socio-demographic groups (shown in Appendix A) and this allows evaluation of the changes in the types of communities who are most at risk of becoming involved in crashes. We compare the socio-demographic data from accidents from 2004 to 2010 with the distribution by Mosaic segments of populations in specific regions in Great Britain.
Coroners’ data

TRL collect, on behalf of DfT, blood alcohol levels from HM coroners and procurators fiscal for all road fatalities aged 16 or over who died within 12 hours of the road accident. Data from 2002 to 2010 were received from the coroners and procurators fiscal for 82% of the fatalities in STATS19 aged over 16.

Over this period we received 14,683 'L407' records that could be matched to STATS19, with blood alcohol information. These 14,683 fatalities consisted of 10,445 driver/rider fatalities, 1,839 passengers and 2,399 pedestrians.
3 Overview

Figure 3 shows the trend in killed and seriously injured casualties from 2000-2010. The number of casualties in each severity group is indexed to the 2000 figure.

The number of casualties killed in 2010 was 46% lower than in 2000; the corresponding reduction for seriously injured casualties was 41%. Although the relative casualty numbers were similar in 2009, the two patterns differ. As shown in Figure 3, seriously injured casualties show a fairly sustained reduction between 2001 and 2010, whilst fatalities show very little change until 2006 with a fairly rapid decline after 2007. Table 1 shows the number of fatalities over three 3-year periods from 2000 to 2010. The reduction in fatalities from 2004-2006 to 2008-2010 was 31% compared to a much smaller reduction from 2000-2002 to 2004-2006.

Table 1: Total number of and change in fatal casualties in three year periods

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatal casualties</td>
<td>10290</td>
<td>9594</td>
<td>6610</td>
</tr>
<tr>
<td>Change from previous period</td>
<td>-</td>
<td>-7%</td>
<td>-31%</td>
</tr>
</tbody>
</table>
4 Road user type

4.1 Casualty trends by road user type

Figure 4 classifies road users into three groups: driver/rider, passenger and pedestrian; casualties in these three groups can be exposed to different types of risk.

There is a striking difference in the trend for vehicle occupants and pedestrians, especially in the first five years. The fatal and serious trends for pedestrians track each other closely until 2008, unlike the other two groups. The proportional reduction from 2000 in fatally injured pedestrians by 2010 is considerably bigger than the reduction in seriously injured pedestrians. The reduction in passenger fatalities drops substantially in 2008 and 2010, whilst the drop in driver fatalities is continuous from 2007.

Section 4.2 develops the investigation into vehicle occupant trends and Section 4.3 combines pedestrians with other vulnerable road users.

4.2 Vehicle occupants

Occupants of different vehicle types are exposed to different risks when involved in accidents as a result of differences in vehicle structures and driving characteristics. Here, we have split the vehicle types that were used by casualties by size into car/taxi, LGV (<3.5tonnes) and HGV (>3.5tonnes). The principal other types of vehicle, pedal cycles and motorcycles, are considered in the next section.

Between 2000 and 2010 car/taxi occupants made up 94% of all fatally injured vehicle occupants, LGV and HGV occupants made up 4% and 2% of fatalities respectively.

The trends in the fatalities vary by vehicle type. As occupants of cars and taxis make up the majority of the casualties and exposure, this trend (shown in Figure 5) is similar to the overall trend shown in Figure 3– there is a distinguishable change in trend in 2007.
Traffic levels for these vehicle types are shown in Figure 6, which shows a small increase in car traffic levels over the same period, with a small drop in 2009 and 2010.

The trend in fatalities in LGV occupants is more variable due to smaller numbers, decreases initially in 2004/2005, followed by a period of relative stability and a further drop from 2008. Figure 6 shows that LGV traffic increased rapidly until 2007, followed by a relatively stable period. The decline in 2008 may be related to the change in traffic trend for LGVs.

For HGV occupants, the variability is even greater with 28 HGV occupant fatalities in 2010 - these small numbers are exposed to random fluctuations. However, there appears to be a generally decreasing trend over time with unusually big drops in 2008 and 2009. The drop in 2009 is replicated in the traffic data which saw a drop in the vehicle kilometres driven by HGVs. Freight movement in Great Britain has reduced during the recession; in particular, there was a substantial reduction in tonne kilometres of bulk product and chemicals (including petrol and fertilisers) in 2009 (Department for Transport, 2011) and this would have contributed to the reduction in HGV occupant fatalities.

Figure 5: Killed and seriously injured casualty trend by vehicle type, 2000-2010
4.3 Vulnerable road users

The pattern in fatalities of vulnerable road users is generally different from vehicle occupants due to the different protection offered to occupants compared with these other road users. Figure 7 shows the trends for fatally and seriously injured motorcyclists, pedal cyclists and pedestrians.

The pedal cyclist casualty trends have fluctuated over this decade. Table 2 shows a small increase (8%) in the number of pedal cycle fatalities between the two periods 2000-02 and 2004-06, followed by a drop of 23% between 2004-06 and 2008-10. The number killed fell in 2008 and 2009 at a time when the volume of pedal cycle traffic rose significantly (Figure 8), so this drop in fatalities is noteworthy. The trend in serious casualties has risen since 2006, and this is one of very few casualty groups of road user with a rising trend.

Motorcyclist traffic dropped in 2008 and 2010 and this matches the drops in fatalities shown in Figure 7. A very small reduction in fatalities occurred between 2000-02 and 2004-06 (2%), followed by a bigger reduction (22%) between the latter periods.

As discussed in Section 4.1, the pedestrian fatality trend tracked the associated serious casualty trend until 2008, reducing substantially in 2004 and gradually from 2007.

Table 2: Total number of and change in fatal casualties in three year periods by road user type

<table>
<thead>
<tr>
<th>Road user</th>
<th>Fatalities</th>
<th>2004-06 compared to 2000-02</th>
<th>2008-10 compared to 2004-06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car/taxi occupant</td>
<td>5116</td>
<td>-4%</td>
<td>-36%</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>1797</td>
<td>-2%</td>
<td>-22%</td>
</tr>
<tr>
<td>Pedal cyclist</td>
<td>395</td>
<td>8%</td>
<td>-23%</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>2458</td>
<td>-18%</td>
<td>-27%</td>
</tr>
</tbody>
</table>
For all three classes of vulnerable road users, the reduction in fatalities from 2004-06 to 2008-10 was considerably less than the reduction in car/taxi occupant fatalities.

**Figure 7: Killed and seriously injured casualty trend by vehicle occupant type, 2000-2010**

**Figure 8: Exposure of vulnerable road users, 2000-2010**
5 Demographics

The change in trend in fatal casualties observed from 2007 affected the various road user groups differently. People from different demographic groups will be present in varying proportions in the different road user groups so it is important to investigate differences between these demographic groups.

5.1 Age and gender of casualties

Figure 9 shows that the overall trend in fatal and serious casualties differs little in the later years between males and females. The reduction in male fatalities was less in the earlier years relative to females but the steeper drop in 2007 and 2008 brought them back in line resulting in a similar proportional drop from 2000 by 2010.

![Graph showing killed and seriously injured casualty trend by casualty sex, 2000-2010](image)

Figure 9: Killed and seriously injured casualty trend by casualty sex, 2000-2010

Table 3 shows the reductions in fatalities by casualty age group in 3-year groups. Figure 10 and Figure 11 compare the trends by age group and gender. The number of children who were fatally injured declined the most but, unlike the overall trend, has gradually fallen over the decade. Between 2000-02 and 2004-06 the child fatalities fell by 19% - this is the biggest reduction during this period across all age groups, and the numbers fell again by 46% from 2004-06 to 2008-10. The fluctuation in these numbers is probably the result of small numbers.

The trend in young people killed (aged 16-30) appears to have first changed in 2007 and this group appears to have been affected earlier and more so than older people (31+) whose trends changed in 2008. The changes in trend observed for male casualties by age group are very similar to the overall trends by age group, as this is the larger group. For females, the killed trend for casualties aged 31+ has decreased gradually over time with no apparent change in trend in 2007, following the trend in serious casualties for the same age groups, quite closely. Young people and children show a steep decline in 2009.
### Table 3: Number and change in fatal casualties in 3-year periods by age

<table>
<thead>
<tr>
<th>Casualty age</th>
<th>2000-02</th>
<th>2004-06</th>
<th>2008-10</th>
<th>Change in fatalities 2004-06 compared to 2000-02</th>
<th>Change in fatalities 2008-10 compared to 2004-06</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-15</td>
<td>593</td>
<td>478</td>
<td>260</td>
<td>-19%</td>
<td>-46%</td>
</tr>
<tr>
<td>16-30</td>
<td>3646</td>
<td>3579</td>
<td>2305</td>
<td>-2%</td>
<td>-36%</td>
</tr>
<tr>
<td>31-60</td>
<td>3845</td>
<td>3550</td>
<td>2564</td>
<td>-8%</td>
<td>-28%</td>
</tr>
<tr>
<td>61+</td>
<td>2206</td>
<td>1987</td>
<td>1481</td>
<td>-10%</td>
<td>-25%</td>
</tr>
</tbody>
</table>

### Figure 10: Male killed and seriously injured casualty trend by age, 2000-2010

### Figure 11: Female killed and seriously injured casualty trend by age, 2000-2010
5.2 Age and gender of drivers

There is some speculation that the sharp decrease in young people killed from 2007 may be related to a decrease in the number of young drivers using the roads. Figure 12 shows differing patterns in the trends of male and female drivers involved in collisions.

In 2010, male drivers accounted for 81% of drivers involved in fatal collisions. The number of male drivers involved in fatal collisions dropped steadily from 2008, for female drivers, this drop is less steep and results in a lower proportional reduction in 2010 relative to 2000 than for male drivers. The number of female drivers in serious collisions fell between 2000 and 2004 and then levelled out.

![Figure 12: Drivers in fatal and serious collisions by sex of driver, 2000-2010](image)

The changes in fatalities vary by age of driver with all age groups experiencing a bigger reduction between 2004-06 and 2008-10. The decrease for male 17-20 year old drivers in fatal collisions has been much bigger between the latest periods than all other age groups resulting in a reduction of 41% between 2004-06 and 2008-10. For the next age group: 26-40 year olds, the number of drivers involved in collisions decreased gradually over time, with drops in 2004 and 2005 which was not seen in the overall trend. For older drivers, the reduction is smaller than overall with very little reduction between 2000-02 and 2004-06, and a smaller than overall reduction between 2004-06 and 2008-10 of 22% and 20% for males and females respectively.

### Table 4: Number and change in fatal collisions in 3-year periods by driver group

<table>
<thead>
<tr>
<th>Driver group</th>
<th>Fatalities 2000-02</th>
<th>Fatalities 2004-06</th>
<th>Fatalities 2008-10</th>
<th>Change in fatalities 2004-06 compared to 2000-02</th>
<th>Change in fatalities 2008-10 compared to 2004-06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male drivers</td>
<td>8735</td>
<td>8118</td>
<td>5465</td>
<td>-7%</td>
<td>-33%</td>
</tr>
<tr>
<td>Female drivers</td>
<td>1555</td>
<td>1476</td>
<td>1145</td>
<td>-5%</td>
<td>-22%</td>
</tr>
<tr>
<td>Male drivers 17-20</td>
<td>1155</td>
<td>1238</td>
<td>730</td>
<td>7%</td>
<td>-41%</td>
</tr>
<tr>
<td>Female driver 17-20</td>
<td>170</td>
<td>203</td>
<td>145</td>
<td>19%</td>
<td>-29%</td>
</tr>
<tr>
<td>Male driver 61+</td>
<td>1026</td>
<td>986</td>
<td>765</td>
<td>-4%</td>
<td>-22%</td>
</tr>
<tr>
<td>Female driver 61+</td>
<td>284</td>
<td>283</td>
<td>227</td>
<td>0%</td>
<td>-20%</td>
</tr>
</tbody>
</table>
Concentrating on the age group with the biggest drop in fatal collision involvement, Figure 13 shows the trend in young driver involvement in fatal and serious collisions by gender. The decline in 17-20 year old drivers in fatal collisions is greater for males than females, with males dropping steeply and steadily since 2007. We saw a significant drop in the number of young female drivers involved in fatal collisions in 2008 and 2009, and an increase in 2010 over this period. This may be directly related to the proportion of young drivers who are gaining their full car driving licence. Figure 14 shows a noticeable reduction in the proportion of 17-20 year old males who gained their driving licence from 2008, suggesting a reduction of young male drivers on the roads.

**Figure 13: 17-20 year old drivers in fatal and serious collisions by sex, 2000-2010**

**Figure 14: Proportion of the population with full car driving licences by age group**
5.3 Socio demographic analyses

MAST online (Road Safety Analysis, 2012) is a web based data analysis tool combining STATS19 data with Mosaic Public Sector, a common socio-demographic database. MAST uses the STATS19 casualty postcodes to classify the community represented by each UK postcode into one of 15 groups, described in Appendix A. Each group has different characteristics covering financial, demographic and property type.

Figure 15 shows the proportion of vehicle occupant casualties per group divided by the proportion of the population in that group, which is effectively a relative measure of the involvement these various groups in road accidents. A value above zero indicates that KSI vehicle casualties in that group are over-represented in terms of the population, one below the line indicates under-representation.

Groups that are over-represented in the casualty data include some of the lowest income families (groups K and O) and families living in small rural communities (A and B); however, the over-representation of the low income families (K and O) has tended to decrease. Under-representation of other groups (for example group G which contains young educated city dwellers) has also decreased – there was a higher proportion of vehicle occupant casualties in group G in 2010 (5.9%) than 2004 (3.6%).
FIGURE 16: Comparison of killed and seriously injured pedestrian casualties by Mosaic classification compared to the population proportion

The equivalent plot for pedestrians, shown in Figure 16, shows that groups G, I, K, M, N and O are over-represented in KSI casualties. These groups account for 42% of the population. Typically people in these over-represented groups have a low income and often rely on state support – they may be over-represented because of low car-ownership rates. For many of the demographic groups the trend is towards zero, which suggests that fatalities in overrepresented groups are getting less overrepresented.

An alternative to the Mosaic socio-demographic groups is the Index of Multiple Deprivation (IMD) which is used to identify how deprived an area is. It uses a range of economic, social and housing data to create a single deprivation score for each small area of the country. Figure 17 shows the trends in IMD quartiles which place the deprivation scores of individual areas into one of four groups of equal frequency, ranging from the 25% most deprived to the 25% least deprived areas.
Figure 17: Killed and seriously injured casualties by IMD quartile

MAST data is only available from 2004 onwards so the casualty numbers have been indexed to the 2004 figure and this shows that since 2004, the indexed number of killed casualties in each quartile has dropped more than the number of seriously injured casualties. Table 5 shows that the number of fatal casualties from the most deprived quarter has (proportionately) dropped the most, and at a steady rate since 2007.

**Table 5: Total number of and change in fatal casualties in three year periods by IMD quartile**

<table>
<thead>
<tr>
<th>IMD group</th>
<th>Fatalities</th>
<th>Change in fatalities 2008-10 compared to 2004-06</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Q1 most deprived</strong></td>
<td>2300</td>
<td>1527</td>
</tr>
<tr>
<td><strong>Q2</strong></td>
<td>2446</td>
<td>1702</td>
</tr>
<tr>
<td><strong>Q3</strong></td>
<td>2673</td>
<td>1854</td>
</tr>
<tr>
<td><strong>Q4 least deprived</strong></td>
<td>2175</td>
<td>1527</td>
</tr>
</tbody>
</table>

In summary, there is some suggestion that the least affluent demographic groups have seen marginally bigger reductions than other groups; however the general pattern is similar for all groups.
6 Environment

6.1 Seasonal patterns

In order to investigate more precisely where the change in trend first occurred the following section investigates the trend in three month periods. Figure 18 displays the trend split into quarters. There are, within this picture, several patterns that appear to change over time:

- Initially the highest peak occurs in Q4 (Oct-Dec) when snow and ice cause dangerous driving conditions, and there is more leisure driving over the Christmas period. Over time, this appears to have changed to Q3 (July-Sept).
- The spread of results throughout each year has got smaller, but not proportionately so: from 2001 to 2006, between Q1 and Q4 there is a range of around 200 (around 25% of the quarterly average) which reduces to a range of approximately 100 from 2007 (around 25% of the quarterly average).

The change in the ranges is shown in Figure 19. This shows the difference between consecutive quarters each year. If the quarterly pattern of fatal casualties was the same each year then the Figure would show straight lines slowly converging as the annual total reduces. The plot is considerably mixed until 2007 when the Q1-Q4 difference rises quickly and consistently. This is showing that the difference between the number of fatal casualties in Q1 and Q4 is decreasing over time, suggesting that the major reductions driving the overall reduction in annual fatal trend occurred in Q4.
Figure 19: Quarterly change in fatal casualties, 2000-2010

Figure 20 shows the average minimum temperature in each quarter (i.e. the average of the minimum daily temperatures throughout a quarter). Over the last five years there have been progressively colder winters, and we propose that drivers may drive more cautiously when roads are visibly more risky. This may be explaining the reductions in Q4 results over the same period.

Figure 20: Average minimum temperature by quarter, 2000-2010

If we look at the rolling four quarter total from 2001 to 2010 in Figure 21, it is possible to see that the change in trend occurred in Q4 2007, steadied from Q4 2008 to Q3 2009 and dropped again from Q4 2009.
6.2 Road type

The casualty trends have changed in different ways on the various road types. Table 6 shows that the number of fatal casualties on non-built up roads has dropped most rapidly between 2004-06 and 2008-10. Figure 22 shows that there were more gradual declines from 2007 on the other road types.
Table 6: Total number of and change in fatal casualties in three year periods by road type

<table>
<thead>
<tr>
<th>Road type</th>
<th>Fatalities 2000-02</th>
<th>Fatalities 2004-06</th>
<th>Fatalities 2008-10</th>
<th>Change in fatalities 2004-06 compared to 2000-02 (%)</th>
<th>Change in fatalities 2008-10 compared to 2004-06 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorway</td>
<td>616</td>
<td>555</td>
<td>408</td>
<td>-10%</td>
<td>-26%</td>
</tr>
<tr>
<td>BU A road</td>
<td>2093</td>
<td>1803</td>
<td>1335</td>
<td>-14%</td>
<td>-26%</td>
</tr>
<tr>
<td>NBU A road</td>
<td>3903</td>
<td>3633</td>
<td>2390</td>
<td>-7%</td>
<td>-34%</td>
</tr>
<tr>
<td>BU minor</td>
<td>2099</td>
<td>2034</td>
<td>1442</td>
<td>-3%</td>
<td>-29%</td>
</tr>
<tr>
<td>NBU minor</td>
<td>1579</td>
<td>1569</td>
<td>1035</td>
<td>-1%</td>
<td>-34%</td>
</tr>
</tbody>
</table>
7 Car design

Accidents involving cars make up around 85-90% of all accidents in the STATS19 data and these are therefore of considerable importance when investigating accident trends. In this section we concentrate on car occupant casualties and pedestrian casualties hit by a car.

7.1 Car accident types

We look initially at the number of vehicles involved in collisions where a car occupant was killed or seriously injured. Figure 23 shows the trend in car occupant casualty numbers for accidents involving one car, one car and one other vehicle and three or more vehicles (including at least one car). The pattern in the fatal trend is different for each collision type and each fatal trend is different from its associated serious trend in a similar way to the general trend. The single vehicle accident fatal trend drops sharply in 2007, 2008 and 2010 from a relatively stationary trend before that. The number of collisions involving two vehicles has been dropping steadily since 2004 and the trend shows no significant change at 2007. The small number of collisions which involve more than two vehicles results in a fluctuating trend with a substantial drop in 2004 and 2009.

![Figure 23: Killed and seriously injured car occupant casualty trend by number of cars involved in the collision, 2000-2010](image)

Figure 24 explores the different types of collision object in one and two vehicle accidents. For two vehicle collisions where the impact was frontal or side, the patterns in the period of interest were different: for side impacts, a drop in trend was observed in 2007 and 2008, similar to that for single vehicle accidents which hit a pole or tree; for frontal impacts, there was more of a steady decline until 2009 and 2010 when a steeper drop occurred. The trend in serious injuries remained the same for frontal and side impacts.
Reduction in fatal trend

Figure 24: Killed and seriously injured car occupant casualty trend by collision type, 2000-2010

7.2 Car body types

Broughton & Knowles (2010) showed that the fatal trend for different types of car types varied from 2000 to 2008; in particular there was a rise in the number of 4x4 and people carrier accidents over that period. Some of these differences are likely to be the result of changes in traffic patterns (i.e. exposure) and here we investigate the accident rate for different car types. Exposure for these different car types is not directly available and has been estimated in Figure 25 (Lloyd, in press).

Figure 25: Traffic (billion vehicle-kilometres) by year and car type

There has been a large increase in traffic levels for 4x4s/people carriers and an increase for the smallest car type minis & super minis. The difference in size of these two vehicle
types shows that the car fleet is diverging in terms of vehicle size. Traffic levels for the most common car type (medium saloons) have decreased over time.

The number of fatalities and seriously injured casualties in 4x4s has increased considerably since 2000 and the number of fatalities in medium saloons has reduced by the highest percentage. In general these changes reflect changes in the vehicle fleet rather than changes in risk to particular car classes. Due to these changes in the fleet, it is difficult to detect patterns in the trends in number of accidents involving these different car types. Figure 26 and Figure 27 show the casualty rates per billion vehicle-kilometres for fatally and seriously injured car occupants respectively by car type.

![Figure 26: Killed car occupant casualty rate by year and car type](image)

![Figure 27: Seriously injured car occupant casualty rate by year and car type](image)

The killed and seriously injured casualty rates for car occupants in all car classes has fallen since 2000, smoothly for seriously injuries and less so for fatalities. The occupant
Reduction in fatal trend

The casualty rate is greater for small cars such as minis and super minis than for larger cars - when two vehicles collide, the laws of physics dictate that the ratio of the masses strongly influences the likelihood of injury in the respective vehicles. The fatality rate for minis and super minis dropped rapidly from 2008, and that for small saloons dropped in 2007. As these cars contribute approximate 70% of the proportion of fatally or seriously injured car occupants these drops are directly related to the changing overall trend in 2007.

7.3 Car age

Figure 28 displays traffic (billion vehicle-kilometres travelled) by year and age of car.

![Figure 28: Traffic (billion vehicle-kilometres) by year and age of car](image)

The mileage of new cars has declined in recent years whilst the mileage of older cars, especially those aged 6-10 years, has increased. This is probably influenced by the changes in the patterns of car ownership, in particular the decline in new car sales from 2004.

Figure 29 and Figure 30 show the trend in killed and seriously injured car occupant casualty rates by age of car. There are no obvious breaks in trend at 2007 but when combined with information from Figure 28, then the numerical trend shows a substantial decline in the fatality rate of 6-10 year old cars, the most commonly used, from 2007; there was a similar decrease for 11-15 year old cars.

In each year, the occupant casualty rate is lower for newer cars, except that rates for cars at least 16 years old tend to be lower than for 11-15 year old cars. The improved protection (secondary safety) provided by more modern cars is examined in detail in the next section.
Reduction in fatal trend

Figure 29: Killed car occupant casualty rate by year and age of car

Figure 30: Seriously injured car occupant casualty rate by year and age of car

Table 7 displays the proportion of casualties killed or seriously injured by age of car in each of the years 1995, 2000, 2005 and 2010.

Table 7: Proportion of driver casualties killed or seriously injured by year and age of car

<table>
<thead>
<tr>
<th></th>
<th>0-2 years</th>
<th>3-5 years</th>
<th>6-10 years</th>
<th>11-15 years</th>
<th>16+ years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>11.1%</td>
<td>11.6%</td>
<td>12.1%</td>
<td>13.3%</td>
<td>14.5%</td>
</tr>
<tr>
<td>2000</td>
<td>8.7%</td>
<td>8.5%</td>
<td>9.1%</td>
<td>11.3%</td>
<td>13.4%</td>
</tr>
<tr>
<td>2005</td>
<td>7.4%</td>
<td>7.4%</td>
<td>7.9%</td>
<td>10.4%</td>
<td>12.6%</td>
</tr>
<tr>
<td>2010</td>
<td>6.3%</td>
<td>6.5%</td>
<td>7.5%</td>
<td>8.2%</td>
<td>10.3%</td>
</tr>
</tbody>
</table>
As Table 7 shows, the proportion of drivers killed or seriously injured is lower in newer cars. The proportion of drivers killed or seriously injured in the newest cars (0-2 years) has been decreasing in recent decades, from 11.1% in 1995 to just 6.3% in 2010. Broughton J. (2003) shows that this effect can be attributed to developments in car design which have improved their secondary safety.

Little information is available relating the age of vehicles to the type of people who drive them. The proportion of driver casualties injured in new cars (0-2 years) has declined across all driver age groups. This drop is larger for young drivers (17-25 years old) and for drivers aged 26-40 which indicates that the decline in vehicle-kilometres travelled by the newest cars is likely to be mostly due to a drop in the purchase of new vehicles, especially by those drivers in the youngest age groups where the risk is, in general, highest.

7.4 Car secondary safety for car drivers

Secondary safety refers to the protection offered by a vehicle in the event of an accident. This is fundamentally different from primary safety which involves systems such as brakes and steering which should help to avoid accidents.

The following section examines the trend in car occupant and pedestrian casualties by age of car. A statistical model is used to analyse car driver and pedestrian casualties by vehicle registration year in order to demonstrate how car secondary safety has improved over recent decades.

Data from accidents occurring between 1990 and 2010 are analysed using a Generalised Linear Model (GLM) fitted to the severity proportion i.e. the proportion of drivers killed or seriously injured.

Car registration year is used to estimate the reduction in the severity of drivers’ injuries linked to changes in succeeding ‘cohorts’ in the car fleet. It is known that older drivers tend to be more seriously injured than younger drivers for physiological reasons and they are also more likely to drive older cars, so we include age/sex by road type in the model. The inclusion of this variable also gives the opportunity to examine whether developments in car secondary safety have benefited some age/sex groups more than others.

Note that cars sharing the same registration year can be at very different stages in the product cycle. At any particular time, some will have just entered production and represent the “state of the art” of car design, while others entered production several years earlier. Consequently, an advance in design technique will only gradually affect these secondary safety results by registration year.
The results indicate that secondary safety seems to have continued to improve on both built up and non-built up roads and faster since 1990-1991 registered cars. Crucially we have not been able to detect a change in trend in 2007-2010, so developments in new cars are either not making cars any more safe than expected, or that the inflow of new cars into the fleet has not been sufficient to have had a dramatic effect.

It should be noted that only 572 drivers of cars\(^2\) were killed in 2010/11 and 5920 were seriously injured; as a result, the figures for the latest vehicles (those registered in 2010/11) are imprecise.

The statistical model contained the variable ‘year of accident’ to allow for the possibility that changes in traffic conditions and independent improvements in road safety may also

\(^2\)with known registration information
have reduced the severity of drivers’ injuries. By examining the proportion of drivers killed or seriously injured in a particular age group and year of registration across the accident years, changes to the risks faced by car drivers can be investigated. Figure 32 and Figure 33 show the casualty proportions for 25-59 year old male drivers of cars that were first registered in 2000-01, estimated using the model coefficients.

**Figure 32**: Modelled killed proportion for 2000-01 cars between 2000 and 2011

**Figure 33**: Modelled seriously injured proportion for 2000-01 cars between 2000 and 2011

The protection provided by these cars did not change through the period. The same variation by accident year is found for each registration year, so it cannot derive from age-related changes either to the performance of the cars or their drivers. Consequently, any changes in the casualty proportion must derive from changes over the period in the
conditions in which the cars travelled or the way in which they were driven. Figure 33 shows that the proportion of driver casualties that were seriously injured changed very little between 2000 and 2011. Figure 32 shows that the proportion of driver casualties that were killed rose steeply between 2000 and 2008 before falling even more steeply. The steepness of the fall must have contributed to the car occupant fatality reductions in 2009 and 2010.

The model has also shown that developments in car secondary safety have benefited some age/sex groups more than others over the period studied:

- For middle-aged (25-59) drivers, the proportion of casualties in 2010-11 registered cars who were killed was only three-fifths of the proportion in 2000-01 registered cars (a reduction of 40%);
- The benefits were slightly less for young (<25) and older (≥60) drivers, but the benefits for men and women were similar;
- The benefits were less for serious casualties than for fatal casualties: a reduction of less than one third for middle-aged drivers and one fifth for young and older drivers.

These changes occurred steadily over the decade, with no particular development from 2007.

### 7.5 Car secondary safety for pedestrians

This section will apply the same approach to examine whether the severity of the injuries suffered by a pedestrian who is hit by a car is influenced by the car’s registration year.

![Graph: Comparison of the reduction in KSI pedestrian casualty rate and KSI car occupant casualty rate for new vehicles (0-2 years)](image)

**Figure 34: Comparison of the reduction in KSI pedestrian casualty rate and KSI car occupant casualty rate for new vehicles (0-2 years)**

The trend in the killed and seriously injured casualty rates for pedestrians hit by cars are similar in shape to that of the car occupant casualties. The rates fluctuate more for pedestrian casualties than car occupant casualties as the numbers are smaller. The difference between the casualty rates for car occupants and pedestrian casualties hit by the newest cars is examined in more detail in Figure 34.
The values in Figure 34 are indexed to the 2000 figure in order to compare how the casualty rates changed over the period studied. From 2000 to 2005 the indexed rates for car occupant and pedestrian casualties remained fairly similar. In 2006 the car occupant casualty rate dropped significantly whilst the pedestrian rate remained similar to the rate experienced in 2005. The divergence in the two rates suggests that car secondary safety in new cars has continued to improve since 2005 whilst secondary safety for pedestrians hit by these vehicles has shown little progress.

We have carried out similar secondary safety modelling for pedestrians hit by cars. Data from accidents occurring between 1994 and 2010 were extracted from STATS19 and a model was fitted to the proportion of pedestrian casualties killed or seriously injured. Due to small numbers, casualties on built up and non-built up roads have been combined. The age/sex variable in this analysis relates to the age and sex of the pedestrian casualty and not to the age and sex of the driver which hit them. The three age groups used in this analysis were 0-15 (children), 16-59 and 60+.

The trend change displayed by the pedestrian casualties is different in shape to that displayed by the occupant casualties. Whereas improvements in secondary safety for vehicle occupants were seen to accelerate around 1990, improvements to secondary safety for pedestrians appear to have decelerated in the last decade. Recent data appear to suggest improvements in secondary safety for pedestrians may have accelerated in the 2010-11 registered cars, which may be the result of an EU regulation introduced in 2009 to improve protection for pedestrians involved in an accident with a car. Note, however, that the coefficients that represent the secondary safety of the newest cars are the least precise as they are derived from relatively few accidents.

On a baseline group of 16-59 year old male pedestrians on BU roads that were hit by cars first registered in 2000-01, the proportion of pedestrian casualties that were seriously injured increased steadily from 2005 to 2010, whilst the proportion of pedestrian casualties killed dropped steeply between 2008 and 2010. The steepness of the fall must have contributed to the pedestrian fatality reductions in 2009 and 2010. Since car age and casualty age and sex are fixed in this context, changes in the casualty

![Figure 35: Modelled severity proportion by registration year for pedestrian casualties hit by cars](image)
proportions displayed must derive from changes in the conditions in which the cars travelled, the way in which they were driven or in the behaviour of pedestrians.
8 Behaviours

8.1 Drink driving

The accident risks associated with the consumption of alcohol are well understood. For riders and drivers, Figure 36 shows the distribution of level of alcohol from the Coroner’s database that was found in the blood of this national sample of driver and rider fatalities. The legal limit for alcohol was 80mg per 100ml of blood in the UK throughout the period studied.

![Figure 36: STATS19 drivers/riders aged over 16, who died within 12 hours and have known BAC](image)

The majority (81%) of driver/rider fatalities were in the lowest alcohol level category (0mg/100ml – 80mg/100ml inclusive), and the proportions in the higher categories (above the legal limit) fluctuated over the nine years of available data. The proportion of fatalities with a blood alcohol level of 80mg/100ml or lower has varied only slightly over the nine years, and increased from 79% in 2004 to 83% in 2010. The proportion with a blood alcohol level of 200mg/100ml or more (the most risky drinkers) varied between 5.5% and 8.8% with a decrease over the last few years. The trends fluctuate over the years but there is some suggestion that there has been a reduction over the last few years in fatalities with a blood alcohol content above the legal limit of 80mg/100ml.

The distribution of level of alcohol found in pedestrian fatalities shows a similar pattern: the largest alcohol level category is 0mg/100ml – 80mg/100ml (inclusive), and this category accounted for fewer pedestrians than drivers/riders (Figure 36). Over the period 2002-2010, 76% of pedestrian fatalities were found to have a blood alcohol level of 80mg/100ml or less. The pattern in the number of pedestrian fatalities who are over the legal drink driving limit over the last four years is similar to that shown in Figure 36 and there has been a marked reduction in the number of pedestrian fatalities with a blood alcohol level of 200mg/100ml or more.

The DfT (Department for Transport, 2011) estimates the number of drink drive accidents each year based on failed and refused breath tests taken at the scene of accidents and...
coroner reports on blood alcohol content. Casualties involved in drink drive accidents are then defined as drink drive casualties and the trend in these estimated numbers is shown in Figure 37. The estimated number of fatalities due to drink driving dropped dramatically in 2007 and again in 2010 and this is a reflection of the roadside breath test data trend.

Figure 37: Estimated number of fatally and seriously injured casualties due to drink driving

These figures show there has been a dramatic reduction in fatalities due to drink driving over the last four years and this suggests that there may have been a reduction in the number of drunk drivers and riders on the roads. The best proxy available for the prevalence of drink driving in general traffic is the results of roadside breath testing by police officers. On average, around 600,000 breath tests have been carried out each year between 2001 and 2010 (Home Office, 2012) at the road side. The majority of these tests have been carried out as a result of a traffic offence, a road traffic collision or the police suspecting the driver to be drunk. The proportion of positive test results (shown in Figure 38) are therefore likely to be artificially high compared to the overall level of drink driving on the roads, however they give some indication of the trend in drinking and driving levels. This trend shows a clear reduction in the proportion of drivers using the road whilst over the drink drive limit (or who refused tests) from 2007. A smaller reduction occurred in 2004.
8.2 Speeding

Exceeding the speed limit or travelling too fast for conditions are two of the most common contributory factors (shown in Section 9) in accidents and inappropriate speed is known to increase the severity of injuries in accidents (Aarts & Schagen, 2006).

Figure 39 shows the proportion of car drivers exceeding the speed limit by a substantial amount on a sample of roads across Britain (Department for Transport, 2011). Road types are separated into Motorways, non-built up (NBU) dual carriageways, non-built up single carriageways, built up (BU) roads with a 40mph speed limit and built up roads with a 30mph speed limit. Since 2006, the proportion of vehicles measured at 10mph (Motorways and NBU roads) or 5mph (BU roads) above the speed limit has dropped on all road types. Compared to a general reduction in speeds below the speed limit, reductions in excessive speeds have a disproportionate effect on safety as it is these speeds which are disproportionately represented in high severity crashes.
Figure 39: Proportion of drivers exceeding the speed limit by 10mph (motorways and NBU roads) or 5mph (BU roads)

8.3 Seatbelt wearing

The wearing of seatbelts has been shown to reduce the severity of injury when involved in an accident (Broughton & Walter, 2007), and therefore the higher the proportion of vehicle occupants wearing a seatbelt, the lower the severity rate, all else being equal. TRL carried out seatbelt surveys for the DfT from 1988 to October 2009 and the results for car occupants over the last decade are shown in Figure 40. Since 2007, the wearing rate for drivers, front seat passengers and child rear seat passengers remained at a constant level of 94-96%. The wearing rate for the relatively small number of adults sitting on the rear seat is much lower but has increased over time. A seatbelt survey based in Surrey was carried out in 2012 (Scoons, 2012) and this suggested that driver and front seat passenger rates were similar to those in 2007-2009 and the wearing rates for rear seat passengers as a whole had dropped a little in 2012. There is no clear indication that the trend in seatbelt wearing rates has changed over the period 2007-2010.
8.4 Drivers’ use of mobile phones

Unlike a seatbelt which affects the severity of an injury once an accident has occurred, use of a hand-held or hands free mobile phone whilst driving has been shown to increase the chance of being involved in an accident (Redelmeier & Tibshirani, 1997). Mobile phone surveys were carried out by TRL for DfT from 2002 to 2009, the results from which are shown in Figure 41.

New legislation banning the use of hand-held mobile phones whilst driving was introduced in December 2003 and the penalties for ignoring this law were increased in February 2007, both indicated on the figures with black lines. The use of hands free
phones whilst driving remains legal, although research has shown that this is also distracting and dangerous for drivers.

Use of hand-held phones has remained fairly stable over time, with drops in use at times of introduction and changes to the legislation, presumably due to increased awareness of the dangers of using a phone whilst driving. Until 2008, the use of hands free phones decreased over time.

The most recent survey, based in Surrey in 2012, shows that the use of hand-held and hands free phone use has increased substantially since 2009 (Scoons, 2012).

### 8.5 Summary

Four driver behaviours that are possible to quantify and measure have been described above.

Over the last four years the prevalence of drink driving and consequently the estimated number of fatalities caused by drivers over the limit has reduced. This is likely to be at least partly due to the economic instability of the country, resulting in more people opting to stay at home rather than going out to drink.

There has been a noticeable reduction in excessive speeds across all road types over the last few years. We suggest that in times of recession, people drive more economically by reducing their speeds and this general reduction in speed, and specifically the reduction in excessive speeds reduces numbers and severities of accidents. The increased use of speed enforcement technology and speed awareness courses over this period is also likely to have contributed.

Seatbelt use has grown fairly steadily over the last 10 years. The wearing rates for drivers, front seat passengers and child rear seat passengers have been around 90% or higher since 2000. The steady growth in seatbelt wearing matches the pattern seen in secondary safety enhancements in vehicle design. In both cases, the developments have continued over the last 10 years but the effect on the fatalities trend has not been as consistent as would be expected.

Mobile phone use has grown substantially over the last few years since 2007, suggesting that, if all else had remained the same, there should have been a rise in the number of accidents and fatalities over this period.
9 Contributory factors

Contributory factors are collected at the scene of the accident and are the Police Officer’s view of the reasons for the accident. It became part of the STATS19 form in 2005. We have examined changes in contributory factors since 2005 to investigate whether any changes in the factors reported might help to explain the fatality trend.

In 2010, 94% of fatal accidents, where a police officer attended the scene and obtained details of the report, were given at least one contributory factor. In 2005 this percentage was lower at just 90%. We report the proportion of accidents where the specific contributory factor was reported as there may be more than one contributory factor reported in any accident. It is relevant to compare the distribution of contributory factors for fatal and serious accidents as the number reported per accident may have changed over time.

Figure 42 shows the top four contributory factors in fatal accidents from 2005 to 2010 were ‘loss of control’, ‘failed to look properly’, ‘careless, reckless or ‘in a hurry’ and ‘exceeding the speed limit’. Figure 43 shows that for serious accidents, the three most common contributory factors were the same but recorded in a different order with ‘failed to look properly’ replacing ‘loss of control’ as the most common factor.

From 2005 to 2010 the proportion of fatal and serious accidents recorded with the contributory factors ‘failed to look properly’ and ‘careless, reckless or in a hurry’ increased steadily. A small part of this increase will be due to more contributory factors being reported over the years.

‘Travelling too fast for conditions’ was reported for a lower proportion of fatal collisions in 2010 than 2005. ‘Failed to judge other person’s path or speed’ and ‘slippery road (due to weather)’ were reported for a lower proportion of serious collisions in 2010 than 2005 but there were no dramatic changes in 2007 in the top 10 contributory factors giving any clues to the reasons for the change in fatality trend in 2007.
Figure 43: Percentage of serious collisions with the ten most common contributory factors, 2005-2010
10 Injuries

We have analysed biennial records from the Hospital Episode Statistics (HES) dataset for inpatients in English hospitals who were injured as the result of a road transport accident from (financial years) 2000/2001 to 2010/2011 based on the following research questions:

1. Has the distribution of injury types in road accidents changed over this period?
2. Have the types of road accident resulting in a hospital admission changed over this period?
3. Has the severity of these injuries changed over time?

STATS19 and HES are not equivalent sources of data and in many cases, a casualty in one will not be found in the other. Article 5 in Reported Road Casualties Great Britain 2008 (Department for Transport, 2009) discusses the differences between the sources. For the purposes of this analysis we have used all transport accidents (excluding air, water and rail) which may include some casualties (pedal cyclists and pedestrians) who were injured off-road.

The dataset contained around 25% of the total number of STATS19 fatalities over the same period, which suggests that the majority of fatal casualties die at the road side. We have therefore concentrated on serious injuries to see if it is possible to detect changes in injury types and accident types for high severity casualties which may be similar in trend to fatal casualties. Severity of injuries is not directly reported in HES but we can use a combination of the variables length of stay, injury type, number of organs supported and number of days in a High Dependency Unit as a proxy, although the latter two variables are not available for the full period. The subset of data analysed involves 326,338 inpatients.

---

\(^3\)HES data have been provided by the Health and Social Care Information Centre: www.ic.nhs.uk
We observe, in Figure 44, that the number of casualties with a head injury dropped in 2008/2009 after rising for several years previously. The proportion of casualties with a head injury dropped from 33% in 2000/2001 to 29% in 2008/2009. Smaller proportional drops were observed in the Thorax and Abdomen and Leg and Foot groups.

The most common injury types were Fracture, Open wounds, Superficial injuries, Intercranial injuries and Dislocation, of which Intercranial injuries and Fractures saw a dramatic drop in casualties in 2008/2009 (as shown in Figure 45). Head, Thorax and Abdomen and Intercranial injuries could be (as a very broad proxy) seen to be more severe injuries, and a decrease in these specific groups could tie in with the reduction in fatal injuries seen in the accident data.
The second research question asks whether there has been a change in road user groups attending hospital. Four road user groups make up around 85% of the casualties in the HES data: car occupants, pedal cyclists, pedestrians and motorcyclists; and the majority of these accidents were either non-collision or collision with a car. Figure 46 shows the three combinations of user group and collision partner that were most common. These were pedal cyclist in non-collision transport accident (17% of casualties over the six periods), pedestrian injured in collision with a car, pick-up truck or van (12% of casualties) and car occupant injured in collision with a car, pick-up truck or van (10% of casualties). Of these collision types, the proportion of non-collision pedal cyclist accidents has increased over time, in particular in the last period.

Figure 46: HES road accident non-fatal casualties by user group combination

Injuries within these collision types are distributed differently, as shown in Figure 47: leg and head injuries are most common in pedestrian car interactions; arm and head in pedal cyclist accidents; and head and thorax in car/car interactions.

The biggest proportional reductions were observed in head injuries for pedestrian/car interactions and car/car interactions.
Reduction in fatal trend

Figure 47: HES road accident non-fatal casualties by body part treated
Figure 48 shows the distribution of length of stay for casualties admitted to hospital after a transport accident. There has been a clear but gradual decrease in the length of time casualties stay in hospital; in particular the proportion who are admitted for less than a day has doubled over the six periods. The number admitted in each period has remained broadly similar at around 22,000. Shorter lengths of stay are not a direct result of a decrease in severities – hospital treatment has got progressively better over time resulting in quicker recovery and shorter stays in hospital. There is no evidence of a substantial change in length of stay in 2008/2009 to suggest a reduction in injury severity or treatment protocol.

**Figure 48: HES road accident non-fatal casualties by episode duration**
11 Economy

In Section 8 changes in driver behaviour are discussed and these changes are attributed in part to changes in the economy. In this section the trend in Gross Domestic Product (GDP) and the effect on traffic levels and types are briefly discussed.

Figure 49 shows the pattern in GDP by quarter which shows a peak in the first quarter of 2008 followed by a relatively sharp fall until quarter 2 in 2009 from where it once again started to rise but at a slower rate than before.

![GDP graph](image)

**Figure 49: Quarterly seasonally adjusted GDP**

The effect on traffic was quick to follow with overall motor vehicle traffic dropping steadily from a peak of 505 billion vehicle km in 2007 to 488 billion vehicle km (3.5% lower) in 2010. Reductions were observed in all motor vehicle groups but the biggest relative reduction was seen for HGVs, where the traffic volume reduced by 10% from 2007 to 2010.

Household expenditure patterns (Office for National Statistics, 2012) in Figure 51 show a reduction in real terms in spending on purchasing vehicles but little obvious reduction in other motoring costs such as fuel and insurance.

---

* Seasonally adjusted chained volume measure
As well as the effect of the recession on driver behaviour, the economic instability in Britain has also affected traffic patterns resulting in reduced driving and reduced purchase of new vehicles, leading to an older car fleet.
12 Foreign Comparisons

Various other countries have experienced fatality reductions in recent years that resemble those experienced in Great Britain. The following chapter will examine published literature to determine which countries are similar; which road user groups have been particularly affected and also possible reasons for the large reductions seen in recent years. The review in Section 12.1 has been restricted to countries within the European Union; Section 12.2 looks in detail at a number of reports from countries which have investigated their reductions in fatalities, to give an overview of the results obtained and possible explanations for these reductions.

12.1 European Union

12.1.1 Overview

The main source of road accident data within the European Union is the Community database on Accidents on the Roads in Europe (CARE) database which contains detailed data on road accidents resulting in death or injury as collected by the Member States, as well as other European States such as Switzerland and Norway. Many of the following graphs and tables have been generated from data extracted from CARE.

Figure 52 displays the annual number of fatalities and injured people in EU-27 from 2000 to 2010.

![Figure 52: Annual number of fatalities and injured people in EU-27, 2000-2010](image)

The total number of fatalities and injured people in EU-27 has been declining since 2000. The decline in fatalities appears to have accelerated since 2008; whereas injured persons are still declining at much the same rate as before. This matches the trend observed in Great Britain from 2007 and suggests that the factors affecting Great Britain are likely to have had similar effects across the European Union.
Figure 53, Figure 54 and Figure 55 display the annual number of fatalities by country from 2000 to 2010. Each country’s figures are indexed to the 2000 figure for easy comparison.

**Figure 53: Annual number of fatalities by country 2000-2010** (BE: Belgium, CZ: Czech Republic, DK: Denmark, DE: Germany, IE: Ireland, EL: Greece, ES: Spain)

![Graph showing fatalities by country from 2000 to 2010](image)

**Figure 54: Annual number of fatalities by country 2000-2010** (FR: France, IT: Italy, LU: Luxembourg, NL: Netherlands, AT: Austria, PL: Poland)

![Graph showing fatalities by country from 2000 to 2010](image)
Reduction in fatal trend

All countries had fewer fatalities in 2010 than in 2000. There are a number of countries which show large fatality reductions in recent years, similar to those experienced in Great Britain. Those countries which show the most significant reductions from the trend experienced pre-2007 include the Czech Republic, Italy, Finland and Slovenia.

The casualty reduction target set by the European Union was to halve road deaths between 2001 and 2010. The average reduction across the European Union was 45% between 2001 and 2011. This falls short of the 50% target which aimed to be achieved a year earlier in 2010.

In the EU the average annual percentage change in fatalities (2001-11) was a reduction of 5.9%; this compares to an average annual reduction in serious injuries (2001-11) of just 3.7% (ETSC, 2012). This difference in the annual reductions shows that during this period fatalities were decreasing faster than seriously injured casualties; this is the same phenomenon which has been experienced in Great Britain where the average annual reduction in fatalities was 5.5% and the reduction in serious injuries was 4.6%.

12.1.2 Fatalities by mode of transport

In Great Britain particular modes of transport were shown to have large reductions in the number of fatalities in recent years. The following figures will look in more detail at specific modes of transport in order to determine if the trend seen in Great Britain is applicable to the whole of Europe.

Figure 56 and Figure 57 display the annual number of fatalities by mode of transport in the EU.

Figure 55: Annual number of fatalities by country 2000-2010 (PT: Portugal, RO: Romania, SI: Slovenia, FI: Finland, SE: Sweden, UK: United Kingdom)
In the European Union the number of fatalities has declined across all modes of transport (except motorcycles where the numbers have remained fairly consistent). In 2009 the number of pedestrian fatalities dropped by nearly 19% from the 2008 figure; this was by far the largest annual reduction experienced by this group in the past decade. Great Britain experienced a similar large drop in pedestrian fatalities in 2009 and again in 2010. It is plausible that the cause of the significant drop in Great Britain was also the reason behind the large drop experienced across Europe. Figure 57 shows that HGV occupants also experienced a similar decline however, this decline started earlier in 2008. During this same period, HGV traffic declined in Great Britain and the fatality
numbers showed a similar downwards trend. Whilst the decline in HGV traffic did not completely explain the large drop in fatalities, it is possible that a similar decline in HGV traffic across Europe may have contributed to the change in trend shown here.

Car occupants account for the vast majority of fatalities within the European Union. Similarly to the STATS19 data, there has been a greater reduction in the number of passenger fatalities than in the number of driver fatalities in EU-19.

Figure 58 compares the British car occupant fatality trend with the trends in the six EU-18 countries with the most car occupant fatalities in 2000. The reductions from 2000 have been fairly steady in France, Spain and Germany, reaching around 60% by 2010. Only in Poland has the trend resembled the British trend, with a period of stability followed by a period of rapid decline.

![Figure 58: Car occupant fatality trends, by country](image)

The composition of the car fleets in these seven countries doubtless differ in detail, but the state of technological development will be rather similar because the same car manufacturers tend to dominate throughout Europe and all new cars have to satisfy the same EC regulations. The range of variation presumably reflects the range driving styles and environments that exist in the various countries. The reduction in France from 2002 is likely to reflect the reduction in speeding that followed an increase in police enforcement activity. The reduction in Spain is likely to be a consequence of that country's extensive highway construction programme.

### 12.2 International analysis

Research in the United State and the Netherlands, reviewed in Section 1.3, into their respective unexplained decrease in fatality trend revealed some particular patterns.

In the US, the biggest reduction in fatality trend since records started (excluding during the Second World War) was observed from 2005 to 2009. Longthorne, Subramanian, & Chen (2010) found that between 2007 and 2008 child fatalities decreased by about 20% and that there was a 17% reduction for fatalities in crashes involving young drivers (16-24) compared with a reduction of around 10% for older casualties.
Sivak & Schoettle (2010) investigated many subsets of collisions and found that from 2005 to 2008, accidents in rush hours reduced more than all time periods, fatal accidents on rural interstates dropped more substantially than all fatal accidents and fatal accidents on roads with a speed limit of 50mph or more showed a greater reduction than all roads. Front-side impact collisions reduced more than all collisions along with accidents where the vehicles had initial points of impact at 3 o’clock and 9 o’clock. This coincides with their finding that air bag deployment from the side increased dramatically.

Concentrating on the reduction between 2007 and 2008, bigger than the overall average reductions were reported for multi vehicle crashes, crashes involving large trucks (reflecting reduced frequency of these vehicles on the road) and occupant fatalities in vehicles that rolled over. They found that motorcyclists and pedal cyclists fatalities showed an increase in 2008.

Similar declines in fatalities were seen in the early 1980s and 1990s, both of which were periods of economic recession in United States. Both times collisions involving younger drivers declined significantly compared with drivers of other ages, and the decline was followed by period of increase, particularly in younger driver fatalities.

The most recent reduction in road fatalities also coincides with recession and the largest declines were seen in areas with higher increases in rates of unemployment. Higher declines were seen in major populated cities than in the rest of their states.

Sivak & Schoetle (2010) also believed the economic down turn accounted for a number of the reductions that they had found. In particular the economic downturn has meant reduced commuter traffic and reduced freight shipments. They also felt that the economic downturn may have also meant that some long-distance leisure driving has been replaced with local leisure driving and that some drivers’ behaviour has changed in efforts to conserve fuel, possible including reducing driving speeds. They also noted an increase in the installation of side air bags, higher proportions of vehicles on the road with front air bags and improved front air bags.

Cheung & McCartt (2010) suggested that improved health and emergency medical services and trauma care may have contributed to the reduction and that older drivers in particular may be benefiting more from vehicle safety improvements.

Weijermars, Bijleveld, & Stipdonk (2010) reported that in the Netherlands there were particular declines in collisions involving pedestrians, light moped riders and car occupants. Males, 18-24 year olds, 40-49 year olds and drivers in single car crashes are also reported to have declined in the Netherlands since 2004. Weijermars, Goldenbeld, Bos, & Bijleveld (2008) mention that in 2006 pedestrian and delivery van occupant fatalities rose.

In the Netherlands, moped ownership fell, which at least in part explains the decline in light moped riders and that alcohol use (particularly 18-24 and 40-49 year olds) fell and car ownership by 18-24 year olds was lower after 2004 than before perhaps explaining the declines in these age groups (Weijermars, Bijleveld, & Stipdonk, 2010). They also reported that seatbelt usage rose and average speeds on 100 and 120 kmph roads fell between 2003 and 2005 and electronic stability control (ESC) and airbags increased in 2004.
13  Surrey data

13.1  Casualty trends in Surrey and the South East

This section considers the killed and seriously injured casualty trends for Surrey and the surrounding areas. Figure 59 shows the trends in fatalities in the five police force areas in South East England (excluding London). Compared to the overall trends shown earlier in this report, these trends are based on much smaller numbers and therefore show more fluctuation due to random variation. However, taking into account this variability, in all areas the general fatal trend is relatively level until 2007 and drops from then onwards. The biggest proportional reductions in fatal casualties from 2000 to 2010 were in Surrey and Hampshire.

Figure 59: Killed casualty trend by police force, 2000-2010

Figure 60 shows the trends in seriously injured casualties across the same areas. These trends split into two groups: in Hampshire, Kent and the Thames Valley the number of seriously injured casualties has fallen steadily from 2000 by 30-40% in 2010; in Surrey and Sussex, the trend is more gradual. In particular, in Surrey the overall number of seriously injured casualties reduced by the least amount (13%) from 2000 to 2010.

Surrey had the greatest difference between reduction in serious injuries and reduction in fatalities.
Annual fatality numbers in Surrey alone are too variable to determine if the fatality trends are similar to those observed across Britain. As a result, fatalities have been combined into three 3-year periods below and casualty numbers from Surrey, Hampshire, Kent, Sussex and Thames Valley police forces have been combined to form the South East region. This allows comparisons to be made between trends in an area where demography, topology and policing practices are assumed to be similar. Where casualties have an unknown category, such as age or gender, they have been randomly allocated a category to ensure that reporting rates do not affect the statistics presented.

### 13.1.1 Road users

Table 8 shows the changes in the number of fatalities for the main road user types in Great Britain, the South East region and Surrey. Due to the variability in number of fatalities in Surrey it has been necessary to combine data from 2000 to 2010 into three 3-year periods: 2000-2002, 2004-2006 and 2008-2010. The changes in the number of fatalities between the three periods are presented in Table 8 and can be used to compare the patterns in Surrey with the South East (SE) and Great Britain (GB). Where small numbers remain a change is not given and the cell is marked with a hyphen. The following interpretations can be derived from the table:

- For car (and taxi) occupants there was very little change in the number of fatalities between the two periods 2000-02 and 2004-06 across all three geographies:
  - GB - a reduction of 4%
  - SE - a rise of 3%
  - Surrey - a rise of 2%
- The corresponding changes from 2004-06 to 2008-10 were much bigger reductions, but also similar across the three regions:
  - GB - a reduction of 36%
  - SE - a reduction of 41%
  - Surrey - a reduction of 40%
Table 8: Changes in number of fatalities by road user group in three year periods in Great Britain (GB), the South East region (SE) and Surrey.

<table>
<thead>
<tr>
<th>Road user</th>
<th>GB 2000-02 to 2004-06</th>
<th>SE 2000-02 to 2004-06</th>
<th>Surrey 2000-02 to 2004-06</th>
<th>SE 2004-06 to 2008-10</th>
<th>Surrey 2004-06 to 2008-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car occupants</td>
<td>-4%</td>
<td>3%</td>
<td>2%</td>
<td>-41%</td>
<td>-40%</td>
</tr>
<tr>
<td>Motorcyclist</td>
<td>-2%</td>
<td>-8%</td>
<td>-5%</td>
<td>-22%</td>
<td>-45%</td>
</tr>
<tr>
<td>Pedal cyclist</td>
<td>8%</td>
<td>17%</td>
<td>-*</td>
<td>-23%</td>
<td>-30%</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>-18%</td>
<td>-23%</td>
<td>-14%</td>
<td>-27%</td>
<td>-32%</td>
</tr>
</tbody>
</table>

*Numbers are too small to give reliable estimates of change

- These suggest that the fatality trends in car and taxi occupants across Surrey and the South East are similar to the trend in Britain.
- For motorcyclists, the changes between 2000-02 and 2004-06 are similar across regions but the reduction between the latter periods appears to be greater in Surrey than in SE and GB.
- An increase in pedal cyclist fatalities occurred in GB and SE between 2000-02 and 2004-06. This increase was proportionately bigger in SE than GB. In both regions there was a bigger reduction in fatalities between the later periods. Numbers in Surrey were too variable to make robust conclusions.
- As discussed in Section 4.3, the fatality trend for pedestrians is different – a steady reduction occurred throughout 2000-2010. The changes in SE and Surrey suggest that the reduction has been greater in SE and less in Surrey than across Britain as a whole.

In general it appears that the patterns in the fatal trends across different road users noted in Great Britain are similar in SE and Surrey, with a slightly bigger reduction in motorcycle fatalities and a smaller reduction in pedestrian fatalities in Surrey than in SE and GB.

13.1.2 Casualty age

Section 5.1 showed that the biggest fatality reductions since 2000 were for casualties aged 0-15 years, followed by young adults aged 16-30. Table 9 shows that this pattern is consistent across GB and SE: the biggest reductions between 2004-06 and 2008-10 were for the youngest age category followed by the young adult category. In Surrey, the pattern remains the same for those categories with sufficiently robust data.

Table 9: Changes in number of fatalities by age group in three year periods in Great Britain (GB), the South East region (SE) and Surrey.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0-15</td>
<td>-19%</td>
<td>-46%</td>
<td>-1%</td>
<td>-67%</td>
<td>-*</td>
<td>-*</td>
</tr>
<tr>
<td>16-30</td>
<td>-2%</td>
<td>-36%</td>
<td>2%</td>
<td>-42%</td>
<td>-6%</td>
<td>-41%</td>
</tr>
<tr>
<td>31-60</td>
<td>-8%</td>
<td>-28%</td>
<td>-5%</td>
<td>-31%</td>
<td>3%</td>
<td>-34%</td>
</tr>
<tr>
<td>61+</td>
<td>-10%</td>
<td>-25%</td>
<td>-13%</td>
<td>-25%</td>
<td>0%</td>
<td>-33%</td>
</tr>
</tbody>
</table>

*Numbers are too small to give reliable estimates of change
In the earlier periods (2000-02 to 2004-06), across Britain, there were substantial reductions for children (0-15 years) and older casualties aged 61 or more. This was matched in the South East (but not in Surrey) for older casualties but not children, however a bigger reduction was observed for children in SE later (46% reduction from 2004-06 to 2008-10 in GB compared to 67% in SE).

In summary it appears that the later reduction is consistent in pattern by age group across GB, SE and Surrey. The reduction in child fatalities appeared later in SE than GB and the reduction in older casualties appeared later in Surrey than SE and GB.

**13.1.3 Road type**

The fatality trends across five different road types were observed in Section 6.2. The reduction between 2004-06 and 2008-10 was biggest on non-built up roads across GB. In the SE region the reductions were biggest on non-built up roads and Motorways, and in Surrey the biggest reduction occurred on built up A roads.

For non-built up roads the reduction in GB was small (-7% and -1% for A roads and minor roads respectively) between the early periods and there was a small rise in SE (2% and 9%), however in Surrey, there was a substantial reduction (-19%) in the number of fatalities between the early periods on non-built up A roads. Conversely a small reduction (-3%) on BU minor roads across GB was not matched in Surrey where there was a substantial increase (33%).

**Table 10: Changes in number of fatalities by road type in three year periods in Great Britain (GB), the South East region (SE) and Surrey.**

<table>
<thead>
<tr>
<th>Road type</th>
<th>GB 2000-02 to 2004-06</th>
<th>SE 2000-02 to 2004-06</th>
<th>SE 2004-06 to 2008-10</th>
<th>Surrey 2000-02 to 2004-06</th>
<th>Surrey 2004-06 to 2008-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorway</td>
<td>-10%</td>
<td>-26%</td>
<td>0%</td>
<td>-40%</td>
<td>*</td>
</tr>
<tr>
<td>BU A road</td>
<td>-14%</td>
<td>-26%</td>
<td>-23%</td>
<td>-28%</td>
<td>2%</td>
</tr>
<tr>
<td>NBU A road</td>
<td>-7%</td>
<td>-34%</td>
<td>2%</td>
<td>-39%</td>
<td>-19%</td>
</tr>
<tr>
<td>BU minor</td>
<td>-3%</td>
<td>-29%</td>
<td>-11%</td>
<td>-28%</td>
<td>33%</td>
</tr>
<tr>
<td>NBU minor</td>
<td>-1%</td>
<td>-34%</td>
<td>9%</td>
<td>-40%</td>
<td>*</td>
</tr>
</tbody>
</table>

*Numbers are too small to give reliable estimates of change*

The patterns across different road types are different here and this is likely to be influenced by the different proportion of road types in SE and Surrey compared to GB.

**13.1.4 Deprivation**

Data from MAST detailing deprivation scores are available from 2004, so Table 11 shows the three year count of fatalities by deprivation quartile in 2004-06 and the proportional change in fatalities by 2008-10.

The obvious difference between GB and SE and Surrey is the spread of fatalities across the different quartiles. In GB, the number of fatalities in each quartile is similar and the proportionate reduction is equally similar, with a slightly bigger reduction in the most deprived category. Across the SE and Surrey there were larger numbers of fatalities in the highest quartile (least deprived) due to the population being generally less deprived in these areas. In the SE, the biggest proportional reductions in fatalities occurred for the most deprived group followed by the second most deprived quartile.
Table 11: Number of and change in number of fatalities by road type in three year periods in Great Britain (GB), the South East region (SE) and Surrey.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 most deprived</td>
<td>2300</td>
<td>-34%</td>
<td>183</td>
<td>-50%</td>
<td>6</td>
<td>-*</td>
</tr>
<tr>
<td>Q2</td>
<td>2446</td>
<td>-30%</td>
<td>351</td>
<td>-41%</td>
<td>31</td>
<td>-*</td>
</tr>
<tr>
<td>Q3</td>
<td>2673</td>
<td>-31%</td>
<td>413</td>
<td>-33%</td>
<td>39</td>
<td>-*</td>
</tr>
<tr>
<td>Q4 least deprived</td>
<td>2175</td>
<td>-30%</td>
<td>501</td>
<td>-29%</td>
<td>112</td>
<td>-36%</td>
</tr>
</tbody>
</table>

*Numbers are too small to give reliable estimates of change

13.1.5 Driver age and sex

The fatality trend for drivers of different ages and genders are discussed in Section 5.2 and show different patterns, in particular for young drivers. Table 12 shows the changes in fatalities associated with particular driver demographics. For all age groups across GB, there were small reductions between the initial periods for male (-7%) and female (-5%) drivers. In the SE the equivalent change was -6% for male drivers and +7% for female drivers. In the latter periods, the patterns of change are similar, the bigger reductions occurred for male drivers in GB and SE.

For young drivers in GB the number of fatalities increased between 2000-02 and 2004-06 for both females and males, followed by a big reduction between the later periods. These reductions were bigger than those seen in all ages. The pattern for males in SE is the same, but we cannot compare with young female drivers as the numbers are not sufficiently robust.

Table 12: Changes in number of fatalities by driver age and gender in three year periods in Great Britain (GB), the South East region (SE) and Surrey.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male all ages</td>
<td>-7%</td>
<td>-33%</td>
<td>-6%</td>
<td>-38%</td>
<td>1%</td>
<td>-44%</td>
</tr>
<tr>
<td>Female all ages</td>
<td>-5%</td>
<td>-22%</td>
<td>7%</td>
<td>-25%</td>
<td>-*</td>
<td>-*</td>
</tr>
<tr>
<td>Male ages 17-20</td>
<td>7%</td>
<td>-41%</td>
<td>23%</td>
<td>-48%</td>
<td>-*</td>
<td>-*</td>
</tr>
<tr>
<td>Female ages 17-20</td>
<td>19%</td>
<td>-29%</td>
<td>-*</td>
<td>-*</td>
<td>-*</td>
<td>-*</td>
</tr>
</tbody>
</table>

*Numbers are too small to give reliable estimates of change

13.1.6 Contributory factors

In Section 9 the 10 most common contributory factors in fatal and serious collisions were shown. Figure 61 and Figure 62 show the five most common contributory factors in fatal and serious collisions in the South East. The three most common contributory factors in the SE in 2010 are the same as nationally and the fourth and fifth most common contributory factors in the SE in 2010 were also amongst the top 10 nationally (6th and 7th). The five most common contributory factors in serious collisions in the SE in 2010 appear in the national rankings in the same places.
It appears that the proportion of fatal collisions where ‘loss of control’ is a contributory factor has increased since 2007 but it has decreased for serious collisions. This pattern is more obvious in the SE data than across GB as a whole. The proportion of fatal and serious collisions with ‘failed to look properly’ as a contributory factor has grown steadily over time in the GB data; the pattern behaves fairly similarly in the SE data. All other featured contributory factors have a similar pattern in SE to GB.

**Figure 61: Percentage of fatal collisions in the South East with the five most common contributory factors, 2005-2010**

**Figure 62: Percentage of serious collisions in the South East with the five most common contributory factors, 2005-2010**
13.2  Surrey population

Surrey differs from Britain as a whole in a number of different ways in addition to, and perhaps leading to, the observed differences in road casualty trends. This section details evidence of a selection of the differences relevant to road safety.

13.2.1  Road use

Figure 63 shows the trend in traffic across Britain, in the South East region and within Surrey since 2000. Quite clearly the amount of traffic across Britain grew steadily since 2000 until it peaked in 2007. After this, and probably as a result of the recession, traffic levels have dropped and in 2010 were around 4% above the level observed in 2000.

In the South East and in Surrey the peak and following downward trend occurred at the same time, however the peak was proportionally lower for both compared to the national peak and the reduction in traffic in Surrey resulted in the traffic level in 2010 being lower than that in 2000.

![Traffic in Great Britain, across the South East and in Surrey indexed to 2000](image)

Figure 63: Traffic in Great Britain, across the South East and in Surrey indexed to 2000

Traffic by different road types is not well recorded at county level, however TSGB 2011 (Department for Transport, 2011) reports the lengths of each road type and it is possible to use these road lengths as a proxy to compare different types of driving across different regions. Figure 64 compares the distribution of different road types in Britain, the South East and Surrey.

There are some clear differences between road types in Surrey and Great Britain:

- 2% of Surrey’s road length is Motorway compared to 1% in Britain overall; Surrey includes sections of the M25, M3 and M23.
- Surrey has a much higher proportion of urban roads than rural roads.
- The total proportions of minor roads and A roads in Surrey and Britain are similar.
The fatality rates for different car types were discussed in Section 7.2, and it was shown that they differed; in particular, small cars (the small saloons and mini & super mini categories) had considerably higher accident rates than larger cars.

The distributions of cars registered in Surrey and in Britain in 2010 by car type are shown in Table 13. There are no major differences but it does show that cars registered in Surrey are slightly more likely to be bigger cars or sports cars than those registered in Great Britain overall.

Table 13: Distribution of car types registered in Great Britain and Surrey

<table>
<thead>
<tr>
<th>Car Type</th>
<th>GB</th>
<th>Surrey</th>
</tr>
</thead>
<tbody>
<tr>
<td>4x4 &amp; people carriers</td>
<td>12%</td>
<td>13%</td>
</tr>
<tr>
<td>Large saloons</td>
<td>7%</td>
<td>9%</td>
</tr>
<tr>
<td>Medium saloons</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>Small saloons</td>
<td>28%</td>
<td>26%</td>
</tr>
<tr>
<td>Minis &amp; super minis</td>
<td>32%</td>
<td>31%</td>
</tr>
<tr>
<td>Sports cars</td>
<td>4%</td>
<td>5%</td>
</tr>
</tbody>
</table>

13.2.2 Demographics

The spread of ages and socio-demographics across Surrey are compared with those across England and the UK in this section. Section 5 shows some age groups (children and young adults) had a steeper reduction in fatal casualties between 2007 and 2010 than others, and that the reduction in young adult casualties was partly driven by a reduction in young male drivers over the same period.

Table 14 shows the distribution of age groups in Surrey and makes a comparison in relation to England. This shows that the proportion of the Surrey population that are young adults is considerably smaller than in England as a whole, while the proportion of all other age groups is marginally higher in Surrey than in England. This may suggest
that there are fewer young drivers, but given the relative prosperity in Surrey (see below), perhaps a higher proportion of these young people have a driving licence.

**Table 14: Distribution of population age groups in Surrey and England, 2010**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Surrey</th>
<th>England</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-14</td>
<td>18.1%</td>
<td>17.7%</td>
</tr>
<tr>
<td>15-24</td>
<td>11.4%</td>
<td>13.0%</td>
</tr>
<tr>
<td>25-64</td>
<td>53.4%</td>
<td>52.9%</td>
</tr>
<tr>
<td>65+</td>
<td>17.2%</td>
<td>16.4%</td>
</tr>
</tbody>
</table>

Figure 65 compares the MOSAIC socio-demographic distribution across Surrey and the UK. MOSAIC groups are defined in Appendix A but roughly cover more prosperous communities in categories A-G and L. In Surrey this encompasses 82% of the population, compared to 57% across the UK. Quite clearly Surrey is a relatively prosperous county.

Unemployment is lower in Surrey (4.6% of working age population) than across the South East and in England (6.1% and 8.2% respectively) as a whole, as shown in Table 15. The number of unemployed people, however, has changed proportionally more during the recession in Surrey (an increase of 57%) than across the rest of England and the South East region (31% and 34% respectively).

**Table 15: Proportion of working age population unemployed in year commencing (YC) April 2011 and proportional change in number of unemployed people since YC January 2008** (Surrey County Council, 2012)

<table>
<thead>
<tr>
<th></th>
<th>Unemployment rate in YC April 2011</th>
<th>Change in unemployment since YC January 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>8.2%</td>
<td>31%</td>
</tr>
<tr>
<td>South East</td>
<td>6.1%</td>
<td>34%</td>
</tr>
<tr>
<td>Surrey</td>
<td>4.6%</td>
<td>57%</td>
</tr>
</tbody>
</table>
13.2.3 Alcohol consumption

Research (Surrey County Council, 2009) has shown that in Surrey there is a significantly higher prevalence of hazardous alcohol abuse than across the country as a whole. The latest available breath test data (2010) show that the failure and refused rate of roadside breath testing is 11% in Surrey (down from 13% in 2009), which is now comparable to the overall rate of 11% for England and Wales in 2010.

13.3 Summary

The overall pictures in the South East and in Surrey are similar to those across Britain, although trends are less easy to identify as a result of much smaller numbers. In Surrey, the major reductions in fatalities occurred in 2008 and 2010. Contrary to the overall fatality trend the number of fatalities in Surrey has continued to fall in 2011 and 2012. Surrey has, however, seen the least reduction of the South East region in serious injuries over the decade.

Surrey differs from Britain as a whole in a number of different ways:

- A lower proportion of its population are young adults, but the proportion with a driving licence may be higher than Britain as a whole;
- It has a much higher proportion of affluent residents;
- There is a significantly higher prevalence of hazardous alcohol abuse, but a level of drink driving comparable to the British average;
- Unemployment is lower but has increased proportionately more during the recession.

These differences present a mixed picture as to whether the conclusions of this research could be applicable to Surrey. There is no clear evidence that the fatality rates in Surrey should have changed any differently to the national fatality rates.
14 Conclusions

14.1 Overview

14.1.1 Aim

Historically, the numbers of fatally and seriously injured road casualties have followed a similar trend, albeit with the number of seriously injured casualties about 10 times the number of those fatally injured. However from the mid-1990s to 2006 the number of fatalities on Britain’s roads scarcely changed, whilst the number of seriously injured casualties continued to fall fairly steadily. The fatal trend changed again in 2007, reducing steeply to 2010 (inclusive). This substantial change in the trend in fatal casualties across Britain in 2007 led to debate as to the cause of the reduction.

The research described in this report has attempted to understand the cause with detailed analyses relating to a number of hypotheses:

The change in the fatality trend in Britain in 2007 was due to

- changes in traffic;
- developments in vehicle safety;
- economic instability; or
- weather.

The research includes the use of many different data sets including STATS19, the British road accident database, MAST which links STATS19 to socio-demographic data, coroners’ data detailing the blood alcohol level for road users killed in accidents and hospital data comprising injury details for road users seriously injured in collisions. A large selection of exposure and explanatory data, mostly sourced from the DfT were also interrogated in order to understand any changes in the population and driving characteristics over the period of interest.

14.1.2 Temporal observations

Patterns of road accidents change during the year due to many factors including driving types (e.g. leisure driving) and weather. The quarterly pattern of road fatalities shows that quarter 4 (Oct to Dec) was commonly the quarter with the most fatalities although this has changed to quarter 3 (July to Sept) in the two latest years. Major reductions in the fatal trend occurred in quarter 4 throughout 2007-2010 and the initial change in the fatality trend appeared to occur in quarter 4 of 2007.

14.1.3 Road user groups

An initial investigation aimed to pick out particular groups of road users which had had big reductions in the number of fatalities over the four year period of interest from 2007 to 2010. If such groups existed then they would be heavily influencing the overall trend across Britain.

The occupants of vehicles (cars, taxis, LGVs, HGVs, buses and coaches) make up around 50% of all fatalities each year. The fatality trend for vehicle occupants is therefore fairly similar to the overall trend with a steep decline in fatalities from 2007 preceded by
several years of similar numbers of fatalities (around 1800 annually). For vulnerable road users, the trends are different:

- The reduction in pedestrian fatalities shows a more continuous decline since 2000, resulting in a 53% reduction in fatalities by 2010;
- The trend in motorcyclist fatalities starts to decline in 2008 resulting in a 33% reduction in 2010 since 2000; and
- The pedal cycle fatality rate is more variable (these make up around 6% of fatalities each year) and shows an upward trend in 2010.

Changes in the number of casualties can be affected by changes in traffic patterns, and accident rates are often used to account for these changes. Overall there has been small a reduction (around 3.5%) in the amount of annual traffic since 2007 and therefore the reduction in traffic does not totally explain the reduction in fatalities which dropped by 37% between 2007 and 2010. Reductions were observed in all motor vehicle groups however the biggest relative reduction was seen for HGVs, where the amount of traffic reduced by 10% from 2007 to 2010. Motorcycle traffic has fallen from a peak in 2007 and pedal cycling has grown over the same period by around 20% since 2007. For all road user types, the relative reduction in traffic is much smaller than the relative reduction in fatalities and therefore traffic does not account for all of the reduction in fatalities.

By casualty age, all groups observed a large reduction in the number of fatalities between 2000 and 2010, mostly in the latter period. When comparing the total number of fatalities in the last three years (2008-10) with the total in the middle three years (2004-06), the biggest reduction was observed for child fatalities (46%) followed by young adults (aged 16-30) whose fatality number decreased by 36% over this period. The reductions over the same period for the remaining adult categories were around 25%. The reduction in young adult fatalities is directly related to the reduction in the proportion of young male drivers who have a driving licence. This group is one of the most risky and therefore reducing their exposure should have a large effect on the number of fatalities.

A different segregation of road casualties is by socio-demographic and deprivation categories. For vehicle occupants it appears from the MOSAIC groups that the bigger reductions occurred for people living in the less affluent regions, however the picture is not fully consistent.

In general there are some hints that some road user groups and different demographic groups had a slightly bigger reduction than others. In addition some interesting patterns appeared, in particular for children and pedestrians, where the reduction was observed throughout the whole period from 2000 to 2010 rather than just for the final four years. The reduction in traffic explains a small proportion of the reduction in fatalities and the proportional reduction in young male drivers over the same period is also likely to be having an effect. Otherwise there is no sign that the overall reduction was influenced heavily by particular groups.

The next steps of the research concentrate on influences that could affect the whole road user population.
14.1.4 Car design

Accidents involving cars make up around 85-90% of all accidents in the STATS19 data and these are therefore of considerable importance when investigating injury trends.

The car’s year of registration has a direct effect on the severity of its occupants’ injuries when involved in an accident. In younger cars (0-2 years), the proportion of severely injured casualties who are killed is lower than that for older cars, and it is lower for more recent young cars. This is due to the development of vehicle safety technology which reduces the severity of injury to vehicle occupants once involved in an accident.

Use of new cars has been declining in recent years whilst use of older cars, especially those aged 6-10 years, has been increasing. Therefore we would expect that as the average age of the car fleet increased, there would be more or at least not fewer fatalities - if everything else remained the same.

The fatality trend is downwards, however, so we use a statistical model to analyse the severity proportion of car driver and pedestrian casualties by vehicle registration year. This allows us to assess how changes in car secondary safety (improved occupant protection) have affected the fatality trend.

The results show that the proportion of car drivers injured in accidents from 2000 to 2010 who were killed has continued to decrease by car registration year, indicating that secondary safety has continued to improve and modern cars clearly protect their drivers much better than older models. Crucially, the trend does not change for cars first registered between 2007 and 2010, so developments in new cars are not making cars any more safe than expected from developments prior to 2007.

A similar model for pedestrians hit by cars shows that secondary safety for pedestrians tended to improve more slowly for cars registered from about 1990. Data for the most modern cars suggest that improvements have accelerated again, and this is perhaps due to the EU regulation introduced in 2009 to improve protection for pedestrians involved in an accident with a car.

In general secondary safety has continued to improve over the past decade, in particular for car occupants. However there is no evidence to suggest that improvements in the secondary safety in cars help to explain the changing fatality trend observed from 2007.

14.1.5 Behaviours

Over the last four years the prevalence of drink driving and consequently the estimated number of fatalities caused by drivers over the limit has reduced. This is likely to be at least partly due to the economic instability of the country, resulting in more people opting to stay at home rather than going out to drink.

There has been a noticeable reduction in excessive speeds across all road types over the last few years. We suggest that in times of recession, people drive more economically by reducing their speeds and this general reduction in speed, and specifically the reduction in excessive speeds reduces numbers and severities of accidents. The increased use of speed enforcement technology and speed awareness courses over this period is also likely to have contributed.

Seatbelt use has grown fairly steadily over the last 10 years. The wearing rates for drivers, front seat passengers and child rear seat passengers have been around 90% or higher since 2000. The steady growth in seatbelt wearing matches the pattern seen in
secondary safety enhancements in vehicle design. In both cases, the developments have continued over the last 10 years but the effect on the fatalities trend has not been as consistent as would be expected.

Mobile phone use has grown substantially over the last few years since 2007, suggesting that, if all else had remained the same, there should have been a rise in the number of accidents and fatalities over this period.

14.1.6 Economy

The most obvious change over this period influencing the whole country was the change in the economy in late 2007. The global economy went from relative stability up to early 2007 to worldwide recession in December 2007, with many effects in this country. The national volume of traffic was affected immediately: it peaked in 2007 and has since declined. This is highly likely to be related to the recession but does not wholly explain the change in fatal trend.

The change in fatality trend first occurred in the final quarter of the calendar year of 2007, in the same period as the recession.

We have observed:

- an ageing and diversifying vehicle fleet, with 6-10 year old cars, and large and small cars becoming much more popular;
- a reduction in drink drive casualties;
- a reduction in young male drivers;
- a reduction in HGV freight movement;
- an increase in pedal cycle traffic;
- increasing fuel prices; and
- a reduction in drivers exceeding speed limits, signifying changes in behaviour.

All of these changes are likely to be influenced by the economic position of the country and how this is perceived by individuals. Some of these changes have been proved to substantially reduce the number of severe collisions, in particular reducing speeds, reduced drink driving and fewer young (male) drivers.

14.1.7 Weather

The major reductions in fatalities occurred in quarter 4 (Oct-Dec) from 2007 to 2010. Over that period, progressively colder winters may explain some of the reduction in quarter 4 results over the same period, as people drive less and more carefully in wintry conditions. However it is not clear whether this is a direct causal link and more research is required in this area to assess this.

14.1.8 Injuries

A review of injury statistics of casualties attending hospital after being seriously injured in a road accident aimed to determine whether the prevalence of particular injury types had changed over time. We observed a large reduction in head and intercranial injuries and fractures between 2006-07 and 2008-09. For head and intercranial injuries in particular, this may indicate that the number of higher severity serious injuries has followed the fatal injury trend. The remaining lower severity serious injuries which make up the majority of the serious injury trend appear to have fallen continuously over time.
14.1.9 Other possibilities

We have evaluated the effect of a number of possible influences on the fatality trend; however it was not possible to include them all primarily due to data constraints. We have not assessed the effect of education or enforcement on the changes in the trend, assuming implicitly that the effects of these important elements have remained fairly constant or grown steadily over time. It appears unlikely that enforcement and education on road safety would increase considerably during times of recession and reduced public spending, although the use of Automatic Number Plate Recognition (ANPR) technology has undoubtedly risen during this period and more drivers have attended speed awareness courses.

14.1.10 Hypotheses

The hypotheses posed at the start of the research were: changes in the fatality trend are due to:

1. changes in traffic;
2. developments in vehicle safety;
3. financial stability; or
4. weather.

We can say with some certainty that, from the summaries above:

1. There have been changes in traffic, in particular there was:
   a. a reduction in overall traffic,
   b. a large reduction in HGV traffic,
   c. a substantial increase in pedal cyclist traffic, suggesting a small modal shift, and
   d. a reduction in young male drivers.

2. Developments in vehicle safety continue to be vital for the continual reduction of severity and collision reduction; however the change in trend is not directly related to vehicle safety. The reason that the fatality trend was not decreasing up to 2006 whilst vehicle safety improvements continued may be due to driver confidence – additional safety features in and on vehicle provide additional confidence and some drivers may have adapted their behaviour (i.e. drive more recklessly) as a result.

3. The economic instability of the country during this period appears to have had a dramatic effect not only on traffic patterns but also on driver behaviour with, in particular:
   a. a reduction in speeding, and
   b. a reduction in drink driving.

   Other behaviours do not appear to have been affected by the recession, such as mobile phone use and seatbelt wearing.

4. The effect of weather on the fatality trend is not so certain – people may have driven more cautiously in the progressively colder winters since 2007 but colder winters earlier in the decade did not result in the same reduction.
14.2 Discussion

In general and over time, continuous and vital improvements in road safety including new regulations, developments in vehicle safety, improved enforcement strategies, more effective education campaigns and enhanced medical treatment have reduced the likelihood of accidents and the injury severity once involved in an accident. However, from the mid-1990s to 2007, the number of fatalities did not decline and this period was then followed by a dramatic drop. These sorts of step patterns in the fatality trend must be influenced by other factors that change in a discrete way.

The obvious step change during this period was the recession, however this research has shown that there is not a direct link between fatalities and the recession, the link is indirect: the recession appears to have caused changes in driver behaviour (for example speed choice and drink driving) which, in turn, make drivers safer and reduces collisions, and in particular, high severity collisions. It is suggested that drivers tend to behave more cautiously when uncertain about their financial future which tends to restrict the types of extreme behaviour that can lead to fatal accidents. This would also help to explain why the number of fatalities failed to fall in line with serious casualties in the relatively prosperous years up to 2007 but have caught up during the years of recession.

Not all observed changes are positive for road safety – we observed an increase in the age of the car fleet, and no evidence to suggest that the recession has had any positive effect on seatbelt use or mobile phone use. The number of fatalities fell between 2007 and 2010 in spite of this.

There remains the possible added effect of weather on the fatality trend. Obviously weather patterns cannot be influenced but we speculate that cold weather also encourages people to change their behaviour and drive more cautiously; extremely cold weather will also reduce traffic volumes. Changing drivers’ behaviour in a similar way to the effect of weather is (at least in theory) possible.

The important lesson here may be that drivers and road users in general will change their behaviour if they see an economic benefit (for example through speed choice) or perhaps also if they can understand the risks involved (for example when there is snow on the road). The challenge is to influence driver behaviour in the way that the recession has affected behaviour, whilst maintaining the vital continual improvements in vehicle and road design, enforcement and hospital treatment. Otherwise we risk an increase or at least little change in future casualty trends.

Indeed, since 2010, the casualty trends have changed, with an increase in 2011 in the number of killed and seriously injured casualties in Britain for the first time in 16 years. Surrey is unusual in this respect as the fatality numbers continued to drop in 2011 and probably to drop again in 2012. It is unclear why the results in Surrey are different from the general country trend. We propose some ideas: perhaps the effects of the recession were slightly delayed due to the relative prosperity of the county. Alternatively, and perhaps more likely, Surrey County Council and Surrey Police introduced Drive SMART in 2009 to target antisocial behaviour and speeding using enforcement and education and publicity campaigns. This sort of initiative aiming to directly influence driver behaviour could well be going some way to replicate the effect of the recession and weather on driver behaviour without economic instability.
15 Bibliography


Appendix A  MOSAIC groups

A  "Residents of isolated rural communities"
B  "Residents of small and mid-sized towns with strong local roots"
C  "Wealthy people living in the most sought-after neighbourhoods"
D  "Successful professionals living in suburban or semi-rural homes"
E  "Middle income families living in moderate suburban semis"
F  "Couples with young children in comfortable modern housing"
G  "Young, well-educated city dwellers"
H  "Couples and young singles in small modern starter homes"
I  "Lower income workers in urban terraces in often diverse areas"
J  "Owner occupiers in older-style housing, typically in ex-industrial areas"
K  "Residents with sufficient incomes in right-to-buy social housing"
L  "Active elderly people living in pleasant retirement locations"
M  "Elderly people reliant on state support"
N  "Young people renting flats in high density social housing"
O  "Families in low-rise social housing with high levels of benefit need"