In-Depth Road Traffic Fatalities Report

for the Years 2015-2020

co-authored by
Police Scotland and Transport Scotland

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

POLICE SCOTLAND
Keeping people safe

Full Report

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1. Introduction

Since 2000, the number of people killed on Scotland's roads has decreased by 47% with 2020 having the lowest number of fatalities ever recorded. However, in 2022, there was a rise in recorded fatalities which follows on from the long-term downward trend and although the figures remain low, one fatality on our roads is simply one too many.

To continue to deliver a reduction in road casualties and gain an understanding of how fatal collisions are happening on Scotland's road network an in-depth analysis of all fatal road traffic collisions on Scotland's road network for the years 2015-2020 was conducted. Working in partnership, in the delivery of Scotland's Road Safety Framework 2030 (RSF2030) Police Scotland and Transport Scotland have established a road traffic fatality database, with an analyst from Police Scotland interrogating the data to create a detailed report.

The outcomes of the report provide insight into the causation of fatal collisions and has allowed for the identification of countermeasures and pro-active recommendations which if implemented, may have prevented or reduced the severity of these collisions and can be used in order to reduce the risk and harm of future collisions that have similar characteristics.

Figure 1:Safe System Wheel

The research supports RSF2030 which has a vision to have the best road safety performance in the world by 2030 and a compelling long-term goal for road safety where there are no deaths or serious injuries on Scotland's roads by 2050.

These outcomes align with the five pillars of the Safe System which puts people at its centre, and aims for a more forgiving road system that takes human vulnerability and fallibility into account; people are fragile and make mistakes that can lead to collisions. A Safe (road) System mitigates that problem with its five pillars which effectively act as layers of protection: safe road use; safe roads and

roadsides; safe vehicles; safe speeds; and better post-crash response; all working in harmony to prevent deaths and serious injuries

All road users are exposed to a variety of risks at all times. The alignment of one or more risks can result in a collision. It is therefore important to understand the nature of collision causation, as it may be any combination of factors that result in a collision and any combination of factors that result in a fatality. Changing the risk in any layer can mitigate the severity of the collision or prevent it from happening entirely.

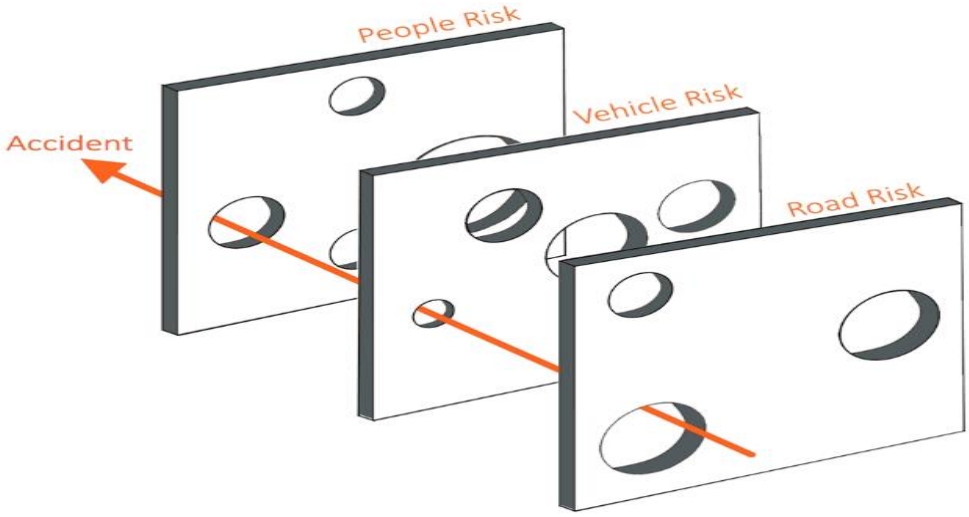


Figure 2: Swiss Cheese Model of Road Risk

In the course of analysis a number of at risk groups of road users were identified. In addition to vulnerable road users (motorcyclists, pedal cyclists and pedestrians), younger drivers, older drivers and foreign drivers were prominent.

Where key findings, countermeasures or recommendations are specific to these groups, this has been highlighted.

Through the review and analysis of existing fatal collision data this report aims to:

- Identify the contributory factors that led to the fatal outcome of the collisions
- Identify the countermeasures that could have prevented the fatal collisions or reduced the severity of injury
- Explore the target populations for specific countermeasures
- Make recommendations to assist in addressing identified themes and issues.

Details of information sources reviewed and methodology/limitations of analysis are provided in Appendix A.

2. Key Findings

The main contributory factors which influenced fatal collisions were people being careless, reckless or in a hurry, failing to look properly and losing control of their vehicle. Nonetheless, analysis identified that a combination of Road, Vehicle and People countermeasures (CMs) were required in order to mitigate the risk of the collision taking place, or reduce the severity of the collision.

Collision Avoidance
Training to improve hazard perception and Advanced Emergency Braking Systems (AEBS) were identified to be the most significant countermeasures for collision avoidance.

Severity Reduction
Seatbelt use and improved occupant/pedestrian secondary safety were found to be most effective in severity reduction.

Avoidance and Severity Reduction
Reduction in speed limits was a countermeasure identified most frequently for both avoidance and severity reduction.

Social Deprivation
Links between social deprivation and driving behaviour were identified, with those from more deprived areas more commonly linked to drink and drug driving, as well as risk taking behaviour such as speeding, aggressive driving, racing and using a vehicle in the course of crime.

This requires a wider public health approach to tackle the root causes of social deprivation and related inequalities.

Additionally, the lack of safe, sustainable and affordable public transport and the lack of adequate, high quality cycling infrastructure were also significant contributors to road safety. All of which require to be addressed to realistically achieve 2050 targets.

Previous Convictions
A large number of drivers/riders at fault had previous convictions for driving related offences including dangerous driving, careless driving, drink driving and speeding. Some had multiple convictions prior to being involved in a fatal collision and a number went on to commit further offences following a fatal collision.
A wider review of penalties and criminal justice is required to ensure a robust preventative and enforcement strategy to address this behaviour.

Young Drivers
A large number of young drivers (390 drivers aged between 16 and 35) were found to be at fault for the fatal collisions and were also more frequently killed as passengers when being driven by peers around the same age.
They often displayed risky behaviour, travelling too fast, getting distracted, drink-driving and not wearing a seatbelt.

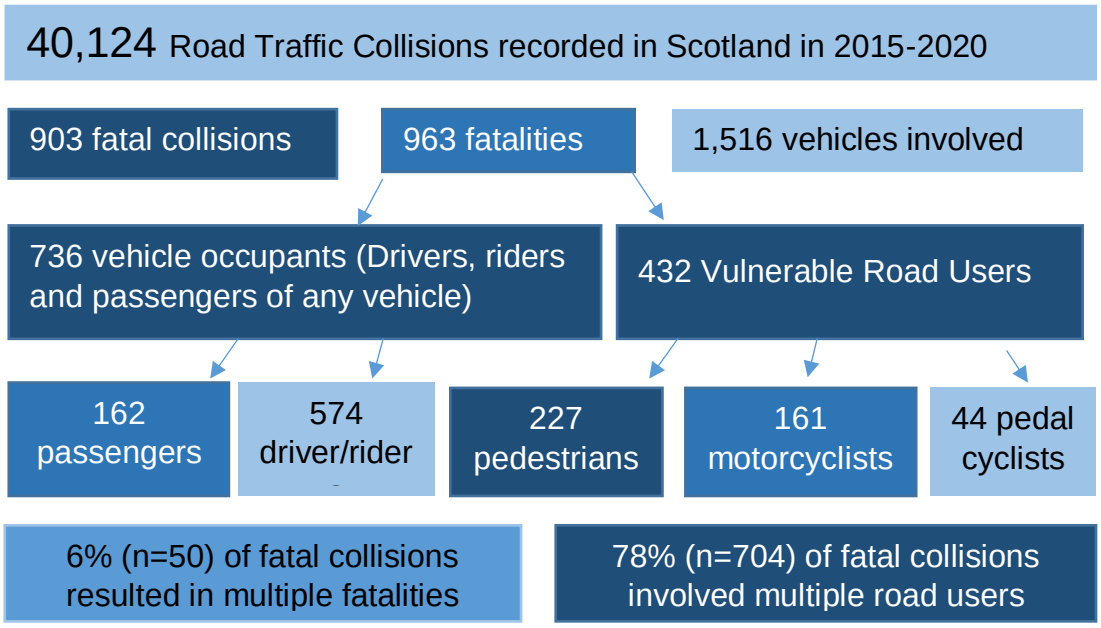
A wide ranging, multi-tiered approach is required to address this behaviour, from consideration of a Progressive Licensing Regime to inclusion of young drivers who have been involved in collisions in a Young Drivers Working Group to identify the best solutions to tackle the issue.

Older Drivers
Contributory factors were commonly identified relating to health and eyesight issues and delayed reaction times for older drivers. A whole system approach is required to review processes around notification by family members, GPs and opticians of fitness to drive, mandatory cognitive assessments and use of assessment simulators.

This report provides more detail on all collision data, contributory factors and countermeasures and provides recommendations for police and partners to try to reduce risk and make Scotland's roads safer.

The statistical key findings, extracted from the analysis below, are provided in the In-Depth Fatalities Study 2015 – 2020 Executive Summary.

3. Collision Analysis



There were 903 fatal collisions involving 963 fatalities recorded between 2015 and 2020. Of these, 226 resulted in pedestrian fatalities, 156 in motorcyclist fatalities and 44 in pedal cyclist fatalities. The remaining 477 fatal collisions did not involve vulnerable road users (VRUs).

The number of fatal collisions remained relatively steady from 2015-2019 with a notable decrease in 2020. This can largely be accounted for by the Covid-19 pandemic which placed travel restrictions on much of the population.

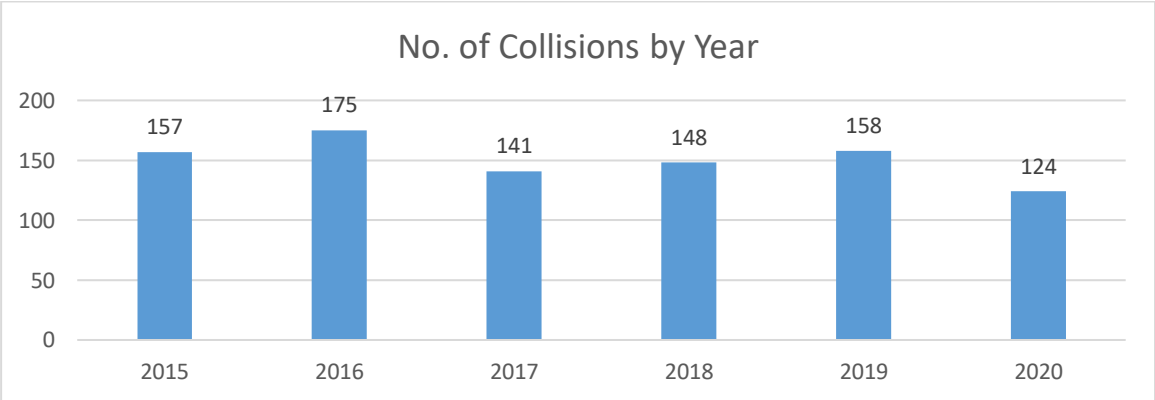


Figure 3: Table of All Fatal Collisions by Year

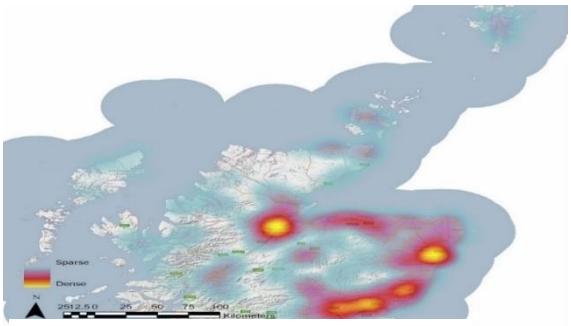
3.1 Geographical Profile

National Overview

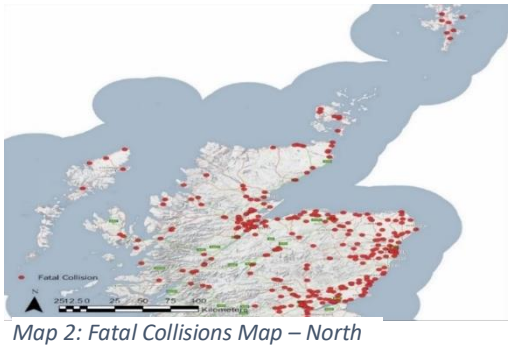
Geospatial analysis of all fatal collisions in Scotland highlights a hotspot around Glasgow with a high concentration of collisions across the Central Belt. Lower intensity hotspots are also observed around major population centres such as Edinburgh, Aberdeen and Inverness.

In addition, there are lesser hotspots/clusters around major roads between Scotland's cities, on routes to England and around the coast from Dundee through Aberdeen and west to Inverness.

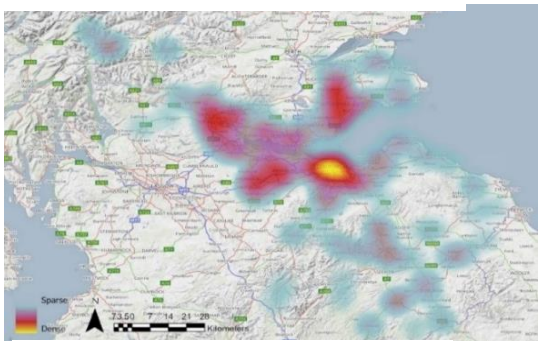
The following maps provide an overview of where all fatal collisions occurred in the north, east and west of Scotland. These includes all vehicular and pedestrian collisions. These maps further highlight that hotspots/clusters exist around Scotland's cities and across the trunk road network. The highest number of fatal collisions occurred in the west of Scotland (38%, n=344), the lowest number occurred in the east (27%, n=245).



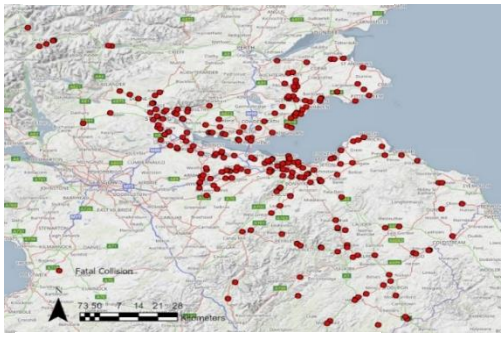
Map 1: Fatal Collisions Hotspot Map – North



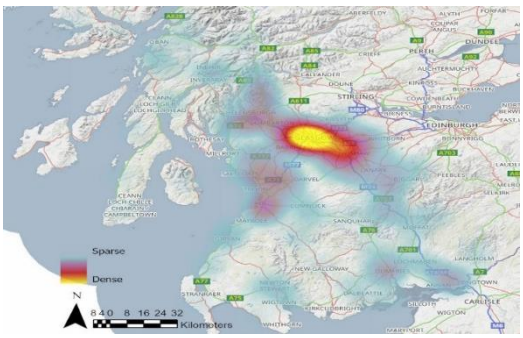
Map 2: Fatal Collisions Map – North



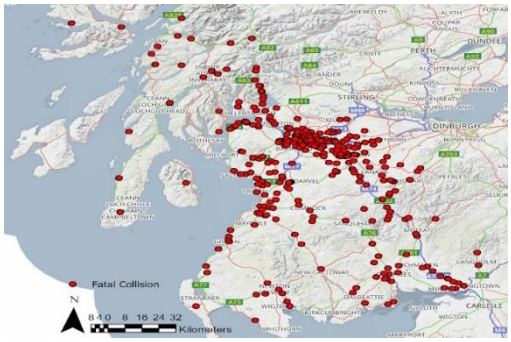
Map 3: Fatal Collisions Hotspot Map – East



Map 4: Fatal Collisions Map – East



Map 5: Fatal Collisions Hotspot Map – West



Map 6: Fatal Collisions Map – West

Figure 4 provides a breakdown by casualty class (mode of transport) by geographical area. This shows car occupant fatalities are notably greater in the north and west of Scotland. Pedal cyclist fatalities were more frequent in east. Pedestrian fatalities were significantly more frequent in the west, as were motorcyclist fatalities.

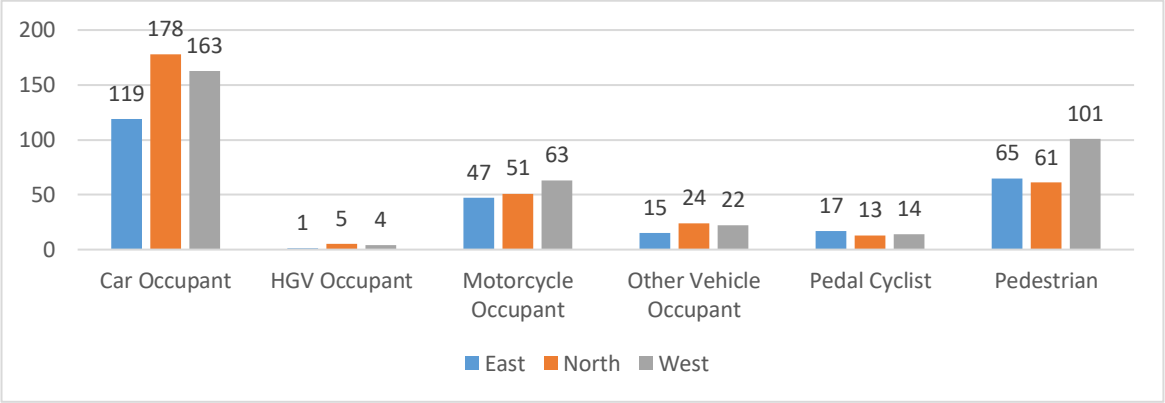


Figure 4: Casualty Class by Geographical Area

Local Authority Area Overview

Considering fatal collisions in terms of Local Authority Area (LAA) the following provides a more detailed picture.

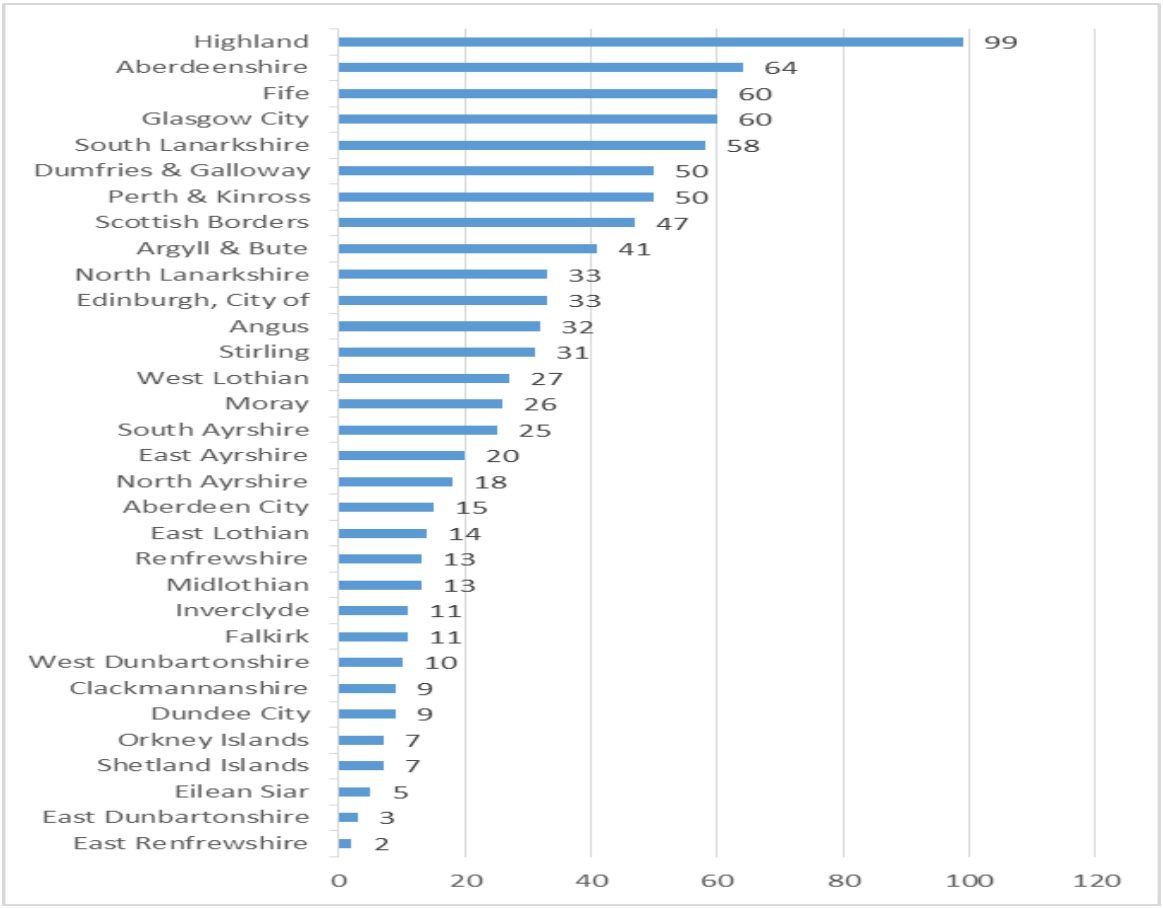


Figure 5: Collisions by Local Authority Area

Figure 5 shows Highland local authority saw the most fatal collisions (11%, n=99). This is largely attributable to the topography of many of the roads within

their local authority area and the large geographical area it covers. In addition, as a popular destination for tourists and sightseers, a lack of familiarity with the roads is likely to be a significant factor.
Aberdeenshire (7%, n=64), Fife and Glasgow City (7% respectively, n=60 each) were the LAAs with the next highest number of collisions.

Figure 6 (below), shows the proportion of casualty class by LAA. This shows a high number of car occupant fatalities in Highland (n=66). This is significantly higher than the next highest LAAs, Aberdeenshire (n=38) and Dumfries & Galloway (n=36).
Glasgow City saw most pedestrian fatalities (n=38) followed by Fife (n=20).
Motorcycle fatalities were highest in Scottish Borders (n=15), closely followed by Dumfries & Galloway (n=13).

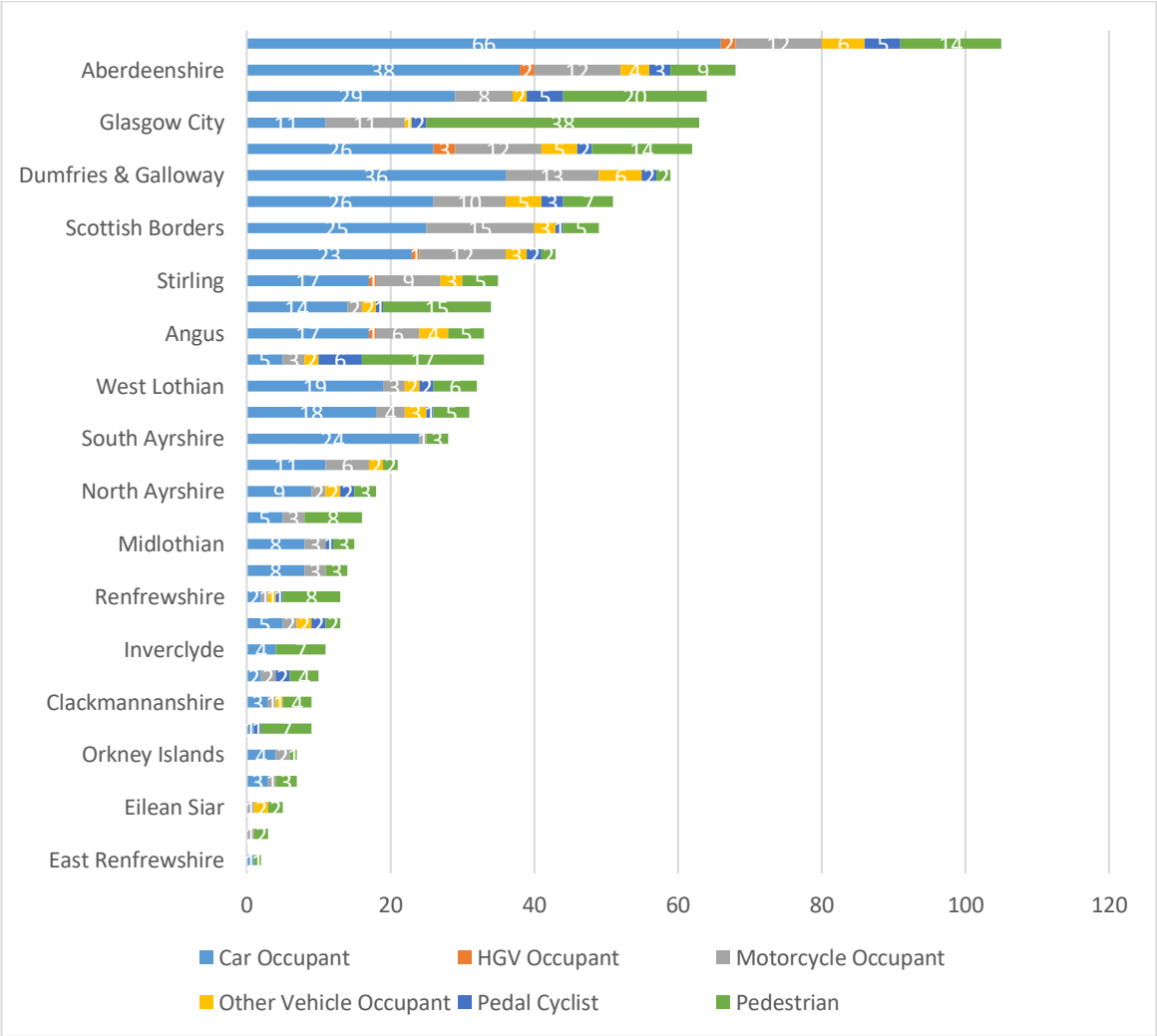


Figure 6: Casualty class by LAA

Pedal cyclist fatalities were most common in City of Edinburgh (n=6), closely followed by Fife and Highland (n=5). In total 19 of Scotland's LAAs saw one or more pedal cyclist fatalities.
Casualty class is subject to further analysis under the fatalities section of this report.

3.2 Collision Type

For the purposes of analysis, collisions have been categorised based on the pertinent manoeuvre carried out which was deemed to have resulted in the collision. It may be the case that a collision could be categorised as more than one collision type, for example those categorised as 'Overtaking and lane change' may also fit into 'Loss of control or off road (straight roads)' but the overtaking manoeuvre was deemed to be the most significant manoeuvre as this instigated the loss of control.
Miscellaneous was used when the collision type did not fit any of the predetermined categories and was deemed to be a relatively unique set of circumstances. For example, the sudden braking of a bus resulted in a passenger being thrown from their seat and sustaining fatal injuries.

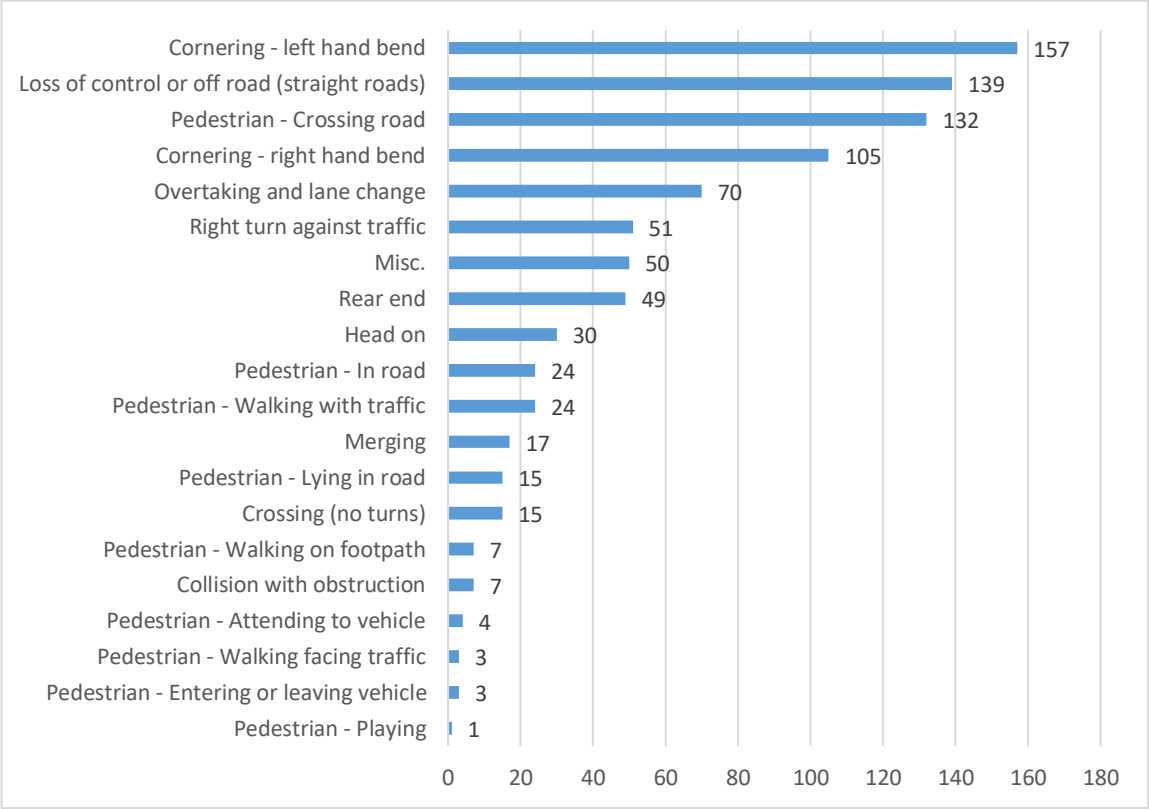


Figure 7: Collision Type – All collisions

For all collisions, 'Cornering (left hand or right hand bend)' and 'Loss of control or off road (straight road)' were the most common collision types, accounting for a combined 44% (n=401) of collisions.
'Pedestrian – crossing road' is the third most common collision type, accounting for 15% (n=132) of collisions. Figure 7 depicts the collision type for all fatal collisions.

Object Hit when Leaving the Carriageway
Of the 736 non-pedestrian fatalities (i.e. driver/rider/passenger), 38% (n=278) were within a vehicle that left the carriageway and hit an object.

The likelihood that removing these hazards or protecting them with a suitable barrier may have prevented fatal injury will be discussed later in this report.

Figure 8 (below), shows the most frequently hit objects were trees (29%, n=82), and wall or fence (27%, n=75).

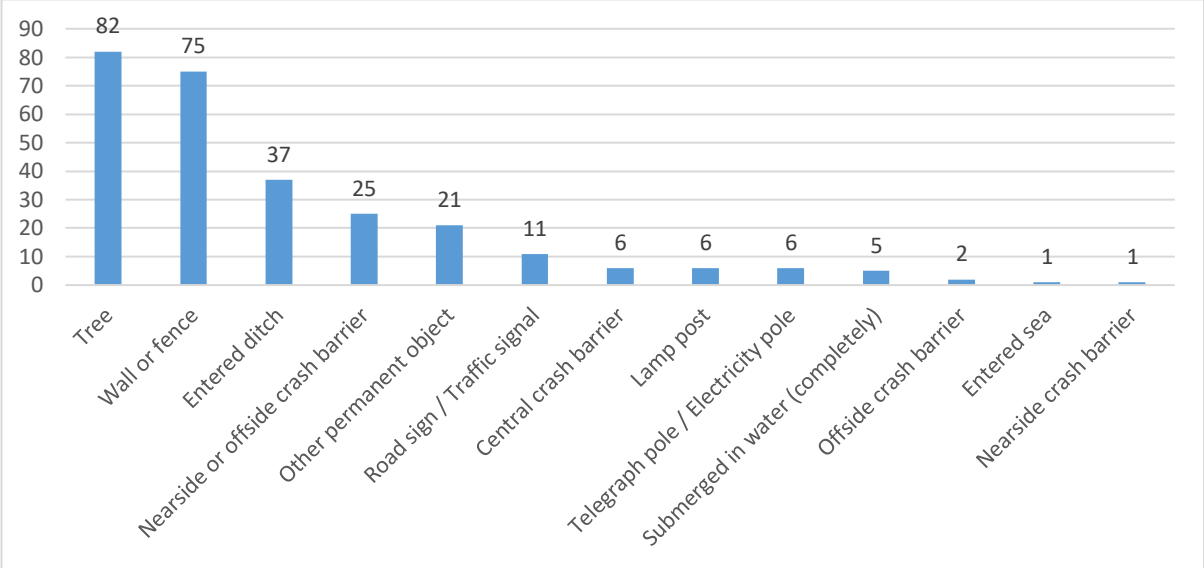


Figure 8: Object Hit When Leaving the Carriageway

Figure 9, on the next page, shows the four most frequent collision types, as highlighted above, for all Local Authority (LAA).
This highlights Highland LAA saw the most fatal collisions overall across these collision types. 19% (n=30 of 157) of all 'Cornering – left hand bend' collisions occurred in Highland.

This chart also highlights the large number of pedestrian fatalities that occurred in Glasgow City. 21% (n=28 of 132) of all 'Pedestrian-crossing road' collisions occurred in this area.
This is owing largely to the urban profile of the area and a high presence of both pedestrians and vehicles. The years 2015 and 2020 saw particularly high levels of pedestrian fatalities in Glasgow City (12 and 9 respectively). The remaining four years (2016 – 2019) saw an average of 4 to 5 pedestrian fatalities.

Over the 6-year period, there were 6 to 7 pedestrian fatalities per year on average in Glasgow City. This is compared with an average of 2 to 3 pedestrians in the City of Edinburgh over the same time frame.

However when looking at 2016 – 2019, the average in Edinburgh increases to 3 to 4 which is not dissimilar to the average number in Glasgow over the same period. Therefore, the higher overall number of pedestrians killed in Glasgow is explained by the unusually high numbers in 2015 and 2020.

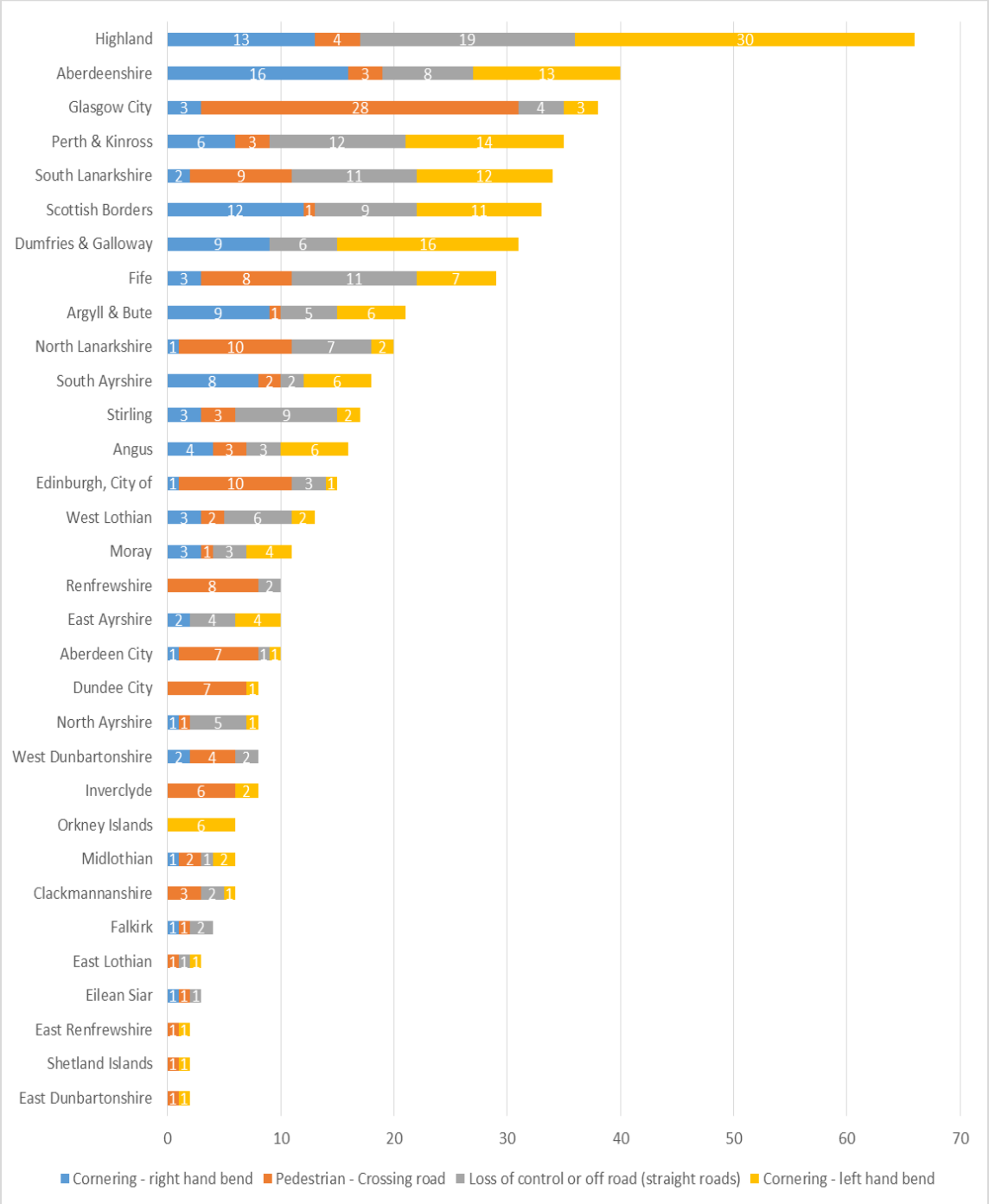


Figure 9: Most common Collision types by Local Authority Area

Collision Type – Pedestrian Fatalities

There were 226 collisions that resulted in 227 pedestrian fatalities.
These occurred most frequently when the pedestrian was crossing the road, accounting for 58% (n=132). Pedestrians who were walking with traffic or in the road were the next most commonly recorded, both 11% (n=24).

'Pedestrian - lying in the road' was recorded in 15 collisions and primarily involved those where pedestrians have been intoxicated and have fallen into the roadway or, have been lying in the road prior to the collision. Pedestrians who have suffered a medical episode and subsequently fallen onto the roadway are also captured in this category.

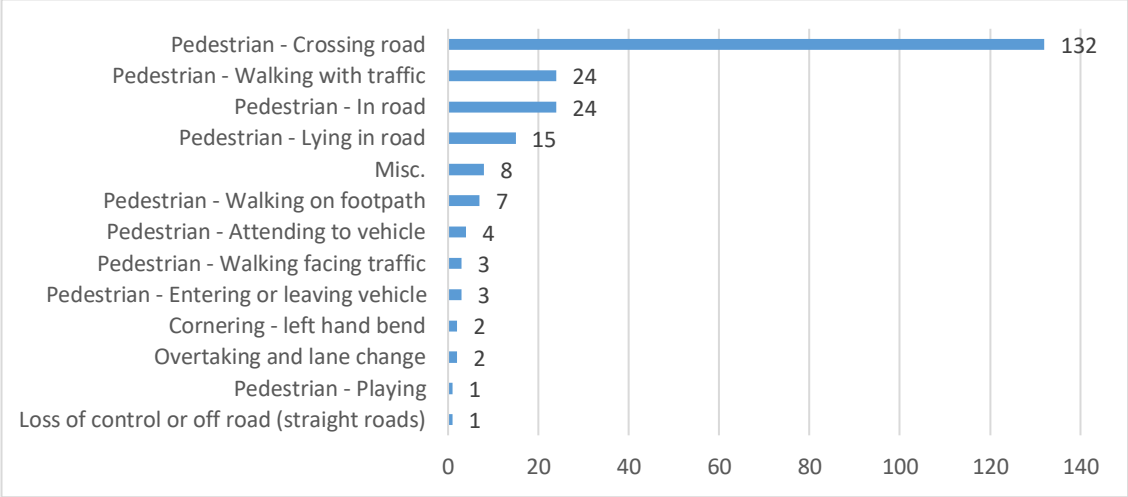


Figure 10: Collision type for Pedestrian Fatalities

Collision Type – Motorcyclist Fatalities

Of the 156 Collisions resulting in motorcyclist fatalities, those involving 'Cornering (left or right-hand bend)' were most common, accounting for 42% (n=65) with left-hand bends being more prominent (n=39). 'Overtaking and lane change' was the collision type for 20% (n=31).

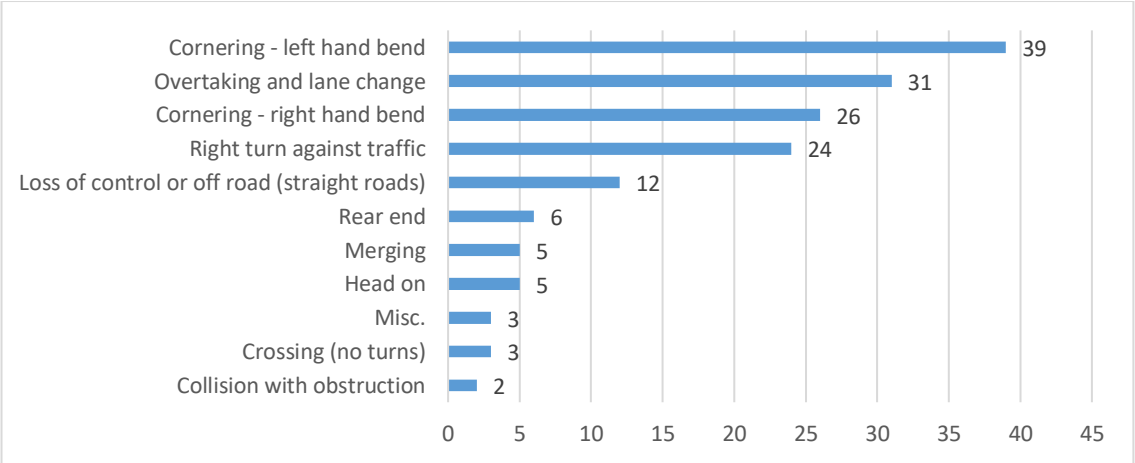


Figure 11 : Collision Type for motorcyclist fatalities

Collision Type – Pedal Cyclist Fatalities

13 of 44 collisions (30%) resulting in a pedal cyclist fatality were recorded as miscellaneous.

Circumstances included striking a deer in the road, the door of a parked vehicle being opened in the path of a cyclist and other drivers failing to observe the cyclist and crossing into their path.

Rear end (14%, n=6) and overtaking/lane change (11%, n=5) were the next most common.

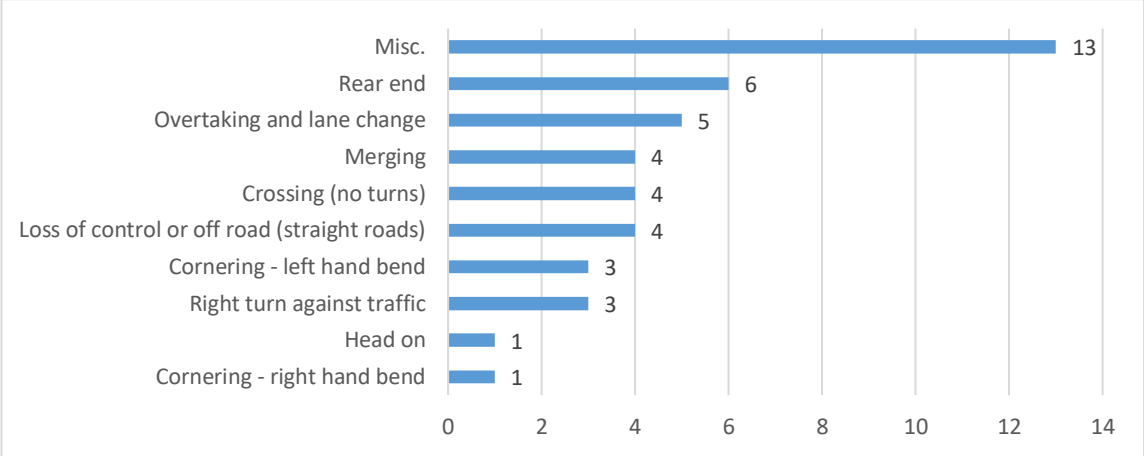


Figure 12: Collision Type for Pedal Cyclists.

3.3 Collision Type – Urban/Rural

The majority (71%, n=642 of 903) of collisions occurred in rural environments.[1] 94% of 'Cornering – right hand bend' (n=99 of 105 collisions) and 90% of 'Cornering – left hand bend' (n=141 of 157 collisions) occurred in rural areas.

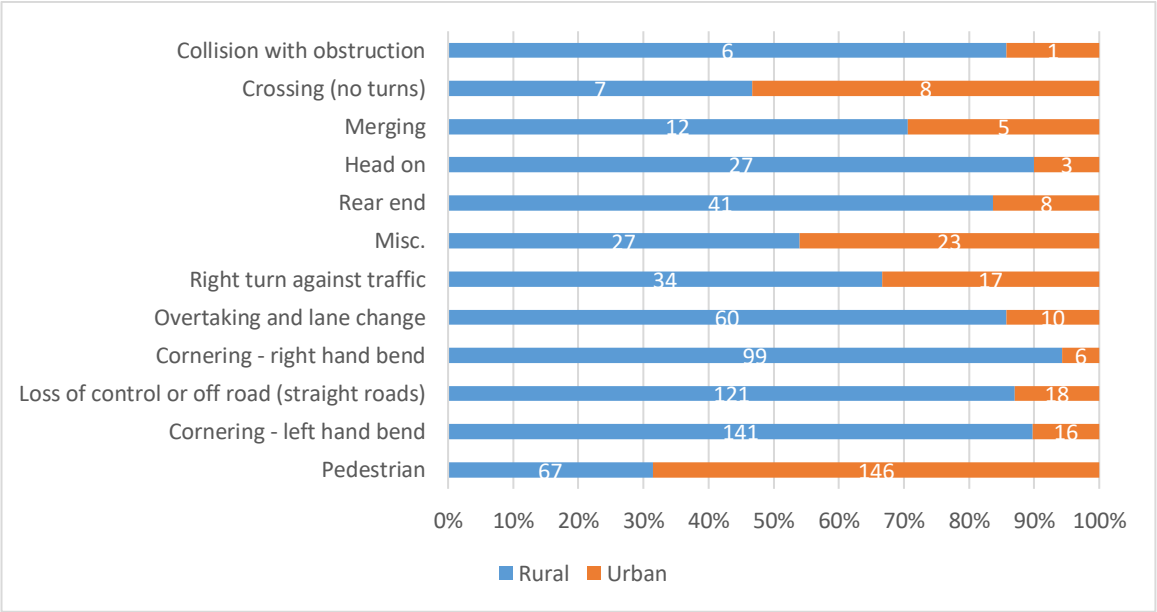


Figure 11: Collision Type by Urban/Rural Classification

The majority (71%, n=642 of 903) of collisions occurred in rural environments.[2] 94% of 'Cornering – right hand bend' (n=99 of 105 collisions) and 90% of 'Cornering – left hand bend' (n=141 of 157 collisions) occurred in rural areas.

[1] An area is defined as rural if it falls outside of settlements with more than 10,000 resident population.
[2] An area is defined as rural if it falls outside of settlements with more than 10,000 resident population.

There were two notable exceptions. Firstly 'Crossing (no turns)' was split but slightly favouring urban locations (n=8 of 15 collisions, 53%). Secondly, 'Pedestrian' fatal collisions were more common in the urban environment (146 of 213 collisions, 69%).[3] Given the increased population density in urban areas, it is logical that more collisions involving pedestrians are likely to occur.

3.4 Road Type/Class

66% (n=600) of fatal collisions occurred on A class roads. Fatal collisions on motorways accounted for 4% (n=37). Figure 13 highlights the differences in road traffic levels per road type compared with the proportion of fatal collisions.[4]

A Class Roads

It is notable that, while A class roads accounted for both the highest proportions of road traffic volume and fatal collision occurrence, there is a stark difference in the levels between the two. Less than half of all vehicle kilometres travelled were on A class roads, but more than half the fatal collisions occurred on these roads.

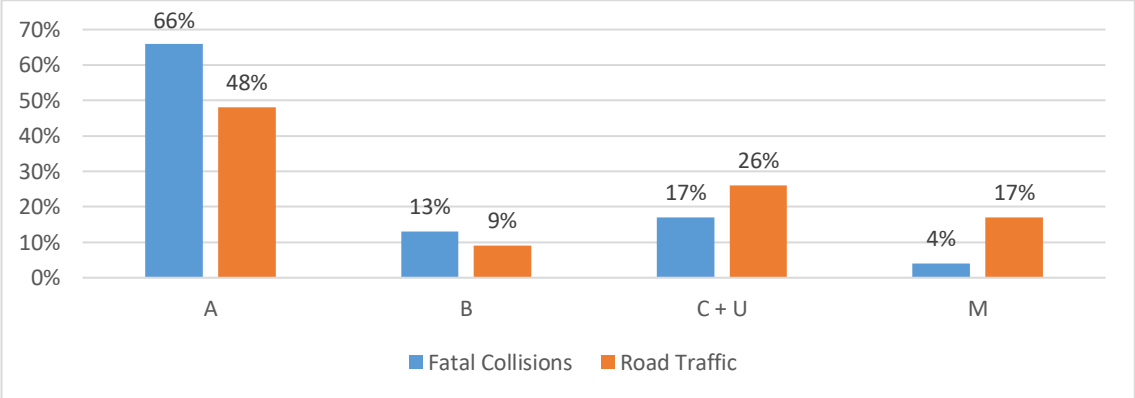


Figure 13: Comparison of Road Type for Fatal Collision and Road Traffic Volume

Motorways

17% of all vehicle kilometres travelled were travelled on motorways, however only 4% of collisions occurred on motorways. This indicates that despite the often higher speeds and close proximity of multiple vehicles on motorways, fatal collisions are much less frequent.

This may be largely attributed to the separation of traffic travelling in opposite directions by central reservation barriers and the well-maintained roads.

Motorway collisions are much more likely to occur with vehicles travelling in the same direction, meaning less energy is involved in a collision.[5] This translates to a reduction in the severity of any collision and a reduced risk of fatality.

[3] In this chart, 'pedestrians' includes all pedestrian collision types ('Pedestrian – crossing road', 'Pedestrian – walking in traffic' etc.)

[4] *Chapter 5: Road Traffic;* Scottish Transport Statistics 2021, Transport Scotland

[5] *Are Motorways Really The Safest Roads In The UK?*; Sunday Times Driving, August 2022

Posted Speed Limit

Figure 14 (below), shows the casualty class and posted speed limits of the roads on which fatal collisions occurred.

It must be noted that while this is the speed limit, it does not represent the speed at which a vehicle was travelling. For example, a driver at fault may be travelling at 50 mph on a road where the speed limit is 30mph

Speed Limit	Car Occupant	HGV Occupant	Motorcycle Occupant	Other Vehicle	Pedal Cyclist	Pedestrian
10	1	0	0	0	0	0
20	1	0	1	3	1	17
30	24	0	26	13	14	120
40	30	1	5	3	3	18
50	20	0	4	2	5	12
60	319	7	122	33	20	45
70	65	2	3	7	1	15

Figure 14: Casualty Class by Posted Speed Limit

Pedestrian

Pedestrian fatalities occurred more frequently on roads with lower speeds limits. 53% (n=120) occurred on 30mph roads and 7% (n=17) on 20mph roads. A further 20% (n=45) occurred on roads with a 60mph limit.

Pedal Cyclists

Pedal cyclists were most frequently killed on 60mph roads (45%, n=20) where they share roads with other faster-moving vehicles followed by 30mph roads where 32% of cyclists were fatally injured (n=14).

The majority of all other casualty classes were fatally injured on 60mph roads.

3.5 Temporal Profile

Figure 15 shows 460 car occupant fatalities occurred across all days of the week with the most frequent days being Saturday (n=84, 18%) and Sunday (n=75, 16%).

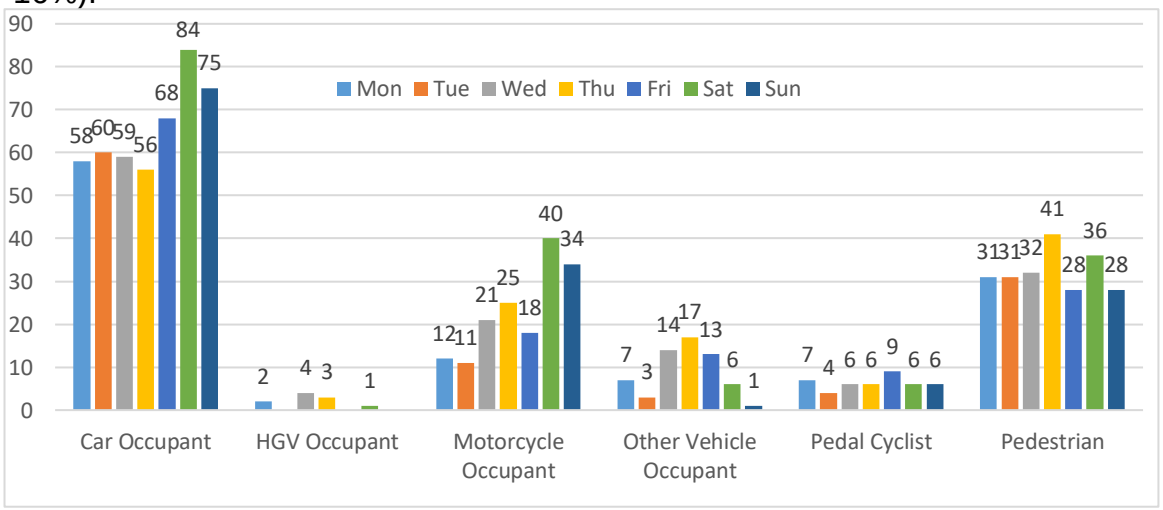


Figure 15: Casualty Class by day of the week

The weekend was also the most frequent time of the week for a collision resulting in a motorcyclist fatality.
The majority (n=9, 90%) of Heavy Goods Vehicle (HGV) occupant fatalities occurred on a weekday. Pedal cyclist and pedestrian fatalities were relatively evenly spread across the week.

Days of the Week / Hours of the day

Table 1 shows the days of the week against hours of the day for fatal collision occurrence.
From this it can be seen fatal collisions occurred most frequently between 10am and 6pm with the most frequent time being 4pm to 5pm.
The least frequent time for fatal collisions overall was between 3am and 6am.

Hour/Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total
12am-1am	2	2	2	1	3	4	7	21
1am-2am	5	0	1	0	0	3	7	16
2am-3am	3	0	4	2	2	5	7	23
3am-4am	2	1	0	1	2	5	2	13
4am-5am	1	0	0	0	3	3	2	9
5am-6am	0	0	2	2	1	1	3	9
6am-7am	4	1	3	5	3	3	2	21
7am-8am	4	6	3	6	5	3	4	31
8am-9am	2	3	9	6	1	4	3	28
9am-10am	5	3	6	8	7	4	3	36
10am-11am	7	9	9	6	7	8	6	52
11am-12pm	8	2	8	9	7	18	12	64
12pm-1pm	8	8	5	11	7	8	10	57
1pm-2pm	6	12	8	2	9	11	11	59
2pm-3pm	7	9	5	5	12	8	8	54
3pm-4pm	7	13	10	6	8	10	8	62
4pm-5pm	7	9	9	15	14	12	10	76
5pm-6pm	10	8	13	8	8	9	6	62
6pm-7pm	5	4	6	6	8	9	3	41
7pm-8pm	6	4	7	13	5	9	5	49
8pm-9pm	6	1	4	6	3	9	5	34
9pm-10pm	4	2	9	6	2	5	7	35
10pm-11pm	3	4	3	5	4	6	1	26
11pm-12am	0	1	3	6	4	7	4	25
Total	**112**	**102**	**129**	**135**	**125**	**164**	**136**	**903**

Table 1 Fatal Collisions by Day and Hour

Thursday and Friday from 4pm to 5pm and Saturday from 11am to 12pm were the days and times when most fatal collisions occurred.

Casualty Class by Season

The most frequent single season for car occupant fatalities was summer followed by winter.

Motorcyclists

Motorcycle occupant fatalities were most common in the summer and least common in the winter. Motorcyclists tend to favour nicer weather during spring and summer months with many riders only insuring motorcycles for six months over the summer season.

Pedestrians

The majority of pedestrians were killed in autumn and winter when weather and lighting conditions are less favourable and they may be less visible to drivers.

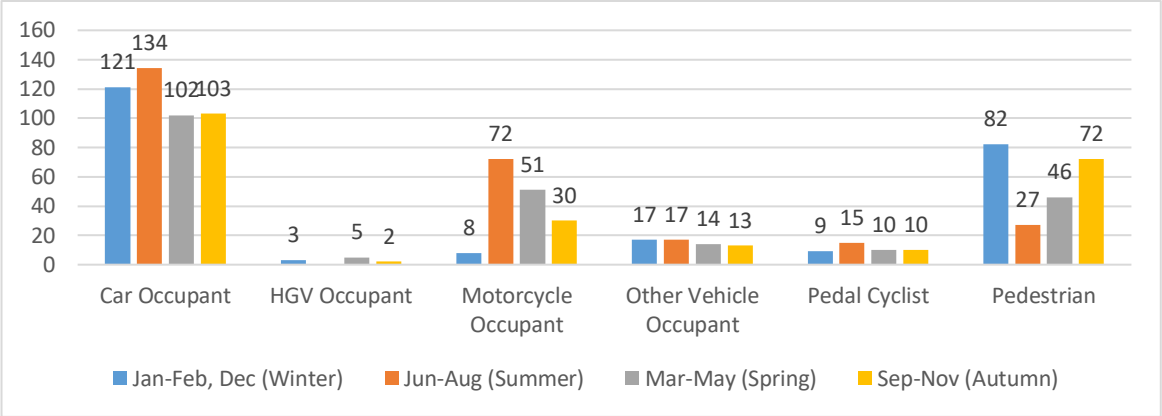


Figure 16 shows casualty class by season.

3.6 Drivers/Riders Deemed at Fault

There were 1,516 drivers/riders involved in the 903 fatal collisions. 977 of these were found to be 'at fault' for the collision.

Age[6]

Drivers/riders aged 46-55 (n=303, 20%) and 26-35 (n=286, 19%) were most frequently involved in fatal collisions. Combined, these age groups accounted for 39% of all drivers/riders. (Recommendation 8 Motorcycle Safety Campaign)

However, when examining drivers/riders at fault for the collision, there is a shift towards younger drivers with those aged 26-35 (n=201, 21%) and 16-25 (n=189, 19%) being the two most represented age groups.

A further breakdown of younger drivers (those aged 16-25) shows those aged 16-20 accounted for 8% and 21-25 year olds account for 11% of all drivers at fault.

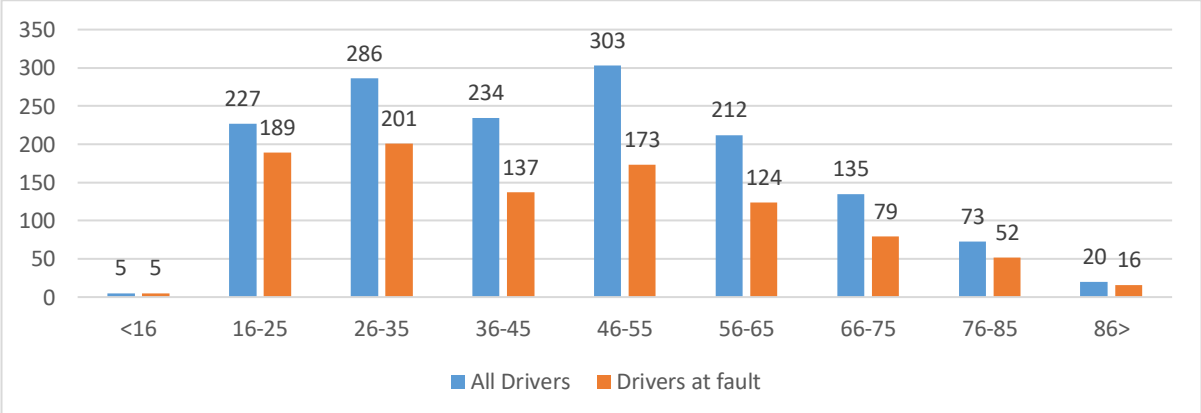


Figure 17: Fault for Fatal Collisions by Age Group

[6] Age data was available for 99% of drivers/riders involved in fatal collisions

Figure 17 shows the overall numbers of drivers/riders involved in fatal collisions and driver/riders at fault by age group. 84% of drivers/riders aged 16-25 involved in fatal collisions were deemed to be at fault. This is compared with 57% of those aged 46-55. This indicates that, when younger drivers are involved in fatal collisions, they are more likely to have been at fault.

100% of driver/riders under 16 were deemed to be at fault when they were involved in a collision. Vehicles being driven/ridden on those occasions included pedal cycles and motorcycles/quad bikes.

80% of drivers/riders aged over 86 were deemed to be at fault for fatal collisions indicating that when involved, they bear a high level of responsibility. (Recommendation 35 Education)

Sex[7]

Department for Transport data shows the number of males and females with full driving licences to be relatively equal with males accounting for 54% and females 46%.[8] Despite this relatively equal split, males accounted for 80% (n=1,190 of 1,495) of all drivers/riders involved in fatal collisions and 82% (n=799 of 974) of all drivers/riders at fault.

67% (n=799 of 1,190) of all male drivers/riders involved in fatal collisions were at fault compared with 57% (n=175 of 305) of all female drivers/riders. Men are more likely to have jobs that involve driving, such as delivery drivers and taxi drivers and are thought to drive more miles overall than women.[9]
This greater presence and increased exposure on the roads may increase their risk and likelihood of being involved in a fatal collision.

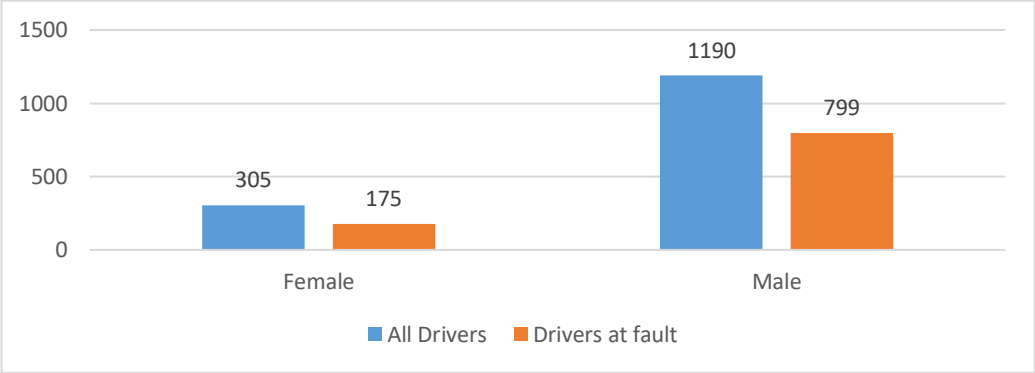


Figure 18: Fault for Fatal Collisions by Sex

There are however notable differences between the sexes when it comes to driving behaviours, with males more prominent when it comes to dangerous behaviour including speeding, aggressive driving and impairment by alcohol and/or drugs.[10]

[7] Sex data was available for 99% of drivers/riders involved in fatal collisions
[8] *GB Driving Licence Data;* Department For Transport, February 2023
[9] Hux, P.D., (2016), *The influence of gender in motor vehicle fatalities*; Allen, Allen, Allen & Allen
[10] Hux, P.D., (2016), *The influence of gender in motor vehicle fatalities*; Allen, Allen, Allen & Allen

These contributory factors will be considered in terms of sex differences further on in this report.

Vehicles[11]

Of the 1,516 vehicles involved in fatal collisions, 64% were cars (n=973). Motorcycles accounted for 11% of all vehicles involved (n=170), despite totalling only 2% of all vehicles licensed for road use in Scotland.[12]
This highlights a disproportionate level of motorcycle involvement in fatal collisions when compared with their road presence.

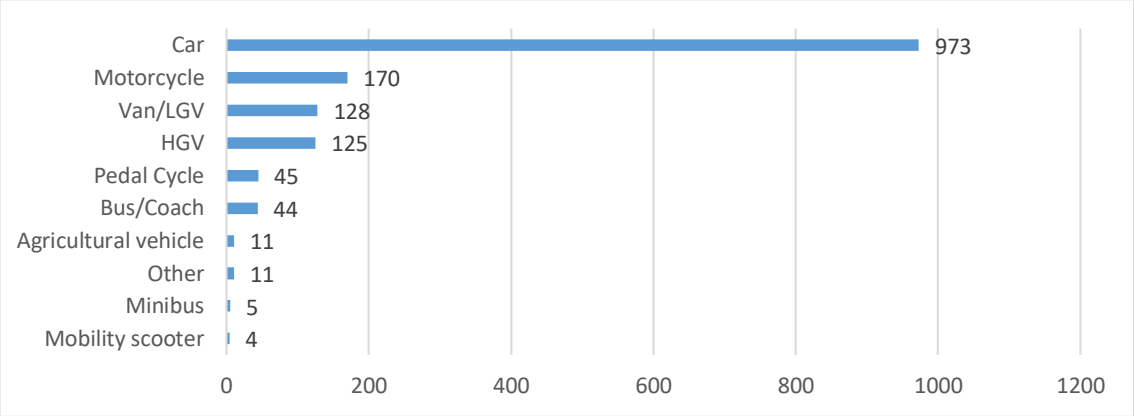


Figure 19: Vehicle types involved in Fatal Collisions

Figure 20 [13] depicts the proportion of vehicle types involved in fatal collisions where the driver/rider has and has not been at fault. This highlights that when involved in fatal collisions, 86% of motorcycle riders were at fault (n=146 of 170).

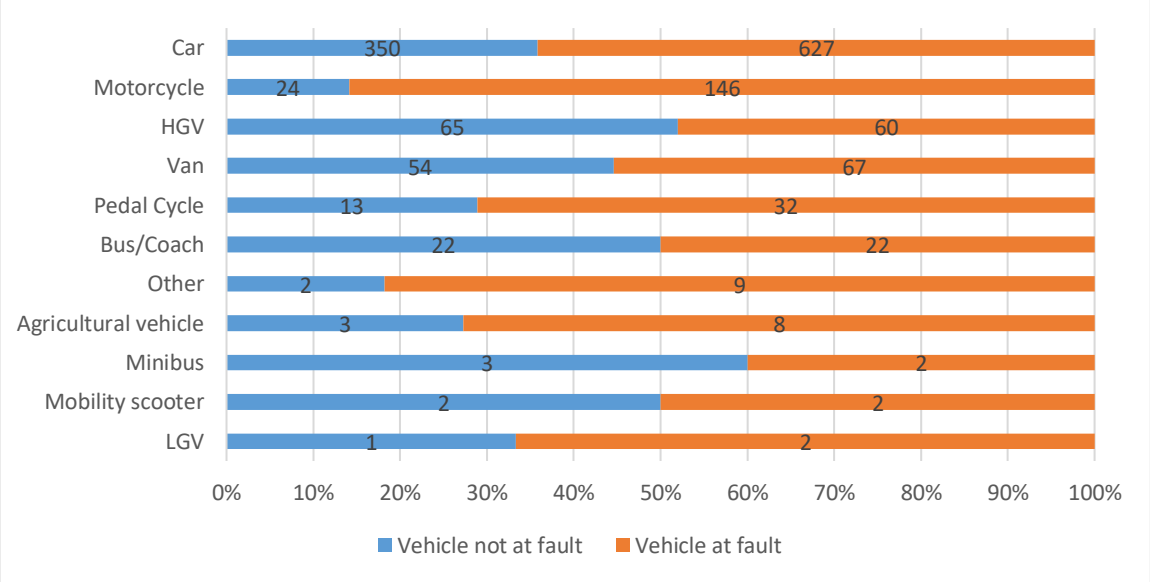


Figure 20: Fault for Fatal Collisions by Vehicle Type

[11] LGV = Light Goods Vehicle; Other refers to vehicles that do not fit into any existing categories namely electric scooters, quad bikes, campervans, forklifts and cherry pickers
[12] *Chapter 1: Road Transport Vehicles*; Scottish Transport Statistics No.39 2020 Edition; Transport Scotland
[13] Other vehicles includes those which are not captured by other category electric scooters, quad bikes, campervans, forklifts and cherry pickers.

71% of pedal cyclists (n=32 of 45) were deemed to be at fault as were 73% of agricultural vehicle drivers (n=8 of 11).
It should be noted this does not always mean they were solely responsible for collision occurrence but, rather, that their actions contributed in some way.

3.7 Fatalities

Casualty Class[14]

The most common casualty class was 'car occupant', accounting for 460 of the 963 fatalities (48%). 24% were pedestrians (n=227).

Vulnerable road users (pedestrians, motorcyclists and pedal cyclists), combined, accounted for 432 fatalities (45%). Vulnerable road users are disproportionately represented in road fatality figures compared with their level of road use.

Motorcyclists

Motorcycles are estimated to account for around 2% of vehicles licenced for use on Scotland's roads and less than 1% of road traffic volume.[15] Motorcyclists however accounted for 17% of all fatalities. In almost all (99%, n=154 of 156) fatal collisions involving a motorcycle, it was the motorcycle rider and/or pillion passenger who died.
Five collisions resulted in the death of both the motorcycle rider and pillion passenger. This again highlights the particular vulnerability of this group of road users when involved in collisions, largely due to the lack of physical protection provided to them on this mode of transport.

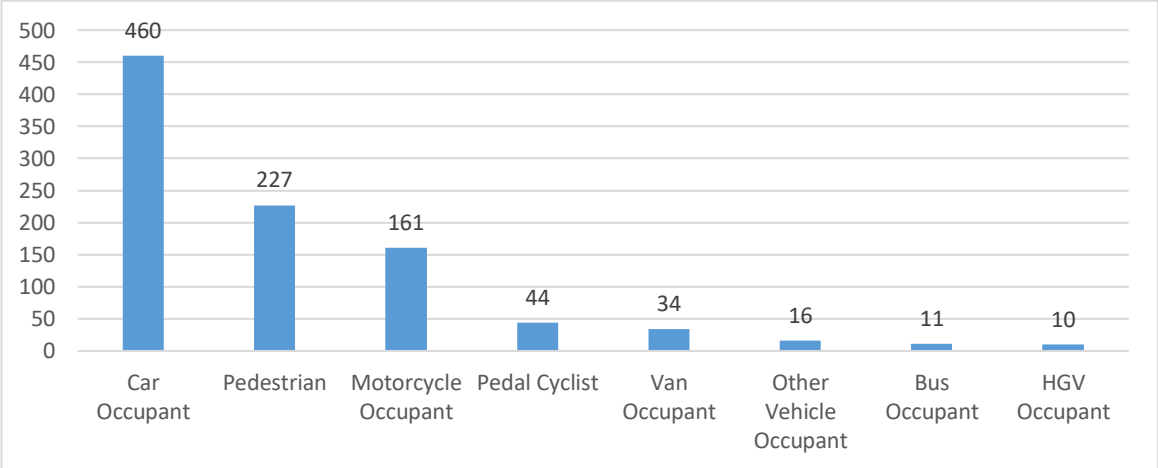


Figure 21: Casualty Class

Pedal Cyclists

Pedal cyclists accounted for 5% of all fatalities.
Pedal cyclist traffic is estimated to account for around 1% of all road traffic, although there has been increase in recent years as a result of both the Covid-19

[14] Other refers to fatalities that were occupants of agricultural vehicles, vans, bus/coaches, mobility scooters, electric scooters, quad bikes, campervans, forklifts and cherry pickers.
[15] *Chapter 5: Road Traffic*; Scottish Transport Statistics 2021, Transport Scotland

pandemic and a conscious move by some to travel in a more economical and sustainable way.[16]

Age

There were fatalities across all age bands between 2015 and 2020.
The age groups with the largest number of fatalities were those aged 16-25 (n=149) and those aged 46-55 (n=147), each accounting for 15% of fatalities.
Those aged under 16 and over 86 were the least frequently killed.

There were 29 child[17] fatalities, ranging from the age of 1 year-old to 15-years old, 14 of which (48%) were fatally injured as pedestrians.

Casualty Class by Age

Across the majority of age groups, more people were killed as drivers or riders than as passengers or pedestrians.

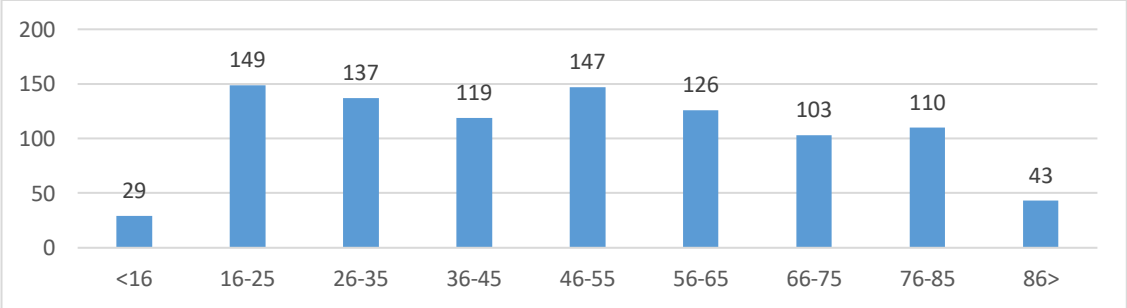


Figure 22: Fatalities by Age Band

Figure 23 shows those aged under 16 and 76-85 were killed more frequently as pedestrians. These age groups may be more likely to be travelling on foot thus increasing their risk of becoming pedestrian fatalities.

However, there may be other factors to consider, including a lack of awareness and understanding around dangers amongst younger children or eyesight and mobility issues amongst older pedestrians.

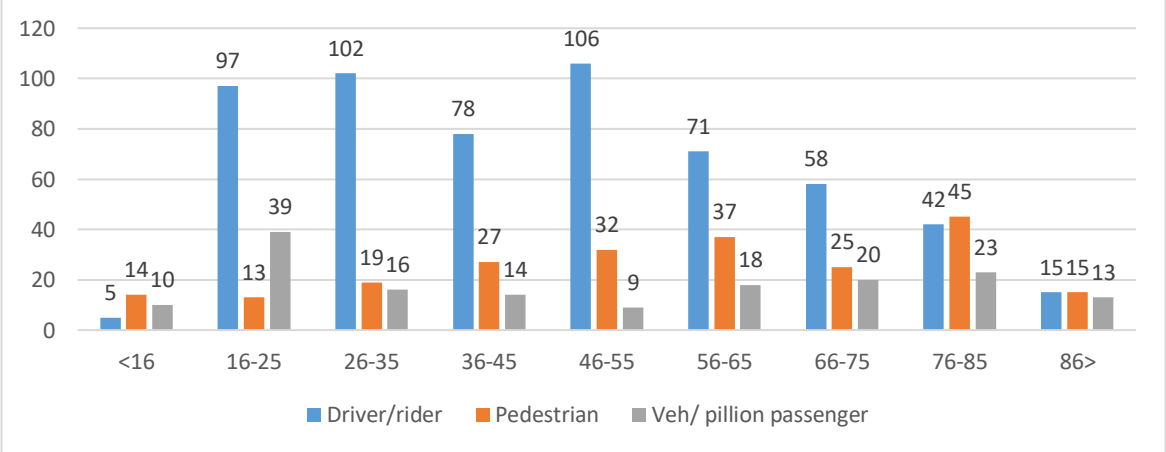


Figure 23: Casualty Class by Age Band

[16] *Cycling UK's Cycling Statistics*; Cycling UK, February 2022
[17] A child is defined as a person aged 15 or under

Figure 23 also shows those aged 16-25 were killed most frequently as passengers than any other age group.
Further analysis has found 77% of passengers in this age group (n=30 of 39 fatalities) were killed in vehicles driven by someone aged 16-25. This will be explored further later in this report.

Sex

Males were killed at a significantly higher rate than females. Males accounted for 673 (70%) fatalities, compared to 290 females (30%).

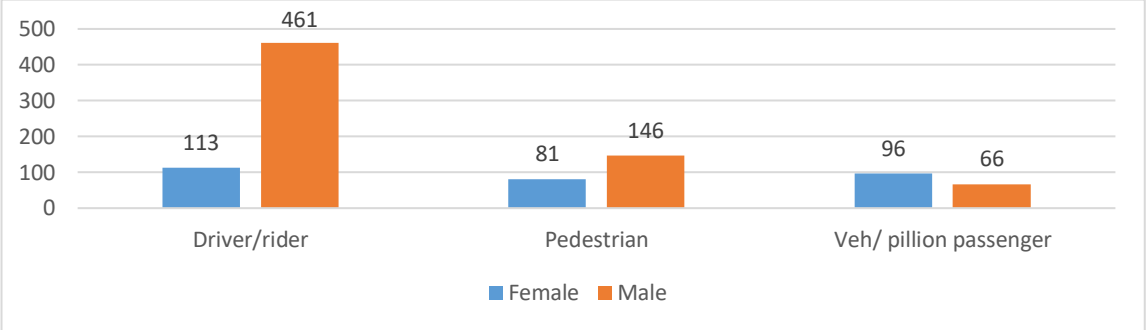


Figure 24: Casualty Class by Sex

Figure 24 shows males were killed significantly more frequently as drivers/riders than females. Men are said to drive more miles than females and are more likely to have driving-related professions[18], therefore exposing them to the risk of a fatal collision more frequently.
Further explanations for higher rates of male fatalities relate largely to cultural gender differences.

It has been suggested women are more likely to drive cars that have been selected based on safety features and reliability, whereas males may be more focused on performance and style.[19]

Men are also more likely to exhibit risky behaviours including not wearing a seatbelt, not wearing a helmet or other safety gear when on a motorcycle, and speeding which results in collisions happening at higher speeds and increasing the likelihood of fatal injury.[20]

Pedestrian

Pedestrian fatalities were also more frequently male than female.
Research has shown males are less likely to cross at designated pedestrian crossings, more likely to make errors (such as misjudging the speed of oncoming vehicles), and more likely to be impaired by alcohol[21] all of which increase their likelihood of becoming a pedestrian fatality.

[18] *Men pose more risk to other road users than women*; BMJ, 2020
[19] Hux, P.D., (2016), *The influence of gender in motor vehicle fatalities*; Allen, Allen, Allen & Allen
[20] Hux, P.D., (2016), *The influence of gender in motor vehicle fatalities*; Allen, Allen, Allen & Allen
[21] Martin, A.; Factors Influencing Pedestrian Safety: A Literature Review; Transport Research Library, 2006

Passengers

More females were killed as passengers. Although the number of female drivers is increasing[22] there is some evidence that culturally, where heterosexual couples are involved, the male is more likely to drive with the female as a passenger which may increase the risk of females being killed as a passenger.[23]

Although men account for a higher proportion of road users and are therefore more likely to be involved in fatal collisions, when females are involved they are more likely to be killed or seriously injured.[24]

It has been identified that females involved in road collisions are significantly more likely to die as a result of injuries to their lower body than their male counterparts.[25] This is largely attributed to vehicle design which often does not take into account the height of an average female. As a result, women often need to sit closer to the steering column in order to reach the car's pedals.
This would appear to be supported by the findings of this research, as shown in figure 25.

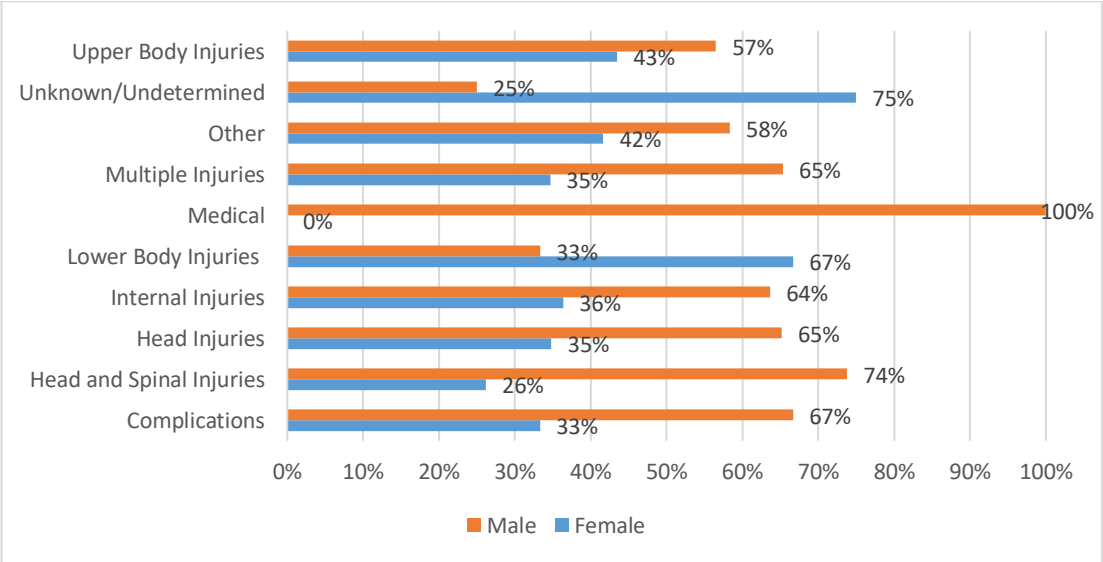


Figure 25: In-Vehicle Fatalities by Injury Type and Sex

Figure 25 displays the injury type of those killed within a vehicle[26], the split for most injury types was relatively similar to the split of males and females killed in collisions (i.e. around 70% male, 30% female). The exception to this was lower body injuries where 67% (n=2) of those whose primary injuries occurred in this area were female. Although the numbers are small, it suggests more suitable safety testing is required based on sex.

[22] Motor vehicles, traffic and driving; Transport and Travel in Scotland 2019: Results from the Scottish Household Survey, Transport Scotland, 2019
[23] *Men or Women – Who's the Safest Drivers?*; Car Lease Special Offers, 2020
[24] *Why Are Women More Likely To Die In Car Crashes Than Men?*; IFL Science, February 2023
[25] *Government accused of 'gambling with women's lives' after not adopting EU crash-test rules*; Driving Instructors Association, March 2022
[26] This excludes pedestrians, pedal cyclists, motorcyclists, mobility scooter riders, electric scooter riders and quad bike riders

Crash-test dummies have historically been designed based on the 'average' male and, therefore, do not take into consideration the differences in height, weight, body shape, body composition and spine stiffness, resulting in vehicle design being favoured towards the protection of males.[27]
Female crash test dummies have been developed and used in safety testing, however questions surrounded how accurately they reflected the female body.

In 2022, a team of Swedish engineers developed the first dummy designed on the body of the average woman.[28] Lab testing is ongoing to analyse the impact of collisions on this dummy and will provide data on ways in which vehicle design can be altered and improved to further protect female occupants.[29]

There is currently no mandatory requirement to use crash test dummies representative of the female body, however the results of the aforementioned testing may do a lot to change this, ultimately improving road safety and boosting gender equality. (Recommendation 55 in car safety)

Criminal History
200 Criminal History Service (CHS) records were available for the 977 drivers/riders at fault[30]. Of these, 108 (54%) had previous convictions for a variety of criminal offences including 81 drivers with previous convictions for driving related offences including dangerous driving, careless driving, drink driving and speeding.
This only takes into account the offences for which a driver has been convicted in a criminal court. It does not cover Recorded Police Warnings (RPW), Conditional Offer of Fixed Penalty Notices (COFPN) or Anti-Social Behaviour Orders (ASBOs) which can be issued for driving-related offences. Therefore, it may be the case drivers have come to the attention of police for criminal behaviour but, as this has not been dealt with in a court, it will not be captured by CHS.

Furthermore, CHS only captures convictions which occurred in Scotland. Therefore this analysis may not capture the whole picture of previous convictions and criminal behaviour.

It is evident that a large number of drivers who have been at fault for fatal collisions have previously been convicted for driving related offences and, therefore, have not been deterred by the punishments received in the earlier instances.

[27] *The deadly truth about a world built for men - from stab vests to car crashes*; The Guardian, February 2019
[28] *The crash dummy aimed at protecting women drivers*; BBC News, October 2022
[29] *This new female crash test dummy will improve car safety for women;* BBC Top Gear, November 2022
[30] An individual's CHS record will only be retained for three years after death, therefore the records for many of those at fault who died in the collisions will no longer be held.

Age Categories
Drivers with traffic-related previous convictions were overwhelmingly male (96%, n=78 of 81) and almost half (48%, n=39) were aged 16-35 (21%, n=17 aged 16-25 and 27%, n=22 aged 26-35).
This supports the suggestion that younger drivers, particularly males, are more likely to exhibit risky driving behaviours.

Home Location
The majority (52%, n=42 of 81) of drivers with traffic-related previous convictions had home postcodes within the most deprived areas of Scotland.

Drink and Drug Offences
Of the 77 drivers found to have been 'Impaired by alcohol', criminal history was available for 19 of them. There was evidence of drivers who had previous convictions for drink-driving.

80 drivers at fault were impaired by drugs. Again, evidence was found of previous convictions for drug-related offences including drug-driving.
Therefore, there may have been opportunities for interventions to prevent or deter them from driving a vehicle while impaired on further occasions, which ultimately resulted in a fatal collision. (Recommendation 3 General)

Speeding
204 drivers were assigned the contributory factor 'Exceeding the speed limit', 10 of which had previous convictions for speeding.
This may suggest the penalties given out for the initial speeding convictions were not sufficient enough to act as a deterrent, and similar behaviour has been repeated ultimately resulting in a fatal collision.

An increase in penalty points as a deterrent could be particularly relevant for newer (often younger) drivers who will lose their licence if they reach six or more penalty points within two years of passing their driving test.

Careless Driving
After speeding offences (29 drivers at fault with previous convictions), 'Careless driving' was the next most common driving-related previous conviction, with 24 drivers at fault having been convicted of this offence.
The contributory factors assigned to these drivers largely related to careless driving but also included 'Failed to look properly'; 'Careless, reckless or in a hurry' and 'Failed to judge others path/speed'.
This indicates that some drivers who have previously displayed, and been prosecuted for, careless driving have not been deterred from repeating similar behaviour.

Dangerous Driving

'Dangerous driving' was a previous conviction for 8 drivers.

Further information is not available about the behaviour that was considered dangerous in these earlier instances – it may have included dangerous overtaking, racing or knowingly driving a vehicle with a dangerous fault or unsafe load.

A number of these drivers were then convicted of Causing Death by Dangerous Driving following the fatal collision.

This included drivers who had previously been banned for prior driving offences.

This exemplifies a pattern of driving behaviour and a continued disregard for road safety.

Repeat Offenders

45 drivers had more than one previous conviction for road traffic offences.

This included being convicted of the same offence type on repeated occasions (e.g. multiple speeding offences) or being convicted of multiple different offence types (e.g. careless driving and speeding).

19 drivers who were at fault for fatal collisions were convicted of further offences following the collision; 8 of which were for traffic related offences including dangerous driving, careless driving and drink driving.

Of these, 8 drivers, 63% (n=5) also had previous convictions for road traffic offences.

This shows a repeated and continued lack of consideration for road safety and adherence to road traffic legislation. (Recommendations 62, 63, 64)

4. Contributory Factors.

Analysis of contributory factors (CF) for fatal collisions is complex. There is often a number of factors which contribute at any one time to the occurrence and severity of a collision. The removal of any one of the CFs could result in a different outcome.

This is visualised by the 'Swiss cheese model' of hazards (see Figure 26) first proposed by Reason (1990). This shows how failures (collisions) occur only when specific risks align. If any one aspect is not conducive to the occurrence of the collision, it is prevented.

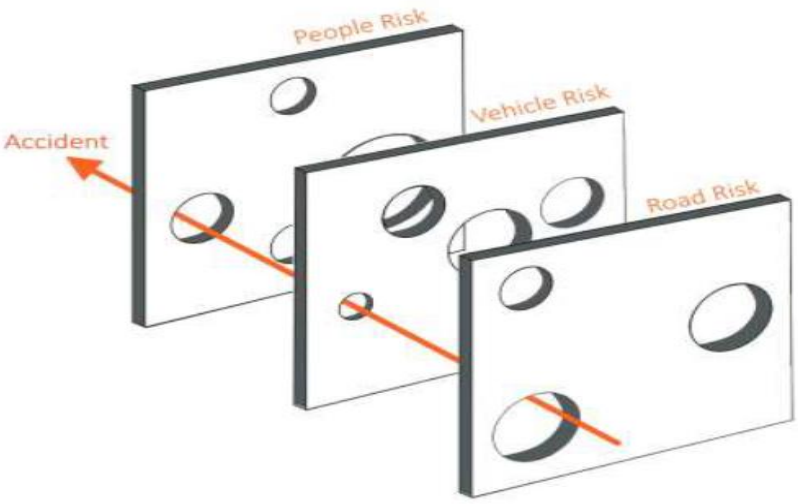


Figure 26: Swiss Cheese Model of Collision Causation (adapted from Reason, 1990)

A total of 5,939 CFs were identified across the 903 fatal collisions from 2015-2020. Every collision was assigned at least 1 CF and the most any single collision had was 14.

Contributory factors were assigned to a collision if they were deemed to be pertinent in any way to the cause of the collision. Each factor was given a level of confidence – A (very likely) or B (possible). All assigned CFs of both A and B levels of confidence are included in the analysis to ensure the most comprehensive picture was established.

Multiple CFs can be assigned to a single person, vehicle or road as it was possible for numerous factors to have resulted in the occurrence of the collision and the resultant outcomes.

It should be noted that one CF did not fit into the categories of 'People', 'Vehicle' or 'Road' – this was 'Gusting wind'. This was a CF in 4 fatal collision

Figure 27 shows the number of fatal collisions where 'People', 'Vehicle' or 'Road' CFs were assessed as having contributed. 'People' CFs were the most prevalent with almost all collisions involving at least one 'People' CF (n=901 of 903).

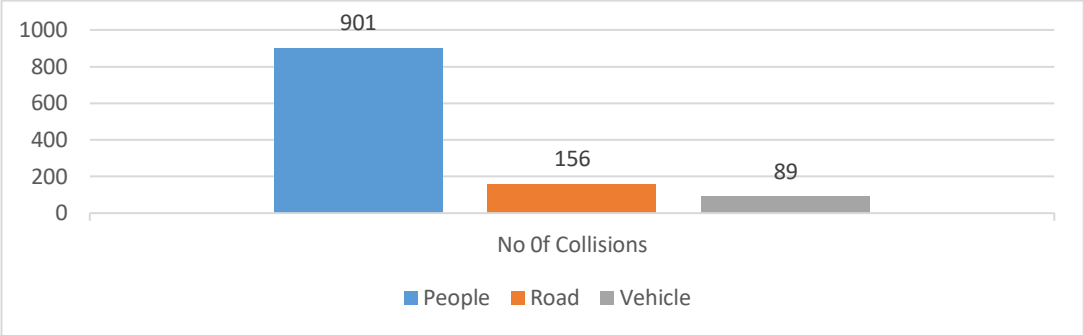


Figure 27: Frequency of Contributory Factors by 'People', 'Road' and 'Vehicle'

Figure 28 shows the majority of collisions (75%, n=680) involved solely 'People' CFs. 14% involved both 'People' and 'Road' and 6% involved 'People' and 'Vehicle'. 3% of fatal collisions involved CFs from all three. Only two collisions did not involve 'People' CFs.[31]

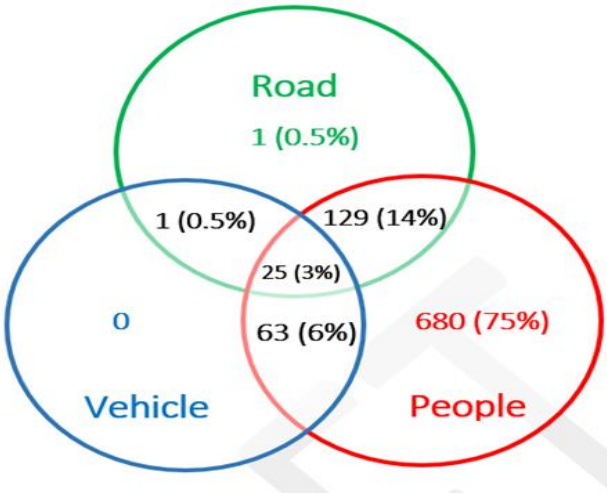


Figure 28: Contributory Factor Venn Diagram

4.1 People Contributory Factors

There was a total of 5,638 CFs relating to 'people risk' assigned across the 903 fatal collisions.

The five most prevalent factors relating to people, 'Careless, reckless or in a hurry', 'Failed to look properly', 'Loss of control', 'Poor turn or manoeuvre' and 'Failed to judge others path/speed' accounted for a combined 2,413 (43%).

[31] One collision with no 'People' element involved a tree falling onto a vehicle. It was assessed that there was no action that could have been taken by the driver to avoid this. In the second, a trailer being towed became detached and crossed into the path of an opposing vehicle. The trailer was found to be poorly loaded and insecurely attached. Whilst the operation, loading and securing of trailers is the responsibility of the driver and arguably involves a 'People' element, such contributory factors are categorised as 'Vehicle'.

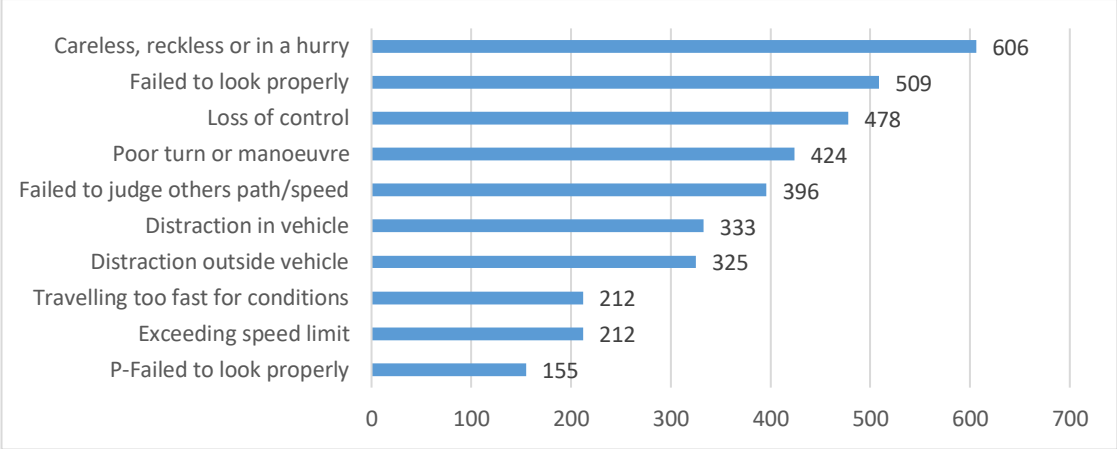


Figure 29: Ten Most Commonly Assigned People CFs

Other commonly recorded CFs included 'Distraction', both inside and outside of vehicles, accounting for 658 CFs (12%) and speed-related CFs (Exceeding speed limit and Travelling too fast for conditions) accounting for a further 424 CFs (8%). A full breakdown of people-related contributory factors is provided in Appendix C.

Interlinked Contributory Factors

Many of the most-commonly applied CFs are largely interlinked.
To illustrate, 'Careless, reckless or in a hurry' was the most common 'People' CF, assigned 606 times across 579 collisions.
Of those:

- 337 collisions (58%) were also assigned 'Failed to look properly'.
- 345 collisions (60%) were also assigned 'Loss of Control'.
- 346 collisions (60%) were also assigned 'Poor turn or manoeuvre'.

86 collisions were assigned all four of the above - failing to look properly may result in a driver committing a poor turn or manoeuvre and ultimately losing control. This may all have occurred because the driver was being careless, reckless or in a hurry.

For most collisions, it cannot be ascertained why a driver chose to behave or drive in a certain way. We may never know why they chose to drive at excessive speed, why they lost control or why they failed to notice an oncoming vehicle or hazard. Therefore, considering the impact of countermeasures including improved safety features within vehicles, such as 'AEBS' and 'Distraction monitoring' (which come into play when certain behaviours occur) and 'Improved road user training and education' (which aim to either prevent these behaviours from occurring), will be more beneficial.

4.2 Vehicle Contributory Factors

The frequency of all 'Vehicle' CFs are shown in Figure 30. 'Illegal tyres' and 'Vehicle blind spot' were found to be the most-frequently applied CFs for vehicles.

Many of the factors could be argued to be 'People'-related as the responsibility is on the operator of a vehicle to ensure that it is roadworthy, and its features are not defective. Nevertheless, as they are factors relating to the vehicle, they are categorised as such.

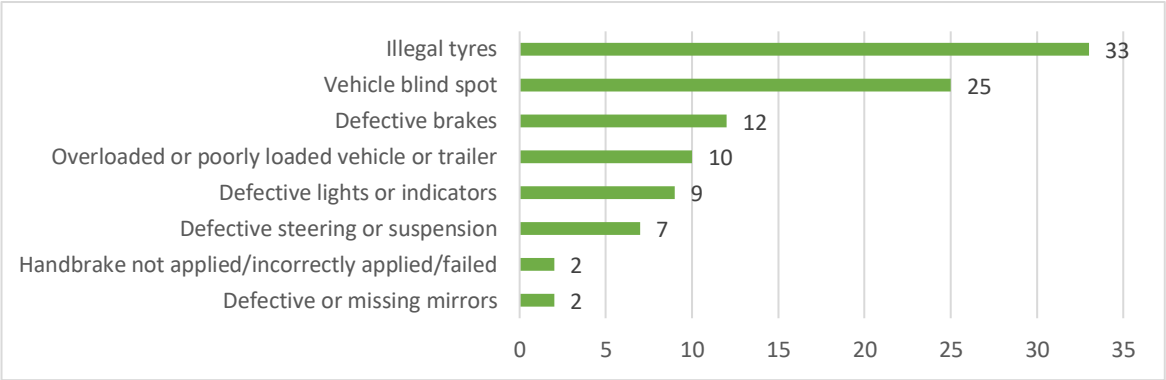


Figure 30: Frequency of All Vehicle Contributory Factors

Vehicle Contributory Factors And Vehicle Type

Of the 100 assigned Vehicle contributory factors, cars were the vehicle type assigned CFs most frequently (n=49) followed by HGVs (n=17) and motorcycles (n=10).

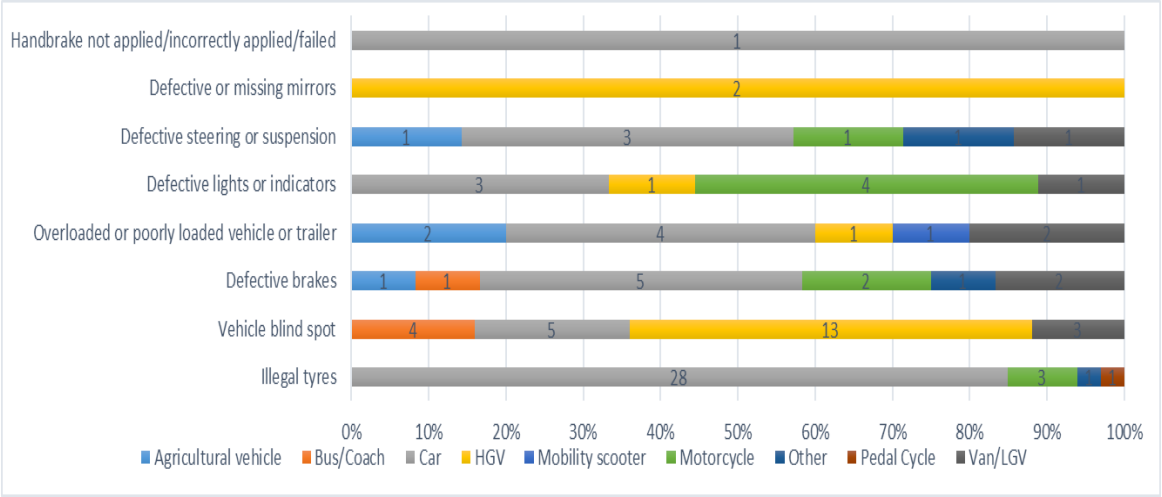


Figure 31: Vehicle Contributory Factors by Vehicle Type

'Vehicle blind spot' is a notable issue amongst HGVs accounting for 13 of 25 instances (52%) where this was assigned; 92% (n=12) of collisions relating to an HGV's blind spot resulted in a pedestrian fatality.
In these collisions, the VRU had not been seen by the HGV driver due to the design of the larger vehicle. Nearly half (46%, n=6) of fatal collisions where an HGV blind spot was a recognised CF were in Aberdeen City and City of Edinburgh.
Pedestrians and HGVs are likely to be in closer proximity in built up, urban areas, including these cities. (Recommendation 11)

Illegal Tyres

'Illegal tyres' were found to be a CF for 28 cars.

61% of collisions with 'Illegal tyres' (n=20 of 33 collisions) occurred across spring (March-May) and summer (June-August). This may suggest drivers are more cognisant of tyre maintenance in autumn and winter months when weather is less favourable, but during spring and summer this becomes less of a concern. This may also be a result of successful campaigns that remind drivers to ensure their vehicles are ready for winter.
Nearly a quarter, (n=4) of these spring and summer collisions were in North East Division in Aberdeenshire (Aboyne, Upper Deeside and Donside; Mid Formartine) and Moray (Speyside Glenlivet).This may present an opportunity for locally focused action. (Recommendations 47, 50)

4.4 Road Contributory Factors

Figure 32 illustrates all 'Road' CFs assigned to fatal collisions. 'Road layout' was the most-frequently applied.

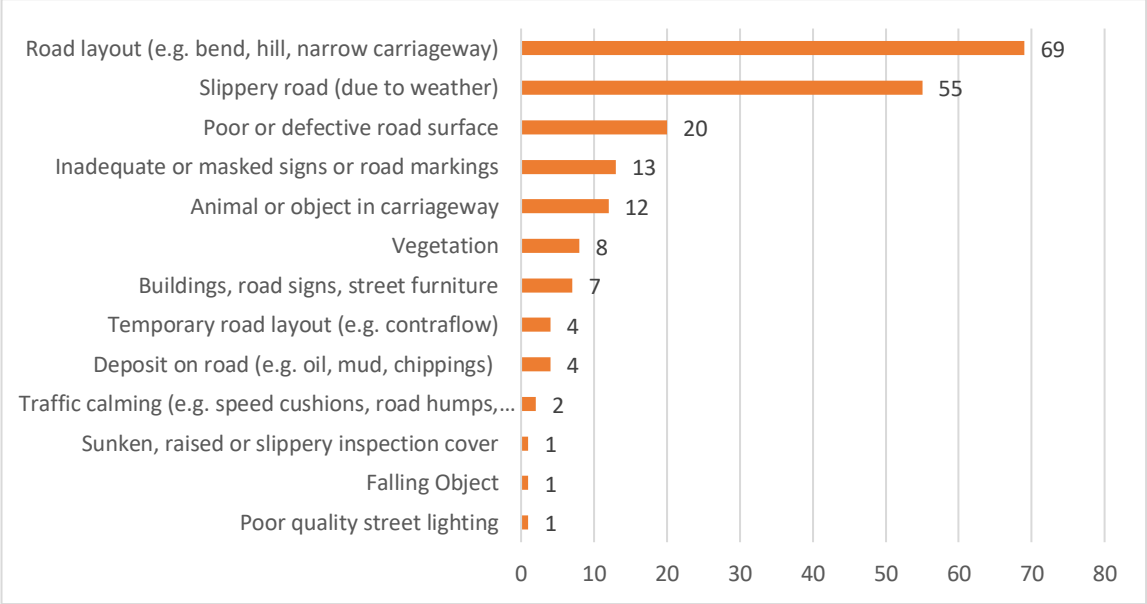


Figure 32: Frequency of All Road Contributory Factors

This was in instances when the physical road environment contributed (e.g. a sharp bend) or when a drivers vision was affected by the layout (e.g. a blind summit restricted views of oncoming vehicles). 'Slippery road (due to weather)' was also found to be a common 'Road' factor.
88 of the 197 assigned 'Road' CFs (45%) were assigned to collisions which occurred in the North of Scotland. This may be largely attributable to the topography in these areas which are known to have many bends and hills for drivers to navigate.
'Animal or object in the carriageway' related primarily to deer. Drivers had struck or swerved to avoid the deer and subsequently lost control.
One collision involved a pedal cyclist and a deer.
Collisions involving deer occurred in Highland (n=3), Argyll and Bute (n=1) and South Lanarkshire (n=1).

Vegetation related to a driver/rider's view being obstructed by vegetation including overgrown side verges and hedges, overhanging branches, large hedges and trees. 88% (n=7) of these collisions occurred in the North of Scotland in Aberdeenshire, Moray and Highland.
In three collisions involving 'Inadequate or masked signs or road markings', the 'Give Way' road markings were in a poor state of repair or not visible and this was identified as a potential CF. Two of these occurred in the Highland area.

4.4 Contributory Factors And Vehicle Type

67% of all CFs were applied to cars. 15% were applied to motorcycles. Given that motorcycles account for around 2% of vehicles on the road, the high proportion of CFs attributed to them is disproportionate.

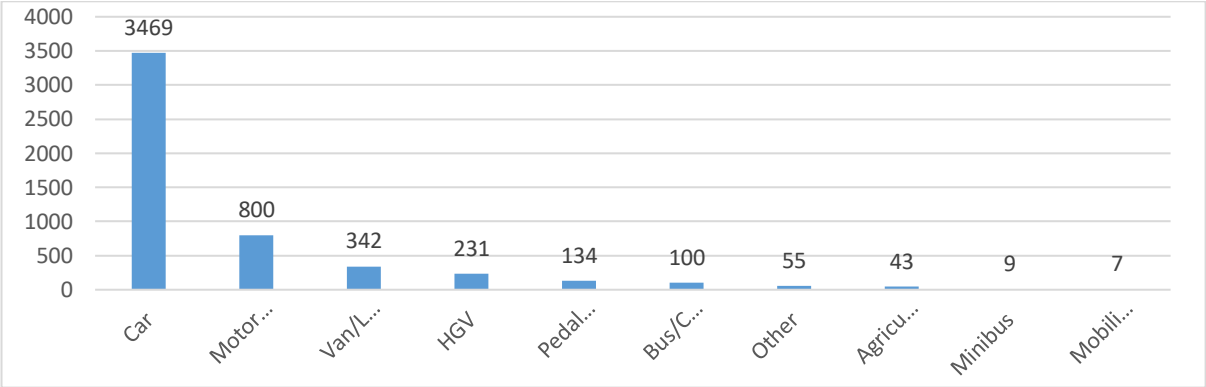


Figure 33: Contributory Factors by Vehicle Type

Figure 34 (below) shows the proportion of 'People', 'Vehicle' and 'Road' CFs assigned to each vehicle type. This highlights some slight differences in the CFs assigned to different vehicle types. For example, 8% of all CFs assigned to pedal cyclists related to 'Road'. This compares to 4% for cars and 4% for motorcycles. Additionally, 9% of agricultural vehicle and 7% of HGV CFs related to 'Vehicle' compared with 1% for cars and 1% for motorcycles.

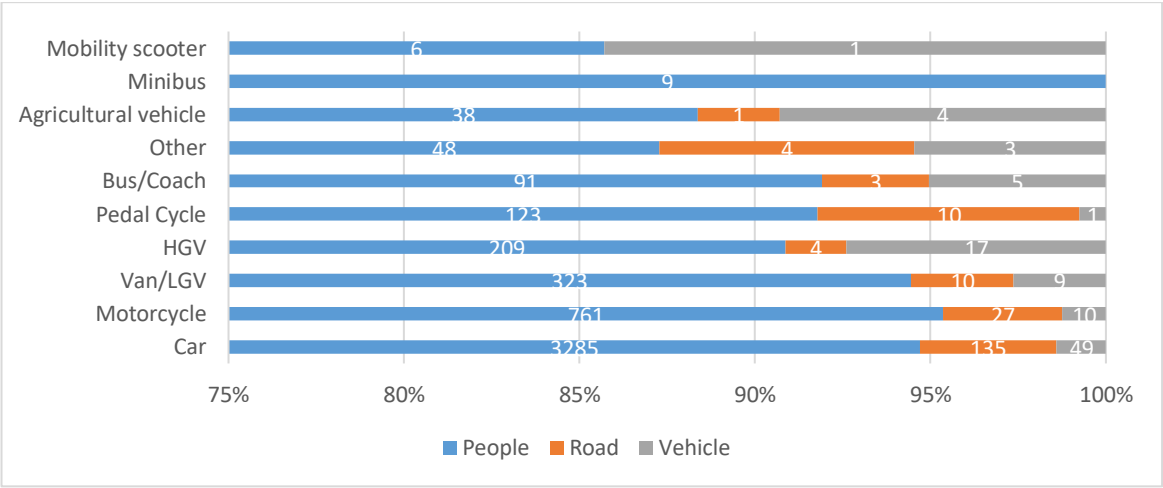


Figure 34: Contributory Factor Breakdown by Vehicle Type

4.5 Age

Younger Drivers - People Contributory Factors

It is clear there is a link between a lack of driving experience, age and fault for collisions, and this merits further exploration. 'People' CFs relating to both a lack of driving experience and risk-taking behaviours are most prevalent amongst drivers aged 16-25.

These include:

- Distraction in vehicle
- Distraction outside vehicle
- Travelling too fast for conditions
- Learner or inexperienced driver/rider
- Unfamiliar with model of vehicle
- Following too close
- Racing
- Stolen vehicle
- Failed to signal or misleading signal
- Not displaying lights at night or in poor disability
- Involved in police pursuit

A high level of risk is often associated with young drivers due to a combination of both youth and inexperience. Less driving experience may result in a reduced ability to identify and react to hazards and increased risk-taking behaviour, such as speeding, is often associated with youth and cognitive maturity[32].

Inexperienced Drivers

35 drivers had less than 2 years driving experience, all of whom were deemed to be at fault to some extent for fatal collisions. Inexperience was deemed to be a CF for nearly 75% of these.

The majority (58%, n=21) of these inexperienced drivers were aged 16-25 and a further 23% (n=8) were aged 26-35. Perhaps not unexpectedly since these age groups will have the largest numbers of new drivers amongst them. However, it can be argued that a driver's cognitive maturity can also have a significant impact[33].

The pre-frontal cortex of the brain plays an important role in regulating impulsive behaviour and the ability to anticipate the consequences of behaviour. The pre-frontal cortex does not reach full maturity until people are at least in their mid-20s[34].

Furthermore, the limbic region, which is associated with emotional responses is over-active between the ages of 15-24. Increased limbic activity means young

[32] *Young Drivers*; Brake

[33] Curry et al. (2017); *Comparison of older and younger novice driver crash rates: Informing the need for extended Graduated Driver Licencing restrictions*; Accident, Analysis and Prevention; 108; p66-73

[34] *Young Drivers*; Brake

people are more easily influenced by their peers and are more likely to indulge in risky behaviour.

The impact of inexperience highlights there may be a need to improve the training offered to new drivers to equip them with the skills to deal with various scenarios as and when they arise. At present, there is no requirement to undertake any further training with a licenced instructor which may result in discrepancies in training standards.

Speed

Factors pertaining to speed were noted to be prevalent amongst younger drivers. 32% (n=66 of 204) of those assigned 'Exceeding speed limit' were aged 16-25 as were 29% (n=62 of 208) of those assigned 'Travelling too fast for conditions'. While the two both relate to speed, there are differences which require different approaches to tackle the issue.

'Exceeding speed limit' relates to a driver driving too fast and disobeying the posted speed limits either through choice or inattention. Countermeasures to tackle this will be discussed in more detail later in this report however they include enforcement/high-visibility patrols, Intelligent Speed Assist (ISA) and improved education/training.

'Travelling too fast for conditions' does not necessarily mean that the driver was exceeding the posted speed limit, but rather the speed at which they were travelling was not adjusted to account for external conditions such as rain or snow, or while negotiating a bend.

This is often a result of lack of experience of driving in such conditions and lack of awareness of how to alter driving behaviour appropriately.

Improved driver training and increased driving experience for younger drivers is required to enhance driving skills and abilities.

Further training

Ensuring novice drivers undertake many hours of supervised on-road driving has proven to be effective in a number of European countries[35].

Drivers may develop safer habits during this supervision including seatbelt wearing, adhering to speed limits and developing enhanced skills around scanning and anticipation of other road users.

Supervised training is likely to extend the length of time before a driver obtains a full licence and, therefore, they will be older when they are able to drive independently.

It is estimated increasing driving age by just one year is likely to produce a 5-10% reduction in the crash rate for the first year or driving[36].

[35] Gregersen, N.P., Nyberg, A. & Berg, H. (2003); *Accident involvement among learner drivers--an analysis of the consequences of supervised practice; Accident, Analysis & Prevention*; 35(5); 725-30

[36] *Guide for Road Safety Interventions: Evidence of what works and what does not work*; Global Road Safety Facility - World Bank, 2021

Progressive Licensing Regimes combine extensive driver training with a phased approach to driving. This includes restricting the times at which young/new drivers can drive, limitations on passenger numbers and zero alcohol tolerance[37]. This approach has been successful in reducing young driver crashes when implemented in countries around the world (USA, Canada, Australia and others)[38]. (Recommendations 29, 40, 41)

Younger Passenger Fatalities

As highlighted earlier, passengers aged 16-25 were significantly more likely to be killed in a vehicle driven by someone in the same age group (n=31 passenger fatalities). Of these 31 fatalities, a third (n=10) of these 16-25 year-old passenger fatalities occurred between midnight and 5am, primarily on Saturday (n=4) or Sunday (n=3) mornings.

20 of these involved speeding, 10 involved impairment by alcohol and 10 impairment by drugs.[39] 24 had 'Distraction within vehicle' as a possible CF linked largely to the presence of young passengers within the vehicle.

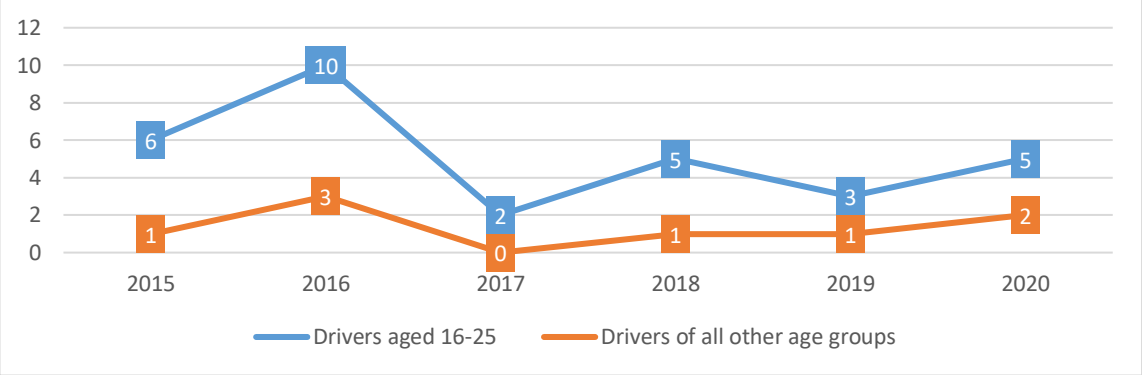


Figure 35: Passenger Fatalities Aged 16-25 by Driver Age.

Research by Brake[40] has shown younger drivers are more susceptible to peer pressure which can encourage bad driving and risk-taking behaviour and newly qualified drivers with a car full of passengers of a similar age are four times more likely to be in a fatal crash, compared with driving alone. When carrying older adult passengers, young drivers are less likely to crash.

This suggests passenger age, peer pressure and the distraction of younger passengers increases the risk.[41] (Recommendation 28)

Vehicle Contributory Factors

Vehicle CFs were noted to be high amongst younger drivers.

Almost half (48%, n=16) of instances where 'Illegal tyres' were deemed to have contributed to the collision involved drivers aged 16-25. These included issues with tyre tread, pressure and size.

[37] *Guide for Road Safety Interventions: Evidence of what works and what does not work*; Global Road Safety Facility - World Bank, 2021

[38] *Young Drivers and Graduated Driver Licensing*; Brake

[39] One collision involved impairment by both alcohol and drugs

[40] *Young Drivers*; Brake

[41] *Young Drivers*; Brake

These collisions occurred most frequently in Aberdeenshire, Glasgow City and Dumfries & Galloway.

Drivers aged 16-25 were also responsible for 33% (n=4 of 12) of 'Defective brakes' and 29% (n=2 of 7) 'Defective steering or suspension' as well as 22% (n=2 of 9) 'Defective lights or indicators'. Therefore, it is strongly recommended there is an improvement in driver awareness, education and training for younger drivers regarding vehicle maintenance.
Improved awareness and development of good practice around vehicle maintenance would arguably have knock-on effects for slightly-older drivers.

Those aged 26-35 were responsible for 18% of all 'Vehicle' contributory factors including 43% (n=3 of 7) of 'Defective steering or suspension' and 33% (n=4 of 12) 'Defective brakes'. Furthermore, those aged 46-55 accounted for 24% of all 'Vehicle' CF assignment.

There is a clear need for improved vehicle maintenance across a range of age groups - however, implementing training, good practice and good habits at the earliest stage of driving could positively impact on all drivers. (Recommendations 51, 58)

Road Contributory Factors
45% (n=88 of 198) of all 'Road' CFs were attributed to drivers aged 16-35 (21% aged 16-25 and 24% aged 26-35, 41 and 47 CFs respectively).

The top 'Road' CF amongst younger drivers (16-25) was 'Slippery road' (due to weather) accounting for 20 CFs. This indicates again there is a relationship between a lack of driving experience and an inability to adapt driving appropriately to relevant conditions.

Older Drivers
There was a number of 'People' CFs assigned most frequently to older drivers (those aged over 65). These are:

- Illness or disability, mental or physical
- Disobeyed Give Way or Stop Sign markings
- Junction overshoot
- Dazzling headlights
- Uncorrected/defective eyesight

These CFs relate largely to health and eyesight issues as well as potentially delayed reaction times.

Illness/Disability
A further interrogation of the collisions where 'Illness or disability, mental or physical' was recorded found that, in most cases, the older driver had, for an unknown reason, lost control of the vehicle, leaving the road or crossing over in

to the path of an oncoming vehicle. As the reason for their deviation from the road is unknown, the possibility of a medical episode prior to the collision has been considered and duly recorded.
Any confirmed medical episodes would be recorded as medical deaths, not reportable road deaths and, therefore, are not captured within the scope of this project.
A review of the fatal collisions involving 'Illness or disability, mental or physical' for over 65s identified a number of occasions where issues with stricter licensing practices may have impacted.
On two occasions, the drivers' licences had been revoked on medical grounds as they were deemed unfit to drive.
In a further three instances, the drivers had reported medical issues to the DVLA but, following investigations by DVLA medical team, they were deemed fit to drive. (Recommendation 36)

Whilst the legal responsibility to alert the DVLA of relevant medical conditions lies with the driver, doctors are encouraged to disclose relevant information if a patient is unfit to drive but continues to do so.

The absence of any legal responsibility and the existence of doctor-patient confidentiality means reporting on fitness to drive is not absolute.
While General Medical Council guidance is clear that public safety should take priority over patient confidentiality[42], at present it remains only guidance.
Establishing a legal responsibility on medical professionals to report to the DVLA may remove the risk of some unfit drivers continuing to be on the roads. (Recommendation 37)

In three instances, the drivers had been complaining to family members of feeling unwell in the days/weeks/months prior to the fatal collision. This included periods of confusion and disorientation.
People must feel encouraged and supported to have difficult discussions with older people around their fitness to drive and to act where necessary.

A study by Transport Scotland in 2020 found family members did not respond positively when they felt road safety campaigns and messages placed the burden on them to have these discussions.[43]
Therefore, there needs to be a balance between providing people with the tools to feel empowered to engage with older drivers but without making it solely their responsibility. This could be mitigated by the introduction of some form of mandatory cognitive assessment when licence renewal is required at 70.

[42] *Confidentiality: patients' fitness to drive and reporting concerns to the DVLA or DVA - ethical guidance summary;* General Medical Council, 2017
[43] *Evaluation: Communicating Effectively with Older Drivers Project; Research Scotland, 2020*

Current licensing requirements mean drivers must reapply for their driving licence when they reach the age of 70 and every 3 years thereafter.
There is no requirement for any medical assessment, and renewal is reliant on the information provided by the driver.

By way of contrast, in Japan, mandatory cognitive tests for over 70s forms part of the licence renewal process. The cognitive test involves testing hazard perception, eyesight, reaction speeds and knowledge of road laws. As a result, Japan has seen a significant reduction in older drivers at fault collisions resulting in death[44].

This reduction will be a combination of some older drivers surrendering their licences as a result of failing the assessment or surrendering their licence because they did not wish to take the mandatory test. Nevertheless, this has resulted in a number of potentially unfit older drivers no longer being on the road. (Recommendation 42)

Currently in the UK, drivers requiring a Group 2 bus or lorry licence must renew this at 45 years old through a D4 Medical Examination Report.

A D4 will be needed every 5 years until the driver is 65 when one will be required annually[45]. Under this process, drivers must see a registered doctor to have their blood pressure and eyesight checked (the eyesight test can also be undertaken by a registered optician) and complete a questionnaire on their medical history[46].

This highlights an efficient and necessary process that could be replicated for older drivers. (Recommendations 6, 7, 45)

Eyesight
83% (n=5 of 6) of drivers who were found to have 'Uncorrected/defective eyesight' were over 65. The majority of those who survived the collision failed the roadside eyesight test afterwards.
Although an argument can be made that reading letters and numbers is different to observing the moving shapes of other road users, it cannot be ignored that the eyesight of these drivers at fault was deemed to be below the required driving standard.

As is the case with GPs, opticians do not have a legal responsibility to notify the DVLA of a patient's fitness to drive and only guidance on prioritising public safety is available[47]. (Recommendation 43, 44)

[44] Inada, H. et al (2023); *Association between mandatory cognitive testing for license renewal and motor vehicle collisions and road injuries*; Journal of the American Geriatrics Society [online]
[45] D4 medical examination report for a Group 2, bus or lorry licence; DVLA
[46] *About the D4 medical*; D4Drivers
[47] *Examining Patients Who Drive*; The College of Optometrists

Services such as DriveAbility Scotland exist where drivers are able to self-refer and undertake driving assessments which include cognitive assessments and eyesight checks alongside practical driving exercises[48].
An instructor will provide the driver with feedback following the assessment.
The outcome is advisory only and will not result in a loss of licence.

In the absence of mandatory cognitive assessments and eyesight checks for older drivers, it will be beneficial to encourage voluntary uptake of such driving assessments.
Humberside Police is currently piloting a project where direct referrals from police are submitted to similar organisations in place of immediate revocation of a driver's licence or prosecution. The findings from this project, when available, could be reviewed to assess suitability for implementation of a similar approach in Scotland. (Recommendations 5, 26)

Cassie's law came into effect in February 2013 after Cassie McCord was killed on her way to school by an 87 year-old driver just three days after he failed an eyesight test and refused to surrender his licence.
Cassie's Law allows the Police to notify the DVLA electronically utilising a D751E form with details of an eyesight test failure. A notice of revocation of the licence can be issued to the driver within hours.

Police Scotland was responsible for 6% of all D751Es submitted between 2013 and 2020 (4th highest number submitted by any UK police force).
Sussex Police, with a population about a fifth of the size of Scotland, submitted more than twice as many D751Es over the same period.
This highlights that, while many officers will be aware of, and utilising, the procedure within Police Scotland, there is more could be done to increase awareness amongst officers.
Knowing the procedure as 'Cassie's law', and remembering the story that led to its introduction, may make it more memorable and increase its implementation. (Recommendations 23, 24)

Driving often provides a sense of independence for older drivers and may prevent isolation, particularly for older people residing in more rural areas. It is imperative, therefore, that any discussions around the potential removal of licences bares this in mind and steps are taken to ensure older people are not negatively affected as a result.
This will include ensuring alternative, attractive, accessible and affordable methods of travel are available.

[48] DriveAbility Scotland

4.6 Additional Findings

Foreign Drivers

70 foreign drivers were involved in 64 fatal collisions.[49] 74% of these drivers were deemed to be at fault.
Figure 36 shows the proportion of foreign drivers deemed to be at fault.
81% of tourists were at fault as were 60% of vocational foreign drivers. 72% of foreign drivers now resident in the UK were drivers at fault.

Foreign Drivers Now Resident in the UK

Foreign drivers now resident in the UK are recorded as those who have home addresses in the UK but were driving on a licence issued by another country.
42% (n=12 of 29) of this group were driving on Polish licences.
One driver had converted to a UK licence from a foreign licence one year prior to the collision.

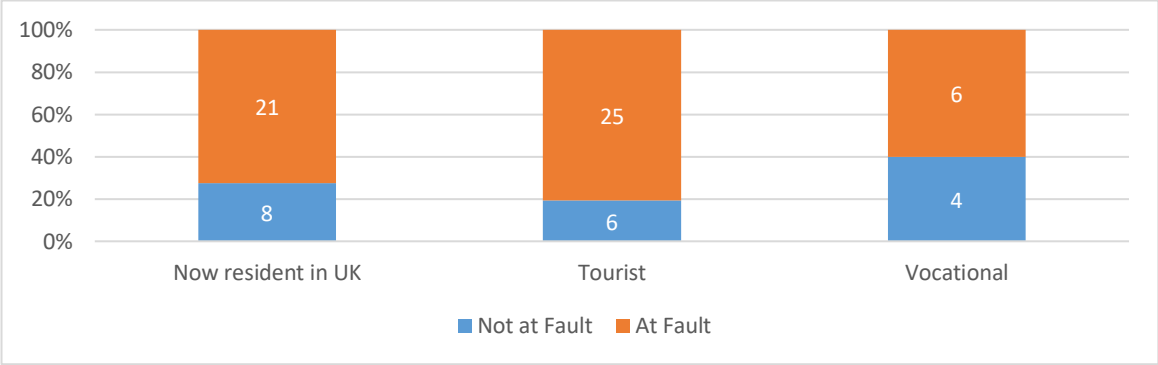


Figure 36: Foreign Drivers by Fault for Fatal Collisions

Polish is the most common non-British nationality in Scotland[50] and, therefore, there is likely to be a large number of Polish nationals on Scottish roads, thus increasing the likelihood they would become involved in a collision.

Only 19% (n=4 of 21) of at fault drivers now resident in the UK had 'Inexperience of driving on the left' assigned as a CF. This indicates that, in the majority of cases, driving in Scotland on a foreign licence does not appear to be linked to a lack of understanding of Scottish road layouts.

The top CFs for this group are largely the same as those for the general cohort including 'Careless, reckless or in a hurry'.

Tourists

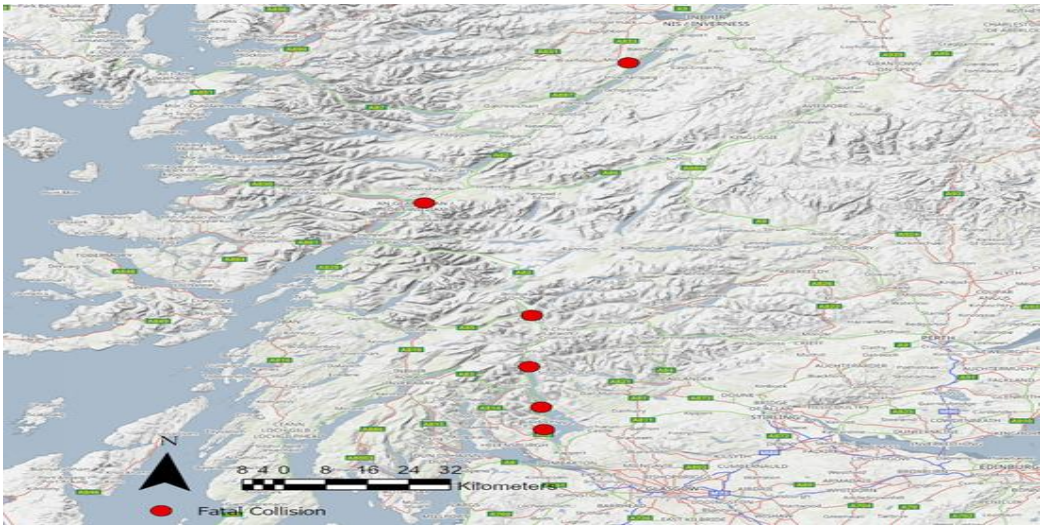
The majority of tourists at fault were male (84%, n=21 of 25) and aged over 26 (92%). Nearly a quarter (24%, n=6) were aged 26-35. 28% (n=7) of all tourists at fault were visiting from Germany. A further 16% (n=4) were from France.

[49] 6 fatal collisions involved 2 foreign drivers; breakdown of foreign drivers: 31 tourists, 29 now resident in the UK, 10 vocational
[50] *Population by Country of Birth and Nationality, Scotland, July 2020 to June 2021*; National Records of Scotland, November 2021

84% (n=21) of tourists were assigned ‘Inexperience of driving on the left’. This was the most frequently assigned CF for this group highlighting that misunderstanding and confusion around road layouts was a significant factor in collisions involving tourists.
In many of these, the driver had been travelling on the wrong side of the road resulting in a head-on collision with oncoming traffic.

In a number of other collisions, the tourist failed to give way to vehicles when joining another road, possibly due to a misunderstanding of the road layout and/or signage and confusion around vehicles travelling in a different direction than they are used to.

More than a quarter (29%, n=6) of collisions resulting from ‘Inexperience of driving on the left’ occurred on the A82, with four on the roughly 40-mile stretch of road between Arden, Alexandria and Bridge of Orchy (see Map 7).



Map 7: Tourist Driver A82 Collisions Involving ‘Inexperience of Driving on the Left’

The majority of other factors assigned to tourists are similar to those recorded for UK drivers including ‘Failed to look properly’ and ‘Poor turn or manoeuvre’.

Of note, 40% of tourist at fault collisions involved ‘distraction outside vehicle’. Although in most cases, distraction is provided only as a possible factor when reasons for other CFs such as loss of control or failing to look are unknown, it may be the case that the tourists became distracted by their surroundings when travelling in unfamiliar and often picturesque locations.

The majority of tourists at fault were driving hire cars (68%, n=17).This indicates that a number of tourists travel in their own vehicles when in Scotland. (Recommendations 15, 16, 17, 18, 31, 32, 65, 69, 70)

Alcohol And Drug Impairment

Driver/rider impairment by alcohol was a factor in 45 fatal collisions and impairment by drugs in 48. Impairment by both alcohol and drugs was a factor in a further 34 fatal collisions.

Blood analysis was available for 22 drivers who were impaired by alcohol. Of these, more than half (55%, n=12) were found to be more than four times the current legal limit. Blood analysis also detected the presence of various drugs including Cocaine, Methadone, Cannabis, Diazepam and Etizolam amongst drivers impaired by drugs.

Impairment is markedly more frequent amongst younger drivers with 63% (n=102 of 161) of these CFs assigned to drivers aged 16-35 (35% aged 26-35 and a further 29% aged 16-25). As previously highlighted, younger drivers are associated with higher levels of risk-taking behaviour, including drink-driving.

For drivers aged 16-25, impairment was significantly more likely on a Saturday and Sunday (28%, n=13 and 33%, n=15 respectively) and for those aged 26-35 on a Saturday (41%, n=23 of 56).

Just under half (48%, n=11 of 23) these collisions occurred between the hours of 10pm and 6am. Collisions with these characteristics were most prevalent in the North and West of Scotland, particularly in Aberdeenshire, Moray, Highland, Orkney, East Ayrshire and South Ayrshire.

Of the 77 drivers found to have been 'Impaired by alcohol', criminal history was available for 17 of them[51].

There was evidence of drivers having previous convictions for drink-driving. Therefore, there may have been opportunities for interventions to prevent them from driving a vehicle while impaired on further occasions, which ultimately resulted in a fatal collision.

Alco-lock technology[52] has been identified as a very effective technology for preventing driving when alcohol is detected.

Under the EU's Vehicle General Safety Regulation, all new cars from 2022 will be built to enable the installation of an Alco-lock device. However, this does not make it mandatory for a device to be installed. (Recommendations 20, 27, 33,)

Commuting And Travelling In The Course Of Employment

Driving is the most dangerous work activity most people will undertake and results in far more work-related accidental deaths than all other work activities[53]. Employers have a responsibility to ensure the safety of their employees when at work.

[51] An individual's CHS record will only be retained for three years after death, therefore the records for many of those at fault who died in a collision will no longer be held.

[52] Alco-lock is a breathalyser that can be installed in a vehicle. It requires the driver to blow into a mouthpiece on the device before starting or continuing to operate the vehicle. If alcohol is detected, the vehicle will not start.

[53] *Driving for Work: Fitness to Drive*; The Royal Society for The Prevention of Accidents (RoSPA), May 2020

21% (n=325 of 1,516) of all drivers involved in fatal collisions were undertaking a 'journey as part of work'. A further 9% (n=134) were 'commuting to/from work'. This highlights that drivers travelling for employment purposes constituted a notable proportion of the drivers involved in fatal collisions.
95% of those undertaking a 'journey as part of work' were male, supporting previous literature[54] that males are more likely to have driving-related jobs.
18% (n=175 of 977) of drivers at fault were undertaking a 'journey as part of work'.
Some notable CFs that were more prevalent amongst this group include 'Vehicle blind spot', 'Overloaded or poorly loaded vehicle or trailer', 'Defective brakes', 'No banksman[55]' and 'Inadequate training for loading vehicle/driving with loaded vehicle'. This highlights poor vehicle maintenance alongside a lack of appropriate training and adherence to health and safety practices.

In order to identify any commonality or trends in the nature of employment, employee duties or companies involved, a review was carried out of drivers involved in fatal collisions whilst undertaking a 'journey as part of work'. However, this failed to identify anything of note that would allow recommendations to be targeted at any specific companies or business types.

12% (n=13) of those assigned 'Illness or disability, mental or physical' were travelling in the course of their employment.
In one case, the driver had a history of health-related incidents, including whilst driving. The driver had sought medical advice regarding this and adhered to all medical advice given to them by medical professionals who had followed DVLA guidelines. Both DVLA and their employer were aware and as a result, mitigations were put in place, they were driving smaller vehicles than they would have previously.
Nevertheless, given medical investigations were still underway into the underlying condition, perhaps more could have been done by the employer and the DVLA to prevent driving until investigations were complete.

9% (n=92) of drivers at fault were commuting to/from work. The top CFs for these drivers were the same as the overall cohort including 'Careless, reckless or in a hurry' and 'Loss of control'.

The Scottish Occupational Road Safety Alliance (ScORSA) assists small to medium sized businesses with developing traffic management processes and systems, providing guidance on how to keep their workforce safe[56].
Membership of this organisation is free and members have access to various resources, networking opportunities and mentoring schemes.
Membership should be encouraged and promoted to increase awareness among companies and reduce the risks for professional drivers. (Recommendation 52)

[54] *Men pose more risk to other road users than women*; BMJ, 2020
[55] Banksmen are operatives trained to direct vehicle movement on or around a site
[56] *Benefits of ScORSA Membership*; Scottish Occupational Road Safety Alliance (ScORSA)

Seatbelt Use

Of the 520[57] fatalities in a vehicle in which seatbelt use is required or recommended:

- 21% (n=107) were not wearing a seatbelt
- 72% were wearing a seatbelt
- 7% were recorded as 'Unknown'[58].

While adherence to the law requiring vehicle occupants to wear seatbelts was generally high, it is clear many drivers and passengers still chose not to utilise this simple but effective safety measure.

Not wearing a seatbelt was seen most frequently amongst young fatalities, particularly young males. Those aged 16-25 accounted for 20% (n=21) followed by those aged 26-35 and 36-45 (both 17%, n=18).
They were also more likely to have home postcodes in more socially-deprived areas.
Therefore, although seatbelt wearing rates were good overall, there is more that could be done particularly targeting young people from more socially-deprived areas to further increase wearing rates.

Two child fatalities were not wearing a seatbelt. It should be borne in mind that it is the responsibility of drivers to ensure any child under 14 is secured by seatbelt or suitable child restraint. (Recommendation 21)
Age and size appropriate child seats are imperative in reducing the risk of injury to children. Those responsible for young children should be fully-informed on appropriate child restraints. (Recommendations 48, 49, 53, 54)

Use Of Helmets

Cyclists - 44 cyclists were fatally injured, of which 39% (n=17) were not wearing a cycle helmet. Nine of these were recorded as suffering head injuries. Whilst it would not have prevented the collision, wearing a helmet could have potentially protected this area and reduced the severity of injury, thus preventing the fatality. The remaining eight who were not wearing a helmet died from multiple injuries and, therefore, the impact which a helmet may have made is inconclusive.

Although female cyclists were significantly less likely to be fatally injured than male cyclists, they were slightly less likely to have been wearing a helmet (43%, n=3 of 7 females compared with 41%, n=15 of 37 males were not wearing a helmet). Studies have found that females may be less likely to wear helmets as they feel they are slow riders or skilful riders and therefore do not require one[59].

[57] This figure does not include casualties who are not affected by seatbelt use including pedestrians, motorcyclists, pedal cyclists or mobility scooter riders.
[58] In some cases, there may be a lack of evidence to allow Collision Investigators to conclude if a seatbelt had or had not been worn by a fatality, for example, if a vehicle has been substantially damaged by fire. Furthermore, on occasions there were no details recorded in the fatal file documentation about the wearing of a seatbelt. These fatalities were recorded as 'Unknown'.
[59] Valero-Mora, P. et al., (2018); *Why women do not use the helmet when riding a bicycle;* Proceedings of the Human Factors and Ergonomics Society Annual Meeting; Vol 62(1); p1594-98

It is argued that wearing a helmet makes little difference to overall cycling safety. Countries with mandatory helmet laws, or high levels of helmet usage, show no reduction in head injuries compared to countries or areas without these laws[60]
Good quality infrastructure has a greater impact on safety than personal protective equipment. Any mandatory helmet use may have a negative impact and discourage people from cycling and have further ramifications for health and fitness[61].
Nevertheless, Scotland's infrastructure for cycling is currently not fit for purpose and there is significant work to be done to make roads more accessible and safer for cyclists. Helmet use is likely to be beneficial and should be strongly encouraged. (Recommendation 34)

Motorcyclists
161 motorcyclists (151 riders and 10 passengers) were killed. Only 5 were not wearing a helmet. This highlighted high levels of helmet use amongst motorcyclists. All of those not wearing a helmet were male and 60% (n=3) were younger than 25; one rider was aged 14 and two aged 23. (Recommendation 9)

Mobile Phone Usage
The dangers of driving while using a mobile phone are well known; they provide a huge source of distraction and require drivers to take their eyes away from the road. Even a momentary distraction can be catastrophic.

A driver using a mobile phone was deemed to be a factor in 24 fatal collisions. Those aged 26-35 were found to be the most frequent offenders, accounting for 38% (n=9) and a further 25% (n=6) were aged 16-25. 29% (n=7) were aged 36-45 showing that mobile phone use is not solely a young driver's issue.
Males were significantly more likely to have been using a mobile phone.

Mobile phones and technology are an intrinsic part of daily life, particularly for young people. Studies have found around a third of young people aged 18-30 have reported symptoms of smartphone addiction[62].
Young people continue to be heavily reliant on their smartphones and this coupled with the previously discussed risk-taking behaviour more commonly seen amongst younger drivers, means it is likely mobile phone usage while driving will continue to be a problem.
Therefore, there needs to be continued awareness raising about the dangers of mobile phone use.
Recent legislation changes have seen rules on mobile phone usage tightened, meaning it is now illegal for drivers to use a handheld mobile phone under virtually any circumstances while driving. It is hoped this will act as a further

[60] *People should wear helmets when cycling*; Cycling Fallacies
[61] *Our position on the use of cycle helmets*; Sustrans, January 2022
[62] *1/3 of young people are addicted to their phones – here's how to break up with your device*; The Independent, March 2021; *Smartphone 'addiction': Young people 'panicky' when denied mobiles*; BBC News, 2019

deterrent for drivers and prevent them from being distracted unnecessarily. (Recommendations 2, 22)

Excessive Speed

'Exceeding the speed limit' or 'Driving too fast for conditions' were contributing factors in 36% of all fatal collisions (n=322 of 903).

As previously reported, younger drivers are prominent, with 15-25 year-olds assigned a CF in 31% (n=101 of 322) of collisions. 26-35 year-olds accounted for a further 27% (n=86).

Collisions occurred throughout the day, peaking between the hours of 15:00 and 18:00 (21%, n=68).There were higher numbers of collisions during summer (n=98) and spring (n=83), with the peak month being July (n=38).

There was little year-to-year variation with the number of collisions ranging from 50 to 63, with the exception of 2015 which recorded only 38 fatal collisions where excessive speed was a contributing factor.

The majority of collisions occurred on single carriageway roads (86%, n=277). In terms of speed limit, collisions on roads with a 60mph limit were most frequent (64%, n=205).

Scottish Index Of Multiple Deprivation (SIMD) [63][64]

There is no strong correlation between deprivation and the likelihood of being involved in or at fault for a fatal collision. There may, however, be a link between some CFs and deprivation.

Drivers involved in fatalities, with home postcodes in the most deprived areas in Scotland, were twice as likely to have been impaired by alcohol and/or drugs as those from the least deprived areas. This confirms a previously established link between social deprivation, alcohol use and abuse, and drink driving[65].

This issue cannot be resolved solely by police enforcement or vehicular technology such as an Alco-lock. It requires a much wider public health approach to tackle the root causes of social deprivation and related inequalities.

A number of other CFs associated with risk-taking behaviour including 'Exceeding speed limit', 'Aggressive driving', 'Racing', and 'Vehicle in the course of crime' which were also notably more frequent amongst drivers from more deprived areas.

Fatalities with home postcodes in the more socially deprived areas were also twice as likely not to have been wearing a seatbelt than those from the least socially deprived areas. 'Fatigue' and 'Illness or disability, mental or physical' were noted to be higher amongst drivers from less deprived areas.

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[63] SIMD is the Scottish Government's standard approach to identify areas of multiple deprivation in Scotland. It looks at the extent to which an area is deprived across seven domains: income, employment, education, health, access to services, crime and housing. SIMD is a relative measure of deprivation across 6,796 small areas called data zones with data zones ranked from 1 (most deprived) to 6,796 (least deprived). For analysis, the data zones can be categorised into percentage groupings – quintiles, deciles and vigintiles. This report uses quintiles which splits the data zones into 5 groups, each containing 20% of Scotland's data zones. Therefore quintile 1 contains the 20% most deprived data zones in Scotland while quintile 5 contains the 20% least deprived data zones.

[64] SIMD quintiles are only available for drivers with home postcodes in Scotland.

[65] Impinen, A. et al (2011); *Association between Social Determinants and Drunken Driving: A 15-Year Register-based Study of 81,125 Suspects; Alcohol and Alcoholism*, Vol 46 (6), p721-28

5. Countermeasures

Countermeasures (CMs) are pivotal in the prevention of fatal collisions. For the purposes of this research, CMs were identified that if implemented at any stage of the collision (pre, post or during), were assessed to have an impact on the outcome: either stopping the collision from occurring at all or reducing the severity of injuries sustained.

Figure 37 shows how countermeasures can alter the risks that road users are exposed to.

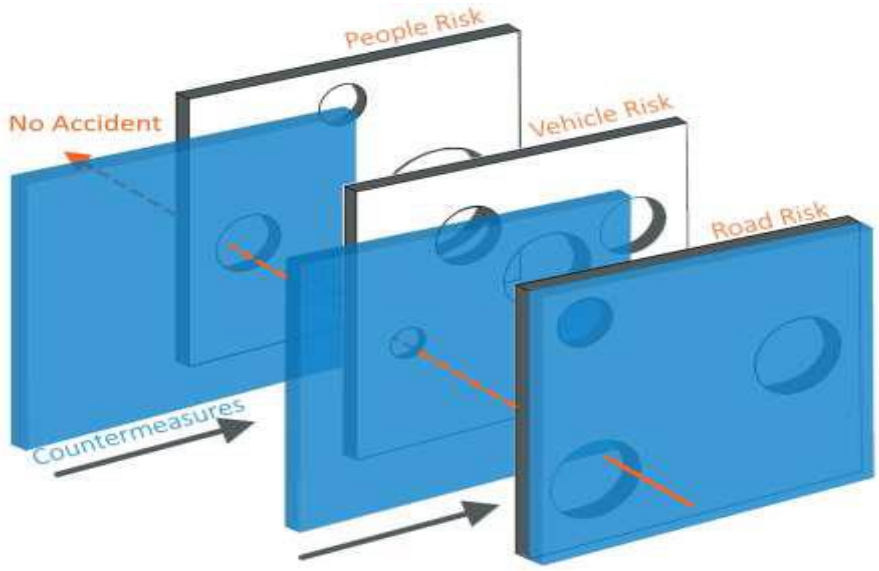


Figure 37: Countermeasure Intervention in the Swiss Cheese Model of Collision Causation (Adapted from Reason, 1990)

The majority of collisions involved contributory factors relating solely to 'People', as highlighted throughout this report. However, analysis of CMs found that less than 1% of collisions would have been prevented or had injury severity reduced by solely 'People' countermeasures.

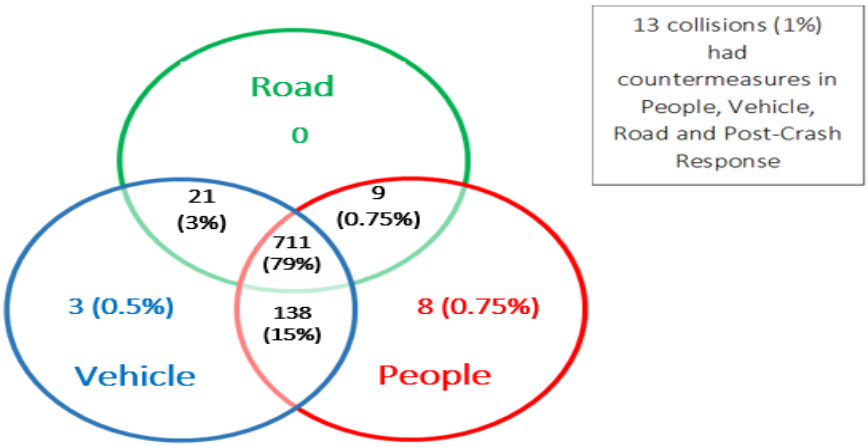


Figure 38: Countermeasure Venn Diagram

The majority (79%) of collisions may have been influenced by a combination of all three CMs, 'People', 'Vehicle' and 'Road'.

98% (n=886 of 903) of all fatal collisions had CMs relating to ‘Vehicle’. This highlights that vehicle safety, design and maintenance are imperative in the reduction of fatal collisions.

As this report includes data from 2015 – 2020, it is noted some countermeasures may now be both mandatory and standard in the fleet, for example Electronic Stability Control (ESC). However, countermeasures were assigned as relevant to the circumstances at the time of the collision.
Figure 39 shows the proportion of countermeasures assigned to fatal collisions. CMs relating to ‘Vehicle’ were the most prevalent, closely followed by ‘People’ CM’s.

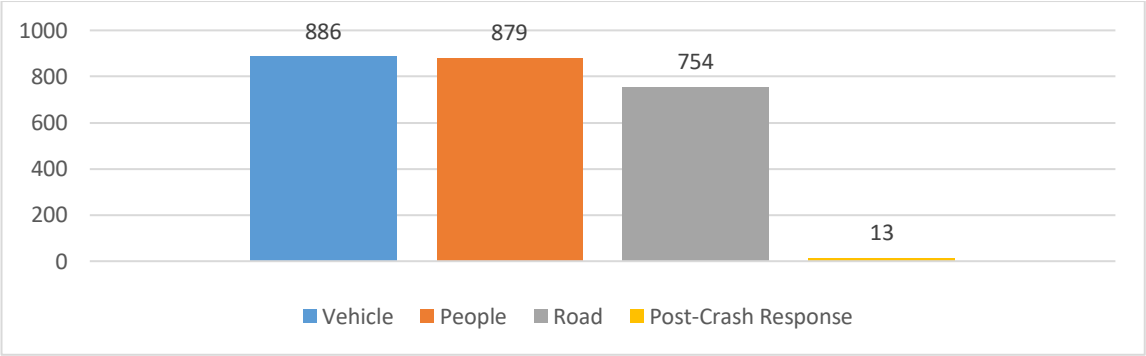


Figure 39: Collisions Assigned a Countermeasure Class

2 CMs did not fit the characters of ‘People’, ‘Road’ or ‘Vehicle’ and were identified as ‘Post-crash Response’. These refer to countermeasures where it is deemed that, had emergency services been able to attend the scene sooner, the outcome of the collision may have been altered. They were relevant for 13 fatal collisions.

5.1 Safe System Pillars

Figure 40 shows the number of fatal collisions that had countermeasures in each of the five Safe System pillars. These pillars contribute to a Safe System which takes a holistic approach to road safety and requires those who manage and design the roads and those who use them to take responsibility for, and contribute to, eradicating fatal and serious injuries.

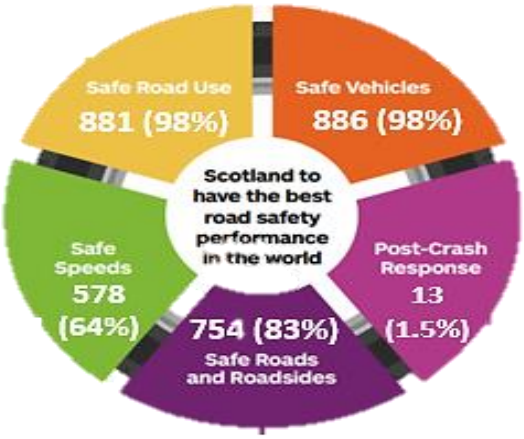


Figure 40 Countermeasure Frequency by Safe System Pillars

There were some countermeasures which were deemed to align with more than one pillar of the Safe System, for example 'Add speed camera' aligns with both 'Safer Speeds' and 'Safer Roads and Roadsides'.

Almost all collisions (98%) had countermeasures relating to Safer Vehicles (n=886) and Safer Road Use (n=881).

This supports the need for vehicles on Scotland's roads to be as safe as possible in terms of maintenance, design, technology and safety systems. There is also a need to ensure drivers and other road users are able to utilise the road safely, efficiently and sustainably.

5.2 Countermeasure Assessment

It is worth considering countermeasures (CM) separately in terms of both collision avoidance and severity reduction.
A countermeasure may be given a low/not applicable confidence score for collision avoidance but may be given a high score for severity reduction.

For example, the use of a seatbelt would not apply to collision avoidance, but it may be crucial in reducing the severity of injuries sustained and ultimately preventing the fatality.

In total, 7,156 countermeasures were assigned to the 903 fatal collisions.
Of these

- 3,105 (43%) related to vehicles
- 2,493 (35%) related to people
- 1,545 (22%) related to roads
- 13 (<1%) related to post-crash response

(Recommendation 71)

The following figures show the frequency and confidence scores of the most commonly assigned countermeasures for both collision avoidance and severity reduction. Confidence rating is from 1 to 4[66].
The countermeasures are displayed in order of frequency and the coloured bars represent confidence scores. Notable exceptions which were assigned in fewer numbers are also highlighted. Full details of the frequency and confidence scores of countermeasures can be found in appendices D-F.

People' Countermeasures – Collision Avoidance
Analysis of 'People' CMs show that while 'Training to improve hazard perception skill' was the most frequently assigned countermeasure for collision avoidance, the confidence level was generally low.

[66] 1 = possible; 2 = likely; 3 = almost certain; 4 = certain

Conversely, more specific countermeasures such as 'Enhanced banksman training' and 'Training for vehicle loading' had very high confidence levels but were applied less frequently.

Overall, 34% of 'People' countermeasures were given a confidence score of 2 (likely) or higher, accounting for 772 of 2,238 CMs assigned for Collision avoidance.

Countermeasure	Possible	Likely	Almost Certain	Certain	Total
Training to improve hazard perception skill	503	156	15	3	**677**
Awareness training of VRU	212	112	18	4	**346**
Training or education to reduce risky driving manoeuvre	189	60	17	3	**269**
Improved VRU conspicuity	141	92	17	2	**252**
Improved policing profile/checks	106	33	6		**145**
Better licencing (increase on road experience driving in specific situations e.g. weather, busy traffic)	80	33	4	2	**119**
Training or education to reduce risky pre-driving behaviour (e.g. drink or drug use)	79	34	4		**117**
Better licencing (medical/health related)	41	38	22	2	**103**

Table 2: Most Commonly Assigned 'People' CMs for Collision Avoidance with Confidence Level

People' Countermeasures – Severity Reduction

'Use of seatbelt' was the most frequently applied 'People' countermeasure for severity reduction and in 41% of collisions (n=40 of 98) it was given a confidence rating of 3 or 4.

The positive impact that 'Proper use of a helmet' could have on fatalities is also evident with 19% (n=6 of 31) given a confidence score of 3 and a further 56% (n=18) a score of 2. This countermeasure was applicable to pedal cyclists, motorcyclists and quad bike riders.

'Better licencing (medical/health related)' and 'Awareness training of VRU' were applied much less frequently, however, had high confidence scores indicating that they may be effective countermeasures in reducing fatalities, albeit in a smaller numbers of collisions.
Overall, 44% (n=156 of 356) of People countermeasures for severity reduction were given a confidence score of 2 or more.

Countermeasure	Possible	Likely	Almost Certain	Certain	Total
Use of seat belt	23	35	34	6	98
Training or education to reduce other risky behaviours (e.g. wearing a seat belt)	29	22	3	1	55
Use of appropriate secondary safety clothing	42	7			49
Training to improve hazard perception skill	31	4	1	1	37
Proper use of helmet	7	18	6		31

Table 3: Most Commonly Assigned 'People' CMs for Severity Reduction with Confidence Level

Vehicle' Countermeasures – Collision Avoidance

AEBS was the most frequently assigned countermeasure for collision avoidance with 45% (n=152 of 344) given a confidence score of 2 or more.
84% of collisions (n=57 of 68) where 'Alco-lock' was a relevant countermeasure, a confidence score of 4 was assigned for collision avoidance. This countermeasure is deemed to be highly effective in preventing fatalities where alcohol impairment was a contributory factor. Overall, 29% of 'Vehicle' countermeasures for collision avoidance were given a confidence score of 2 or more (n=657 of 2,259).

	Possible	Likely	Almost Ce	Certain	Total
AEBS	192	129	17	6	344
Distraction monitoring	258	39	5	1	303
Driver alert for approaching hazard	211	46	20	1	278
Electronic Stability Control	202	41	2	1	246
Lane keep assist	188	39	4		231
Intelligent Speed Assistance	122	34	7		163
Fatigue Monitoring	135	19	2		156
Telematics Insurance	123	21	3		147
Anti-lock Braking System (motorcycles only)	74	20	2		96
Alco-lock		2	9	57	68

Table 4: Most Commonly Assigned 'Vehicle' CMs for Collision Avoidance with Confidence Levels

Vehicle' Countermeasures – Severity Reduction

Vehicle CMs were not given high confidence scores for severity reduction with only 12% (n=194 of 1,143) given a confidence score of 2 or more.
Vehicle CMs would appear to be more significant in collision avoidance.

The vehicle countermeasures with the highest confidence scores were 'Driver alert for approaching hazard', 'AEBS', 'Improved rear underrun guards', 'Post impact braking system', 'Intersection Assistance' and 'eCall'.
However, the majority of these are assigned in low numbers of collisions.

Countermeasure	Possible	Likely	Almost Certain	Certain	Total
Improved occupant secondary safety (relative to current typical level)	354	70	6		430
AEBS	290	21	1	2	314
Improved pedestrian secondary safety (relative to current typical level)	217	20	1		238
Intelligent Speed Assistance	144	18	4		166
Post impact braking system	61	7	6		74
Telematics Insurance	71	2			73
Driver alert for approaching hazard	59	8		1	68

Table 5: Most Commonly Assigned 'Vehicle' CMs for Severity Reduction with Confidence Levels

Road' Countermeasures – Collision Avoidance

45% of Road CMs assigned for collision avoidance (n=457 of 1,013) were given a confidence score of 2 or more indicating that countermeasures in this group could be effective in preventing fatal collisions from occurring. This is despite the fact that only 18% of collisions were found to involve road related contributory factors.

Countermeasure	Possible	Likely	Almost Certain	Certain	Total
Reduce speed limit	329	29	1		359
Add speed camera at locus	112	37	17		166
Add street lighting	26	36	11		73
Add appropriate barrier	10	26	26	8	70
Add pedestrian crossing (if in urban area and appropriate)	7	29	26	2	64

Table 6: Most Commonly Assigned 'Roads' CMs for Collision Avoidance with Confidence Levels

Although 'Reduce speed limit' was the most frequently assigned measure, a confidence score of 1 was given in 92% of cases (n=329 of 359).
By contrast, 'Add appropriate barrier' was also applied frequently and in 48% of collisions (n=34 of 70) it was given a confidence score of 3 or 4 indicating that it is likely to be a more effective countermeasure.
Other CMs with high confidence scores were 'Add cycle lane'; 'Add pedestrian crossing (overpass or underpass)'; 'Add traffic light control to junction' and 'Add roundabout'.

Road' Countermeasures – Severity Reduction

Road CMs could be effective in reducing severity with 32% of those assigned given a confidence score of 2 or more (n=335 of 1,042).
Countermeasures relating to barriers and hazards would appear to be the most effective including 'Add appropriate barrier'; 'Remove hazard'; 'Shield hazard with VRS/Improve type of VRS' and 'Higher containment level barrier'.

Countermeasure	Possible	Likely	Almost Certain	Certain	Total
Reduce speed limit	372	56			428
Add appropriate barrier	66	65	31		162
Add speed camera at locus	130	12	1		143
Shield hazard with VRS/Improve type of VRS	40	63	9		112
Remove hazard	30	43	20	1	94

Table 7: Most Commonly Assigned 'Roads' CMs for Severity Reduction with Confidence Levels

5.3 Vulnerable Road User Fatality Prevention

The following section show the CMs that were applied most frequently in relation to collision avoidance and severity reduction for collisions that resulted in a VRU fatality. In addition, countermeasures with a high confidence level have been highlighted.

A countermeasure may be attributed to the VRU or to another road user, vehicle or road factor that may have contributed to the collision.
Full lists of VRU related countermeasures can be found in Appendices G-I.

Pedestrians

In total, 1,808 countermeasures were applied to collisions resulting in a pedestrian fatality. 'Vehicle' CMs accounted for 41% (n=740) of all countermeasures assigned for pedestrian fatalities with particular focus on vehicular technologies such as 'AEBS', 'Driver alert for approaching hazard' and 'Distraction monitoring'. This highlights the importance of the roll out of this technology in reducing pedestrian fatalities.

Countermeasure - Collision Avoidance	Possible	Likely	Almost Certain	Certain	Total
Awareness training of VRU	112	73	10	4	199
Training to improve hazard perception skill	142	39	4	2	187
AEBS	98	76	9	3	186
Improved VRU conspicuity	95	71	14	1	181
Driver alert for approaching hazard	130	24	13		167
Reduce speed limit	84	9	1		94
Add pedestrian crossing (if in urban area and appropriate)	7	28	26	2	63
Add appropriate barrier	9	23	24	4	60

Table 8: Most common assigned CMs for collision avoidance with confidence levels

AEBS was made mandatory in all new HGVs from 2015 and it is hoped that similar regulations covering other vehicle types will be established in the UK in the near future[67].
87% (n=159 of 187) of 'Training to improve hazard perception skill' was assigned to drivers/riders indicating that there is a significant responsibility on drivers to be aware of the presence of pedestrians and the hazard they present. Nevertheless, 'Awareness training of VRU' and 'VRU conspicuity' were amongst the most frequently assigned countermeasures which shows that pedestrians themselves are pivotal in preventing fatalities. This includes taking measures such as wearing suitable, bright clothing during hours of darkness and crossing at appropriate places in the road.
'Reduce speed limit' was a countermeasure in 48% (n=104) of fatal collisions. In many of these, a lower speed limit may have meant a driver who was travelling slower would have increased time and distance to stop in sufficient time to avoid the collision.

Countermeasure - Severity Reduction	Possible	Likely	Almost Certain	Certain	Total
Improved pedestrian secondary safety (relative to current typical level)	171	19	1		191
AEBS	159	6	1	1	167
Reduce speed limit	91	13			104
Driver alert for approaching hazard	35	2			37
Intelligent Speed Assistance	22	1			23

Table 9: Most Commonly Assigned CMs for Severity Reduction with Confidence Levels

[67] *Current and Emerging Challenges*; Scotland's Framework to 2030, Transport Scotland

A lower speed may also have resulted in less severe injuries and therefore not resulted in a fatality. Details of suggested speed limit reductions are provided in Appendix L.

The countermeasures with the highest confidence scores for Pedestrian fatality prevention were:

- Awareness training of VRU
- AEBS
- Add appropriate barrier.

Details of locations for the addition of an appropriate barrier are provided in Appendix O.

Motorcyclists

A total of 1,191 countermeasures were applied to collisions resulting in a motorcyclist fatality. The countermeasures applied most frequently and with the highest confidence ratings relate primarily to the behaviour of the motorcyclist. 73% (n=115 of 157) of 'Training to improve hazard perception skill' and 80% (n=67 of 84) of 'Training or education to reduce risky driving manoeuvre' was assigned to the motorcyclist indicating that the motorcyclist themselves must take responsibility for their driving style and behaviour.
Nevertheless, it is important that other drivers and road users are reminded of the need to be aware and mindful of motorcyclists.

Countermeasures relating to speed management, namely 'Reduce speed limit' and 'Add speed camera at locus' accounted for 50% of all 'Road' countermeasures assigned (n=121 of 239).This indicates that reducing the speed at which motorcycles can legally travel and ensuring riders stick to designated speed limits could have an impact on motorcyclist fatality numbers.

Countermeasure - Collision Avoidance	Possible	Likely	Almost Certain	Certain	Total
Training to improve hazard perception skill	113	41	3		157
Awareness training of VRU	81	25	4		110
Anti-lock Braking System (motorcycles only)	71	20	2		93
Training or education to reduce risky driving manoeuvre	55	23	6		84
Electronic Stability Control	66	3			69
Reduce speed limit	61	5			66
Add speed camera at locus	28	11	5		44
Improved VRU conspicuity	29	11			40

Table 10: Most Commonly Assigned CMs for Collision Avoidance with Confidence Levels

'Anti-lock Braking System' (ABS) for motorcycles accounted for 24% (n=94) of 'Vehicle' countermeasures indicating it could be an effective technology for reducing motorcyclist fatalities. These 94 collisions account for 59% of all fatal collisions resulting in the death of a motorcyclist.

ABS has been mandatory on all new motorcycles over 125cc since 2016. It is therefore hoped that the benefits of this technology amongst the fleet will be seen over coming years. (Recommendation 10)

Countermeasure - Severity Reduction	Possible	Likely	Almost Certain	Certain	Total
Reduce speed limit	71	4			75
Use of appropriate secondary safety clothing	32	6			38
Add speed camera at locus	33	4			37
Anti-lock Braking System (motorcycles only)	33	1			34
Intelligent Speed Assistance	28	4			32

Table 11: Most Commonly Assigned CMs for Collision Avoidance with Confidence Levels

The countermeasures with the highest confidence scores for motorcyclist fatality prevention were:

- Remove hazard
- Training or education to reduce risky driving manoeuvre
- Add speed camera at locus
- Better licensing (reduce exposure to specific high-risk situations).

Details of the suggested locations for the addition of a speed camera are provided in Appendix M

Pedal Cyclists

A total of 334 countermeasures were applied to collisions resulting in a pedal cyclist fatality. Overall, the confidence scores were lower than for other vulnerable road users.

Countermeasure - Collision Avoidance	Possible	Likely	Almost Certain	Certain	Total
Training to improve hazard perception skill	28	17	1		46
Awareness training of VRU	15	11	4		30
Improved VRU conspicuity	15	9	3	1	28
Add cycle lane	1		7	7	15
Driver alert for approaching hazard	10	2	2		14
AEBS	5	7	2		14
Training or education to reduce risky driving manoeuvre	7	4	3		14
Reduce speed limit	10				10

Table 12 :Most common Countermeasures for pedal cyclists collision avoidance

‘Training to improve hazard perception’ was the most frequently assigned countermeasure for pedal cycle fatalities, however more than half of these (59%, n=27 of 46) were assigned to other road users. This indicates that there is a need to improve awareness around pedal cyclists amongst other road users to ensure that they can share roads safely.

Countermeasures relating to the use of a helmet ('Proper use of helmet' and 'Better helmet') were applicable in 25 collisions, this represents 57% of all fatal pedal cycle collisions.

The addition of a cycle lane was a countermeasure in 36% (n=16) of pedal cyclist fatalities. These countermeasures will be discussed further, later in this report.

Countermeasure - Severity Reduction	Possible	Likely	Almost Certain	Certain	Total
Improved pedestrian secondary safety (relative to current typical level)	27				27
Proper use of helmet	4	11	3		18
Reduce speed limit	10	5			15
AEBS	12				12
Improved sideguards	7	2			9

Table 13: Most common countermeasures severity reduction

Countermeasures relating to 'Vehicle' were also noted including 'AEBS', 'Driver alert for approaching hazard' and 'Distraction monitoring' all of which relate to vehicles that share the road with cyclists. These were also noted to be the more common 'Vehicle' measures for pedestrian fatality reduction. Therefore, the introduction of these technologies to the fleet including mandatory fitment could be significant in preventing VRU fatalities.

The Countermeasures given the highest confidence scores were:

- Add cycle lane
- Add appropriate barrier.

Locations for the suggested addition of a cycle lane are provided in Appendix N. (Recommendation 14)

5.4 Countermeasure Application

By exploring the groups to which the most prevalent countermeasures were applied for fatal collisions, target populations can be identified for the most effective implementation of these countermeasures.

People' Countermeasures

Training and education relate to:

- Training to improve hazard perception skill
- Training or education to reduce risky driving manoeuvre
- Training or education to reduce risky pre-driving behaviour (e.g., drink or drug use)
- Training or education to reduce other risky behaviours (e.g., wearing a seatbelt).

Although there is a separate overarching 'Awareness training of VRU' countermeasure (discussed below), the above countermeasures were also assigned to VRUs.

These two separate categories allow more ready identification where VRUs can be specifically targeted. It should also be noted that more than one of the above could be assigned per party involved in a collision.

For example, a driver who may have been impaired by alcohol and not wearing a seatbelt may be assigned both 'Training or education to reduce risky pre-driving behaviour' and 'Training or education to reduce other risky behaviours'.

Analysis of the training and education countermeasures identifies they would be most beneficially targeted at younger car drivers, particularly males.
Those aged 16-25 accounted for 30% (n=217) of those assigned these countermeasures and those aged 26-35 a further 22% (n=162).
Males accounted for 82% (n=178) of those aged 16-25 and 87% (n=141) of those aged 26-35. (Recommendation 61)

18% (n=209) of training and education countermeasures were assigned to motorcyclists. This equates to 139 unique riders, 81% of all motorcycle riders involved in fatal collisions and highlights a possible need for improved training of motorcyclists.
Again, this countermeasure would be most effectively directed at younger male riders as those aged 16-25 accounted for 14% (n=29 of 209) and those aged 26-35 for 26% (n=55).
One female in the 16-25 age group was assigned a training CM, all others were male. (Recommendation 46)

Collisions resulting in a pedestrian fatality accounted for nearly a quarter of all fatal collisions where training or education was deemed to be an appropriate countermeasure (23%, 175 of 750 collisions).
However, training or education was only applied to pedestrians themselves in 3% (n=22) of collisions indicating improved training of drivers (particularly car drivers) could reduce pedestrian fatalities. (Recommendation 39)

Awareness Training of VRU
It was determined VRU awareness training merited a countermeasure of its own as VRUs account for a high number of fatalities. Therefore, although the overall training and education countermeasures discussed above may also be applicable to them, it is worthwhile exploring dedicated awareness training for VRUs.

Of the 18 child VRU fatalities, 16 (89%) were assigned this countermeasure highlighting that increased awareness raising of children – particularly as pedestrians and pedal cyclists – would be beneficial.

More than a quarter of pedestrians to whom this measure was applied were aged over 76. This may also highlight a need for awareness raising amongst older members of the population.

Around half (48%, 95 of 197) of all pedestrians assigned this CM had home postcodes in the more socially deprived[68] areas of Scotland compared with 28% (n=56) from the least deprived areas[69].

For child pedestrians, 72% (n=8 of 11) had home postcodes in the most deprived areas and only 9% (n=1 of 11) in the least deprived areas. (Recommendation 19)

Better Licensing (Medical/Health)
This measure was applied primarily to collisions when a driver/rider medical episode had been suspected and those where defective eyesight was detected. More than half of those it was applied to were over 65 (51%, n=53 of 103), with 31% being over 76 (n=32 of 103). This indicates that improving licensing schemes for older drivers, including the introduction of mandatory cognitive assessments and eyesight tests could have a positive impact on fatality figures.

It will not be possible to test for nor prevent medical episodes amongst drivers of any age, however, arguably more could be done to assess fitness to drive amongst older drivers.
This countermeasure was also applied to two collisions considered as possible suicides. In both instances, the driver was known to be suffering with mental health problems. Fatal collisions with such characteristics are referred to the Partnerships, Prevention and Community Wellbeing (PPCW) Division where the skills and contributions of partners are used to deliver guidance and advice. This whole system approach uses a public health ethos to tackle the complexities and issues faced by those most in need of services[70]. (Recommendation 25)

Use Of Seatbelt
Seatbelt wearing is known to be a very effective way of preventing fatalities. 107 fatalities were not wearing a seatbelt.

The use of a seatbelt was identified as a suitable countermeasure and may have resulted in a different outcome for 102 (94%) fatalities.
It is important to ensure that all vehicle occupants, where required to wear a restraint do so while making sure these are correctly fitted and properly secured. As highlighted earlier, not wearing a seatbelt was most common amongst those aged 16-25. Therefore, unsurprisingly, this is the age group to which this countermeasure was most frequently applied. (Recommendation 4)

Use of seatbelt was most frequently applied to car occupants, however, a number of bus/coach occupants were also noted. 9 bus passengers were fatally injured, 6 of whom would have been required to wear seatbelts but were not.

[68] 40% most deprived areas.
[69] 40% least deprived areas.
[70] *Partnerships, Prevention and Community Wellbeing (PPCW)*; Police Scotland

This highlights a need to increase seatbelt wearing rates amongst bus passengers. These collisions occurred across the East and West of Scotland. (Recommendations 1, 38)

Enforcement of seatbelt wearing on buses is difficult as passengers are only required to wear belts when a bus or coach is moving. This means officers cannot pull over vehicles for spot checks and would have to travel on vehicles to be able to issue fines. Therefore, the focus must be on raising awareness of both the law and benefits of seatbelt wearing on these modes of transport.

Proper Use Of Helmet

'Proper use of helmet' was applied to pedal cyclists, motorcyclists and quad bike riders.

For pedal cyclists, the countermeasure was applied to all riders who had not been wearing a helmet indicating it could be an effective measure in reducing the severity of injuries. This was targeted primarily at older cyclists with 50% (n=9 of 18) being over the age of 56 (2 aged 56-65, 7 aged over 65).

Proper use of a helmet was identified as a countermeasure for all cyclists aged under 16. Therefore, helmet usage amongst children should be encouraged.

As The Child Safety (Cycle Helmets) Bill 2020 continues to be progressed through parliament, it may become mandatory for child cyclists to wear safety helmets.

As has been highlighted previously in this report, there are arguments that mandatory helmet requirements do not improve cyclist safety and instead suitable infrastructure is required.

Nevertheless, until Scotland's roads are improved for cyclists, helmet wearing should be encouraged as it has been identified as a potentially effective countermeasure. (Recommendations 12, 13)

Only 5 of the 161 (3%) motorcyclist fatalities were found not to be wearing a helmet. However, the countermeasure of 'proper use of helmet' was applied to 10 motorcyclists. For the 5 riders assigned this measure who had been wearing helmets, their helmets had come off following impact and there was indication or assessment that these had not been secured correctly or at all.

Therefore, there is a need for motorcyclists to ensure that helmets are fitted and secured properly. (Recommendation 30)

'Vehicle' Countermeasures

'Vehicle' countermeasures have been highlighted throughout this report as significant in reducing road fatalities.

It must be noted at this stage the following analysis focusses on countermeasures relative to fatal collisions, as and when they occurred.

Vehicle technology is an ever changing and advancing field. Therefore, vehicle features and systems may have been identified as countermeasures for some

collisions may now be standard and/or mandatory in vehicles today. Nevertheless, this will hopefully highlight the importance of these technologies and encourage uptake and fitment.

The technologies and safety systems discussed in this section of the report became compulsory in all new vehicles manufactured and sold across the EU from July 2022[71] under the EU's Vehicle General Safety Regulation[72].
This recognises the increased road safety benefits brought by these technologies which the UK's Transport Research Laboratory believe could potentially have a greater safety benefit than the introduction of seatbelts[73].
Following EU-exit, the UK Government has not yet decided whether they will adopt the same standards for new vehicles manufactured in this country. (Recommendation 56)

Improved Occupant Secondary Safety
'Secondary safety' refers to vehicle features that come into play once a collision has occurred and are designed to reduce injury to the occupants. This covers seatbelts and airbags, head restraints and the design of the bodyshell and vehicle interior.
'Improved occupant secondary safety' was applied as a countermeasure when it was deemed improvements in vehicle design or performance could have had a positive influence on the outcome.
This includes collisions where internal safety features have not performed as expected or where an increase in their presence may have been beneficial.

This countermeasure was applied primarily to cars, however, was also noted to be relevant to HGVs.
10 HGV drivers were killed during the reporting period. Improved occupant secondary safety was assigned as a possible countermeasure for 90% of these fatalities.
This indicates there may be improvements which could be made to the design of HGV cabs to make them safer for HGV drivers and occupants.

HGVs have limited crumple zones[74] and a cuboid cab design[75] which can result in fatal injuries to HGV drivers as they are afforded little physical protection by the vehicle bodyshell. This will be most relevant for collisions involving HGVs with other HGVs or large vehicles, or collisions with objects and hazards such as trees.

[71] *Regulation (EU) 2019/2144 of the European Parliament and of the Council*, November 2019
[72] *New rules to improve road safety and enable fully driverless vehicles in the EU*; European Commission, July 2022
[73] *The potential for vehicle safety standards to prevent deaths and injuries in Latin America*; Transport Research Laboratory, 2016
[74] Crumple zones assist in transferring some of a vehicle's kinetic energy into controlled deformation or crumpling, at impact.
[75] *Study on Enhanced Truck Front End Designs (TFEDs): Safety Benefits for Vulnerable Road Users (VRUs)*; Transport Research Laboratory, 2017

Improved occupant secondary safety may be more effective at preventing younger fatalities. 58% of all fatalities aged 16-25 were applied this measure (n=87 of 149) as were 58% of those aged 26-35 (n=79 of 137).
This is compared with 38% of fatalities aged 76-85 (n=48 of 110) and 41% of those aged 86 and over (n=18 of 43).
Collisions involving younger drivers/fatalities may be more likely to involve higher speeds and, therefore, more forceful impact where the presence of fully-functioning secondary safety systems could make a difference.

The Scottish Government has recently launched the new Mobility and Scrappage Fund – offering cash incentives and Travel Better vouchers for households removing older, more polluting cars from the roads. Although this pilot project has a largely environmental focus, it may also have a positive impact on road safety by encouraging drivers to remove older vehicles from the road which have less advanced secondary safety systems. (Recommendation 57)

Advanced Emergency Braking System (AEBS)
AEBS monitors the road ahead of a vehicle and activates the brakes when a potential collision is detected. This in turn assists in reducing the speed of a vehicle, meaning a collision may occur at a lesser speed or be avoided altogether.
AEBS could play a significant role in reducing pedestrian fatalities.
82% of collisions resulting in a pedestrian fatality has AEBS applied as a countermeasure (n=186 of 226).
AEBS was relevant primarily for cars, however, it was also applied to a large number of vans, Light Goods Vehicles (LGVs),Heavy Goods Vehicles (HGVs) and buses/coaches. AEBS has been mandatory in new HGVs since 2015 and the technology has been found to be highly effective in preventing collisions or reducing the severity of a crash[76].
The benefits realised by the mandatory implementation of this technology to HGVs is likely to be replicated across all other vehicle types.

Distraction Monitoring
Distraction monitoring systems monitor the movements of a vehicle to ensure it is being driven in a controlled manner. When risky driving behaviour is detected the driver is alerted through audio and/or visual alerts. This may encourage drivers to alter their behaviour, thus reducing the risk of a collision occurring.
This technology was assigned as a potential countermeasure 304 times over 303 collisions.
It would be most beneficial for younger drivers with those aged 16-25 accounting for 21% (n=64) of instances where this measure was applied. This is compared with 6% (n=17) for those aged 76-85 and just 2% (n=7) for those over 86.

[76] *AEBS 'a crucial safety system' for HGVs*; Road Safety GB, February 2022

While it was relevant primarily for cars, larger vehicles including vans/LGVs, HGVs and buses/coaches would also benefit from having this technology installed.

Intelligent Speed Assistance

Intelligent Speed Assistance (ISA) uses speed-recognition and/or GPS linked speed limit data to advise drivers of the current speed limit and automatically limits the speed of a vehicle as needed.

ISA systems do not automatically apply the brakes but simply limit engine power preventing the vehicle from accelerating past the current speed limit unless overridden.

ISA on new vehicles is already relatively common, helped in part by Euro NCAP's decision to reward extra points for vehicles that include ISA[77].

Under the EUs Vehicle General Safety Regulation, over-rideable ISA systems are mandatory on all new cars sold in the EU from 2022.

This countermeasure was applied primarily to cars but was also noted to be relevant to motorcycles.

This measure is identified as being potentially significant in tackling the issue of young male drivers exceeding the speed limit. It was applied significantly more to younger drivers with 36% aged 16-25 (n=65 of 182) and 31% 26-35 (n=56). The overwhelming majority (94%, n=170) were males.

ISA would be effective for collisions on roads with higher speed limits as more than half (54%, n=98) of collisions in which it was identified as countermeasure had occurred on 60mph roads. However, more than a fifth (21%, n=38) had occurred on 30mph roads. 45% (n=17) of these collisions had resulted in a pedestrian fatality.

Therefore, ISA could be effective in preventing collisions that occur at lower speeds and have a positive impact on VRU fatality numbers.

Alco-Lock*[78]*

Alco-lock devices have been identified through this study as being a highly-effective countermeasure where impairment by alcohol was a contributory factor.

Under the EU's Vehicle General Safety Regulation, all new cars from 2022 will be enabled to have an Alco-lock device installed. However, this does not make it mandatory for a device to be installed.

This countermeasure would be most effective at tackling collisions involving young male drivers.

Those aged 26-35 accounted for 38% (n=23 of 68) of those the measure was applicable to, and drivers aged 16-25 a further 32% (n=20). 90% (n=60) of these drivers were male. (Recommendations 59, 60)

[77] *Intelligent Speed Assistance (ISA)*; European Transport Safety Council

[78] Alco-lock is a breathalyser that can be installed in a vehicle. It requires the driver to blow into a mouthpiece on the device before starting or continuing to operate the vehicle. If alcohol is detected, the vehicle will not start.

'Road' Countermeasures

Reduce Speed Limit - A reduction in the speed limit may mean collisions can be avoided entirely by allowing drivers more time to react to hazards or may mean injury severity is reduced if a collision occurs at a lesser speed.

The specific roads this measure was applied to most frequently were the A82 (n=25) and the A9 (n=21). These roads cover large geographic areas from Glasgow to Inverness and Falkirk to Thurso respectively.
Further analysis was undertaken of these roads which identified a reduction in the speed limit was assigned as a suitable countermeasure for a number of separate clusters of collisions that occurred in close proximity to one another[79]. .

On the A82, the highlighted collisions which occurred on Great Western Road occurred within 50mph limits; the remaining highlighted collisions occurred on 60mph roads.
On the A9, collisions occurred on 60mph roads.

The Great Western Road collisions all resulted in either a pedestrian or pedal cyclist fatality due to the close proximity of these VRUs and fast-moving traffic. 50% (n=3) of the fatal collisions that occurred on the A82 between Tarbet and Arden (approximately 14 miles apart) resulted in a motorcyclist fatality. The reduction of the speed limit in these areas, therefore, may have a positive impact on motorcyclist fatality numbers. (Recommendation 66)

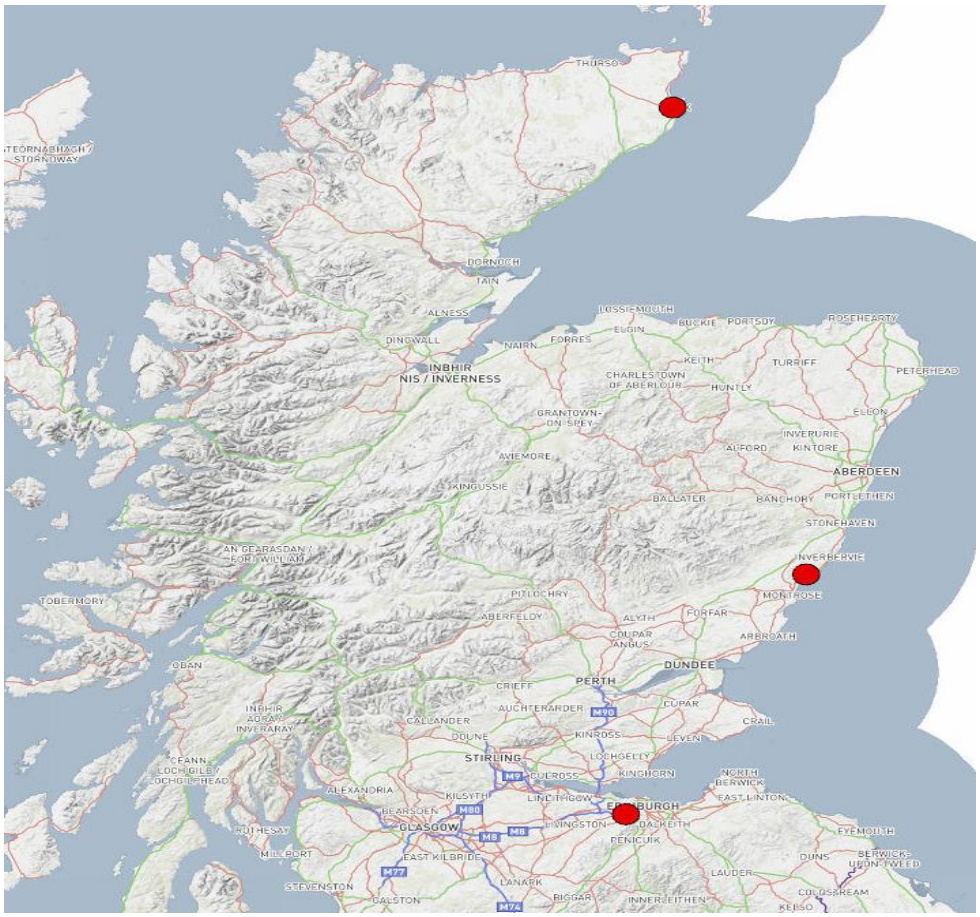
It should be noted that in only one of the highlighted collisions on the A82, was a driver, deemed by Collision Investigation, to be exceeding the speed limit. A third of the highlighted collisions on the A9 (n=2) were due in part to a driver 'Exceeding the speed limit' or 'travelling too fast for conditions'.
This highlights the majority of these fatal collisions occurred while vehicles were travelling at or within the posted speed limit and as such a speed limit reduction may be beneficial.
Any speed limit reduction on the A9 must be considered alongside the ongoing A9 Perth to Inverness dualling programme.

Add Speed Camera At Locus

The roads which this measure was applied to most frequently were the A9 (n=6), followed by the A82, A92, and A93 (n=5 each).
63% of the roads it was applied to had a posted speed limit of 60mph. This measure was deemed to be appropriate for 83% of collisions where 'Exceeding a speed limit' was a contributory factor. This provides an example of a 'People' CF that could be effectively targeted by a 'Road' countermeasure.

[79] See Appendix K for a full information table for these identified locations.

The locations where the addition of a speed camera was assigned the highest confidence scores are shown in Map 8[80].



Map 8: High Confidence Identified Locations for Addition of a Speed Camera

A speed camera was assessed as being highly likely to have had an impact on collision occurrence and/or injury severity in these instances.

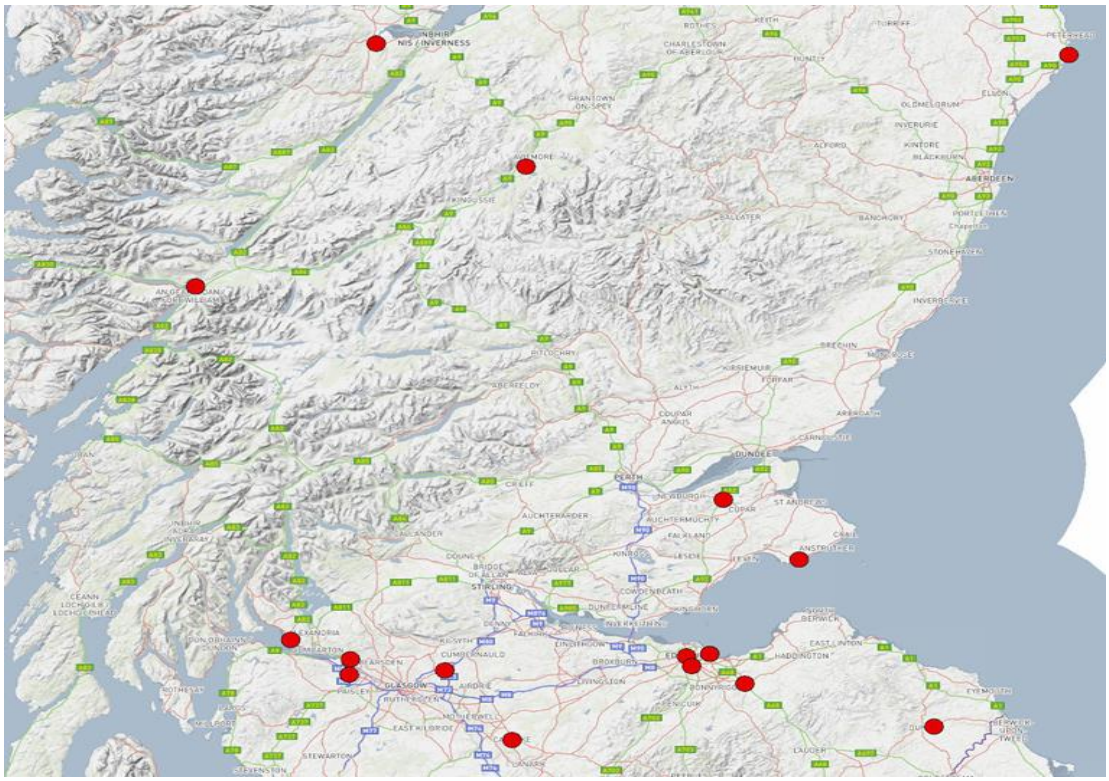
The Scottish Safety Camera Programme Handbook[81] highlights that camera enforcement resources must be prioritised at sites with the potential for maximum casualty reduction.
Prior to the installation of a camera, collision data over the most recent five-year period should be assessed and must only include collisions in the direction of proposed enforcement. Based on this data, a points-based system is used to decide if a site can be considered for this enforcement.

Add Cycle Lane
The addition of a cycle lane scored very highly for collision avoidance. 88% (n=14 of 16) of collisions to which it was applied were given a confidence score of 3 or 4 (almost certain or certain).
It was a recommended countermeasure in more than a third (36%, n=16 of 44) of collisions which resulted in a pedal cyclist fatality.

[80] See Appendix L for a full information table for these identified locations.
[81] *Handbook of Rules and Guidance*; Scottish Safety Camera Programme, March 2022

Recent years have seen an increase in pedal cyclists, both for leisure and everyday journeys[82]. This is due to a number of factors including the Covid-19 pandemic, an increased interest in and awareness of environmental and sustainability issues and the desire for a more active lifestyle. A need for suitable, high-quality infrastructure for cyclists – including dedicated cycle lanes – is crucial[83] to ensure the safety of cyclists.

Map 9 indicates where the addition of a cycle lane is recommended[84]. It should be noted, these locations were highlighted in response to where pedal cyclist fatalities have already occurred and consideration has not been given to the real time practicalities of implementing cycle lanes in these places.



Map 9: Identified Locations for Addition of a Cycle Lane

They are however worth noting as they indicate locations where vehicular traffic and cyclists have come into contact and highlight the significant difference a dedicated cycle lane could have made. (Recommendation 68)

75% (n=12 of 16) of the identified locations are roads with a 50mph or 60mph posted speed limit indicating that cycle lanes are likely to be most effective and necessary on roads where pedal cyclists are in close proximity to vehicles travelling at higher speeds.

[82] *Attitudes and Behaviours Towards Cycling in Scotland - Wave 3*; Cycling Scotland, October 2021
[83] *Cycling by Design*; Scottish Government, September 2021
[84] See Appendix M for a full information table for these identified locations.

The drive to introduce safer, more suitable infrastructure for pedal cyclists including the addition of cycle lanes must continue, as it is recognised as a potentially highly-effective countermeasure for pedal cyclist fatalities.
Until suitable infrastructure is in place, other measures to protect cyclists require to be utilised. These include encouraging other road users to be cognisant of pedal cyclists, and campaigns to highlight the importance of helmet wearing.

Add Appropriate Barrier
A number of different kinds of barriers are available such as wire-rope safety barriers and concrete barriers. Different barriers will be more suitable for some locations but unsuitable for others.

Barriers have proved to be an effective measure in road safety and provided they are properly installed and adequately maintained they can reduce severe collision outcomes by up to 80%[85]. More than a quarter (29%, n=66 of 227) of fatal collisions assigned this countermeasure involved a pedestrian fatality.
In these instances it is possible the addition of a barrier would have prevented the pedestrian from being able to enter the road thus, potentially, preventing them from coming into contact with a vehicle.

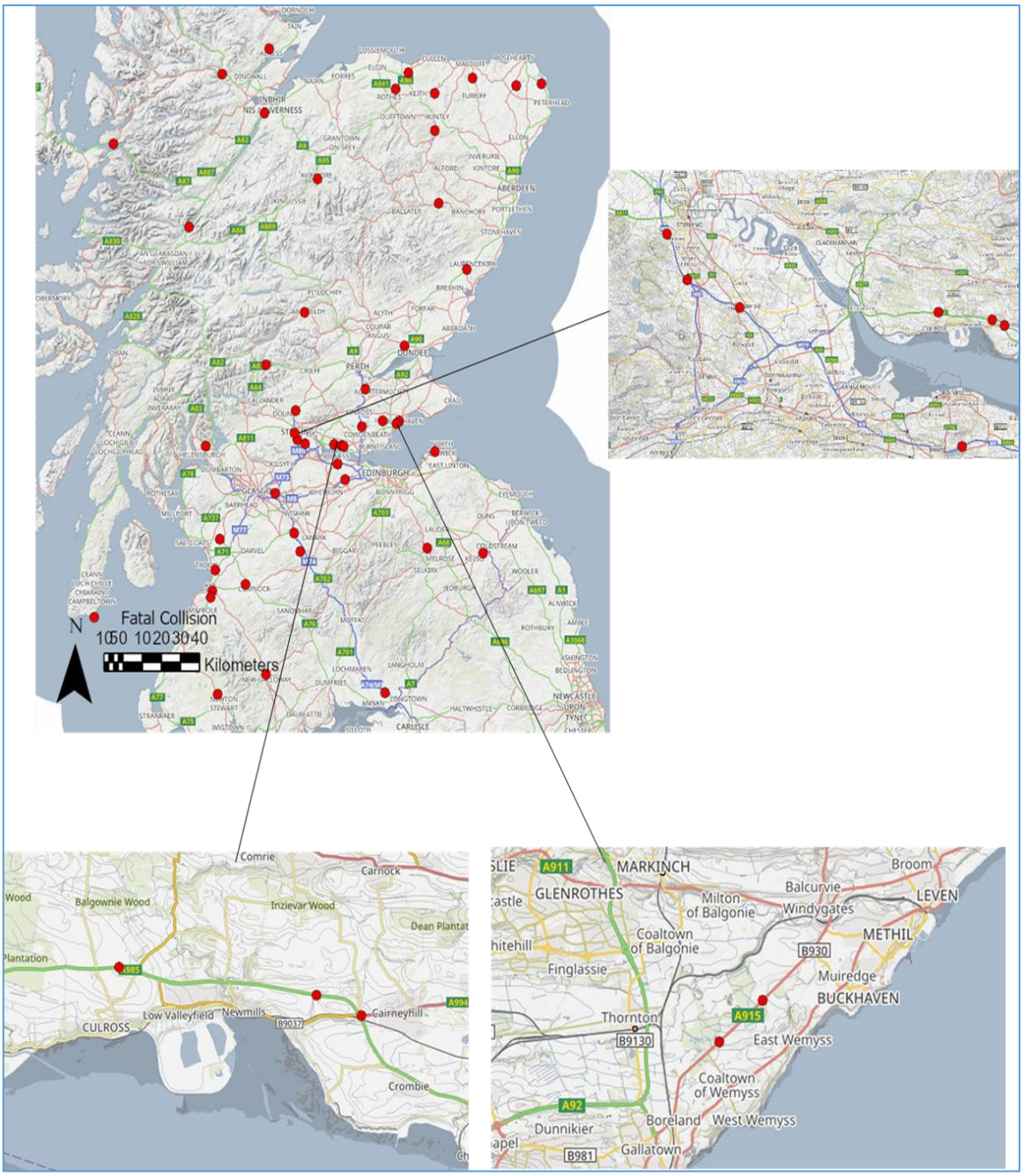
On a number of other occasions, a driver has lost control and mounted the pavement where the vehicle has struck pedestrians. The presence of a barrier may have provided the pedestrians with some protection.
The addition of a barrier was also found to be a suitable countermeasure for 6 pedal cyclist fatalities and 12 motorcyclist fatalities indicating this countermeasure could be effective in preventing VRU fatalities.

The majority of collisions however related to vehicles that had lost control – either on a straight road or on a bend. Many of these vehicles had subsequently left the road and collided with a hazard, including trees, walls and fences.
The presence of a roadside barrier may have prevented the vehicle from leaving the road and/or hitting a hazard.

Other vehicles have lost control and crossed over into the opposing carriageway. The presence of a central reservation barrier may have prevented this.
(Recommendation 67)

[85] *Guide for Road Safety Interventions: Evidence of what works and what does not work*; Global Road Safety Facility - World Bank, 2021

Collisions where addition of a barrier would have prevented a vehicle from leaving the road and colliding with a tree are depicted in Map 10[86].

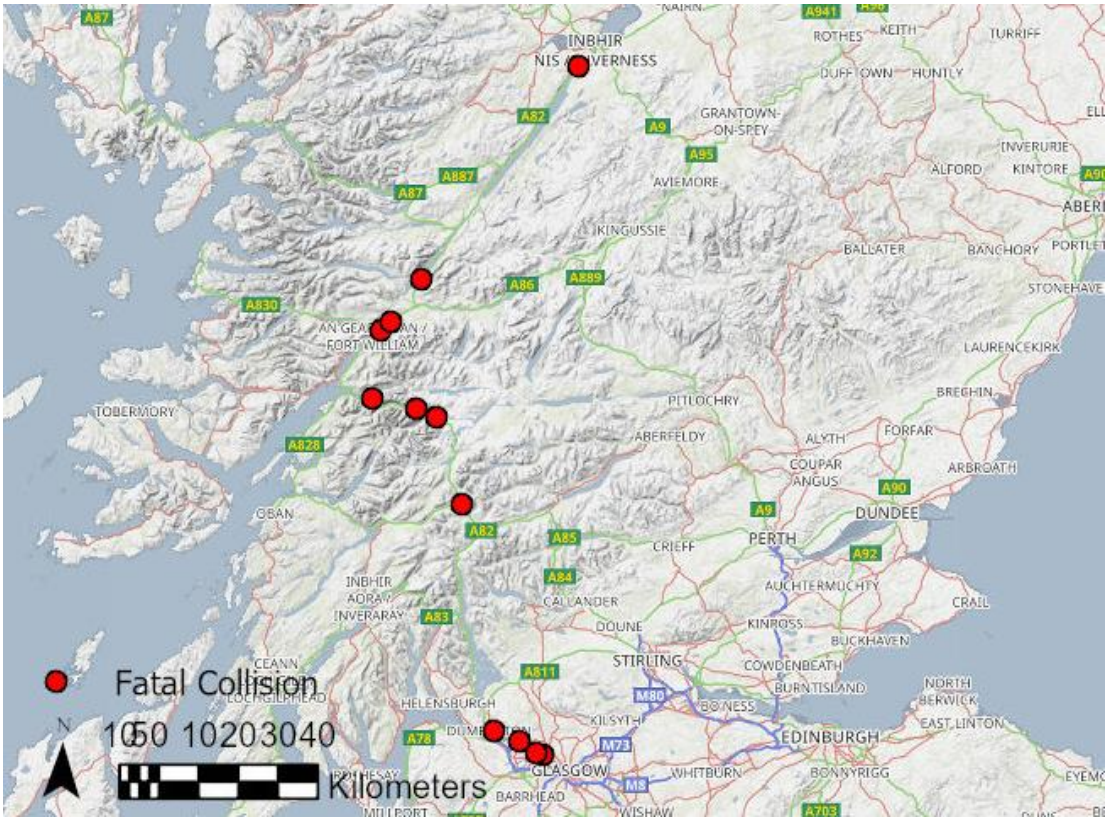


Map 10: Identified Locations for Addition of a Barrier (where vehicle left the road and collided with a tree)

Of note, 4 (10%) of these collisions were on the M9. This map also identifies collisions with similar characteristics that occurred on both the A915 (on a stretch known as the Standing Stane Road) and the A985. This countermeasure was applied to the A82 most frequently as per Map 11 (below).

[86] See Appendix N for a full information table for these identified locations.

The addition of an appropriate barrier was assigned as a countermeasure for two collisions on a roughly 5 mile stretch of road between Fort William and just north of Torlundy, and for three collisions on a roughly 15 mile stretch between Glencoe and Bridge of Orchy.
It was also a measure for two collisions on the Great Western Road section of the A82, both of which resulted in a pedestrian fatality.



Map 11: Identified Locations on the A82 for the Addition of a Barrier

6. Conclusion

This report has analysed data relating to the 903 fatal collisions that occurred on Scotland's road network from 2015-2020.

The contributory factors for each collision have been determined and potential countermeasures identified which could have prevented collisions from occurring or reduced the injury severity.

The findings of this research will allow pre-emptive action to be taken by Police Scotland, Transport Scotland and relevant partners, with the aim of influencing the outcome of future collisions with similar characteristics.

Almost all fatal collisions involved a 'People' contributory factor exemplifying the effect human error and behaviour have on the occurrence of a fatal collision. 'Vehicle' and 'Road' contributory factors were relevant to a number of fatal collisions but at a significantly lower rate and very rarely without a 'People' element also present.

Conversely, a 'Vehicle' countermeasure was applicable to almost all fatal collisions and 'Road' countermeasures in a significantly large number. While 'People' countermeasures were also applicable in most fatal collisions, this exemplifies the role safer vehicles and safer roads have to play in fatality prevention and counteracting human fallibility.

The depth of the data captured for this report has enabled detailed analysis of fatal collisions and provided valuable insight into both causation and potential prevention.

Recommendations, aligned to the pillars of the Safe System, are provided below, highlighting action to be considered.

The cost and feasibility of these have not been considered at this stage, therefore future cost-benefit analysis will be required to ensure any implementation is practical, possible and cost-effective.

It is also recommended similar analysis be undertaken on available data for fatal collisions that have occurred in 2021 and 2022, to further enhance the available picture.

A process should be established to allow for the on-going assessment of fatal collisions as and when they occur. This will continually add to the evidence base and assist with identifying countermeasures, monitoring trends over time and evaluating the effectiveness of implemented countermeasures in the long term.

7. Recommendations

The following recommendations have been identified through analysis and are presented for consideration:

Safe Road Use – Education and Awareness

General recommendations

Recommendation 1

Encourage bus passengers (public and private) to wear seatbelts where they are fitted. (Page 60)

- A campaign could be developed in collaboration with major bus providers operating both public and private hire vehicles in the East and West of Scotland, to encourage passengers to wear seatbelts where they are fitted.
- Existing national campaigns around seatbelt use, such as those run by Road Safety Scotland, should be cognisant of including messaging aimed at bus passengers

Recommendation 2

Raise awareness of the dangers of mobile phone use while behind the wheel. (Page 48)

- Continue campaigns such as Road Safety Scotland's 'Drive like Gran's in the car' to target young males

Recommendation 3

Provide access to relevant materials and support for drink and/or drugs misuse when taken into custody. (Page 27)

- Drivers who are found to be under the influence of drink and/or drugs and taken into custody should be signposted to relevant materials and support for substance misuse issues.
- Custody suites should ensure they have relevant materials available with information regarding appropriate local and national Third Sector Organisations.

Recommendation 4

Younger Drivers

Raise awareness of the importance of wearing a seatbelt to younger age groups and in areas of deprivation. (Page 60)

- Campaigns should continue to be developed by Road Safety Scotland, Police Scotland, Transport Scotland and similar organisations which highlight the importance of wearing a seatbelt and the financial penalties incurred by those who don't.
- To reach this audience, the campaigns should be targeted both in person and virtually in locations such as gyms/leisure centres, fast food chains, TikTok, YouTube and using other media appropriate to the audience.

Recommendation 5
Older Drivers
Develop campaigns regarding eyesight and fitness to drive. (Page 41)

- Campaigns should be developed to target older drivers' eyesight. This will involve utilising different communication methods from other national campaigns as older people are less likely to be utilising the internet and social media. This may include adverts on TV or in print, in GP and optician surgeries, supermarkets etc.
- Work in partnership with pharmacies should be considered, to develop a package which highlights important messages about fitness to drive.

Recommendation 6
Develop a campaign on when is the right time to give up driving. (Page 40)

- A campaign could be developed in conjunction with organisations such as Age Scotland highlighting the signs to look for in older drivers regarding their fitness to drive.
- A particular focus of any campaign should be on signposting resources and organisations that can be utilised for assistance.

Recommendation 7 (Page 40)

- Police Scotland and Transport Scotland should work with DriveAbility Scotland to highlight the available services and encourage older drivers to self-refer.

Recommendation 8
Motorcycles
Develop or continue to run campaigns on motorcycle safety (Page 19)

- Targeted campaigns should continue to be cognisant of seasonal differences for motorcyclist fatalities.
- Police Scotland's Motorcycle Safety Campaign in 2022 ran from April to September, the findings of this report support this time period for future similar campaigns.

Recommendation 9
Consider young male riders when developing any messaging and campaigns for motorcyclists.(Page 47)

- Campaigns highlighting the importance of motorcycle helmet use could be developed and targeted at young male riders.

Recommendation 10
Consider ways to reduce or manage speed for motorcyclists. (Page 57)

- Improved training and education are required for motorcycle riders in addition to speed management measures, including speed limit reductions and the addition of Intelligent Speed Assistance systems, to address riding style and behaviour.

Recommendation 11
Pedal Cyclists
Continue to roll out the driver awareness training by Cycling Scotland, consider rolling this out further or developing further initiatives. (Page 32)

- National Highways recently launched a new safety campaign aimed at educating drivers to 'know the zones', highlighting blind spots where HGV drivers have limited visibility. A similar campaign could be developed in conjunction with bodies such as the Road Haulage Association aimed at educating pedestrians and cyclists about blind spots and ensuring they remain visible to HGV drivers.
- While a national campaign would be beneficial (particularly in busy, densely-populated areas), given a large percentage of collisions with these characteristics occurred in Aberdeen and Edinburgh, consideration should be given to targeted campaigns in these areas.

Recommendation 12
Consider cycle helmet use. (Page 61)

- Police Scotland, Transport Scotland and relevant partners such as Cycling Scotland should encourage cyclists to consider wearing a helmet in line with the Highway Code recommendation.
- Any communications should consider targeting child cyclists and older cyclists.

Recommendation 13. (Page 61)

- Should The Child Safety (Cycle Helmets) Bill 2020 be passed, appropriate communications and campaigns should be developed to raise awareness.
- Dedicated enforcement campaigns should run alongside any awareness campaigns.

Recommendation 14
Continue to raise awareness of the minimum passing distance vehicles should give to a cyclist. (Page 58)

- Police Scotland could continue to raise awareness of the minimum distance a passing vehicle should give to a cyclist through Operation Closepass and encourage other road users to share the roads safely with pedal cyclists.

Recommendation 15
Foreign Drivers
Develop foreign driver materials and distribute at relevant locations. (Page 43)

- Posters/display materials could be developed and displayed in various establishments on the A82 such as the Green Welly Stop.
- Materials should reinforce the requirement to drive on the left and provide an overview of common road layouts and driving practices including giving way when joining traffic and the direction of travel of other vehicles.

Recommendation 16. (Page 43)

- Transport Scotland and other relevant partners could work in partnership with major car rental companies to develop materials that can be disseminated to foreign drivers on obtaining a hire vehicle.
- Hire companies should also have such materials available on their websites for foreign drivers when booking online.
- Road Safety Scotland has a wealth of materials available in various languages that could be utilised.

Recommendation 17. (Page 43)

- Transport Scotland could work in partnership with major UK airports and ferry ports to display materials aimed at foreign drivers.
- Materials should reinforce the requirement to drive on the left and provide an overview of common road layouts and driving practices, including giving way when joining traffic, and the direction of travel of other vehicles.
- Materials should also be available on ferries servicing many of Scotland's islands which are popular with tourists, including Caledonian MacBrayne and Northlink Ferries.

Recommendation 18

Use technology to inform. (Page 43)

- Road Safety Scotland has developed a video for foreign drivers prior to them travelling to the UK. The dissemination of this video should be supported by Transport Scotland and Police Scotland and further utilised where appropriate.

Recommendation 19

Pedestrians

Develop material targeting socially deprives areas aimed at pedestrians. (Page 60)

- Campaigns and safety interventions for pedestrians, particularly those aimed at children should be targeted towards more socially deprived areas.

Actions

Recommendation 20

Vehicle Safety, Drink and Drug Testing. (Page 44)

- Increased policing patrols by Police Scotland officers to undertake roadside stops, breath tests and drug wipes.

Recommendation 21

Seatbelt Safety. (Page 46)

- Enforcement and increased policing patrols by Police Scotland to both deter drivers and passengers from not wearing a seatbelt and to stop and issue fines to those not adhering to the law.

Recommendation 22

Mobile Phone and Distraction. (Page 48)

- Continued enforcement by Police Scotland for drivers seen to be utilising a mobile phone at the wheel alongside ongoing public education around the relevant legislation and associated dangers.

Recommendation 23

Eyesight / License Removal. (Page 41)

- Ensure that Cassie's Law is referenced at Roads Policing officer training at the Scottish Police College

Recommendation 24. (Page 41)

- A briefing should be prepared for Police Scotland's intranet highlighting Cassie's Law and the background to its implementation, highlighting the available legislation and associated processes to all officers across the force.

Recommendation 25

Mental Health. (Page 60)

- Police Scotland should continue to refer cases involving possible mental health aspects to Partnerships, Prevention and Community Wellbeing (PPCW). This will allow for a multi-agency review of these collisions by a group of partners to identify various approaches to be considered and ultimately implement better practices for moving forward.

Recommendation 26

Driving Assessments. (Page 41)

- Police Scotland should consider the development of a pilot project where suitable drivers are directly referred for DriveAbility Scotland driving assessments.

Recommendation 27

Young Drivers

Campaign - Drink and Drug Driving – Younger Drivers. (Page 44)

- Consideration should be given to a drink and drug driving campaign aimed at younger drivers. This campaign should highlight both the dangers of the behaviour and the associated enforcement. Policing presence from both divisional and Roads Policing should be focused at the weekend during the hours of 10pm and 6am.

Recommendation 28

Focus Group – Young Drivers. (Page 37)

- Police Scotland, Transport Scotland and appropriate partners should establish a 'Young Drivers Working Group' to ensure collaborative working to target and effectively prevent collisions amongst this group of drivers.

Recommendation 29

In-Car Technology. (Page 37)

- Telematics or black box insurance for younger drivers is widely available and should be encouraged. Insurance companies should continue to advertise and incentivise their use, offering reduced insurance premiums for safer driving.

Recommendation 30

Motorcyclists

Community Engagement – Safety Initiatives. (Page 61)

- Police Scotland should collaborate with motorcycle clubs and venues such as Knockhill Racing Circuit to develop roadshows and/or drop-in points where motorcycle helmets can be checked by a knowledgeable expert, ensuring they are correctly fitted and that riders are aware how to secure them correctly.

Recommendation 31

Road Safety Messaging – Foreign Drivers. (Page 43)

- Liaison with ferry ports and airports in Germany and France to develop and display materials aimed at tourists travelling to Scotland with relevant road safety messaging.

Recommendation 32. (Page 43)

- Vehicle familiarisation inputs should be available for all foreign drivers obtaining hire vehicles to ensure they are accustomed to left-hand drive and all vehicle controls. These should be facilitated by car hire companies.

Funding Grant Projects

Recommendation 33

Campaigns – Drink and Drug Driving – Initiatives. (Page 44)

- The Scottish Government should consider funding for the development of awareness campaigns that involve the distribution of free portable breathalysers for drivers. This could be developed in conjunction with local licensing authorities and night-time economy establishments.

Recommendation 34

Pedal Cyclists - Safety Helmets – Initiative. (Page 47)

- The Scottish Government should consider the development of a scheme in partnership with major retailers offering discounts on safety helmets.

Legislation

Recommendation 35

Education (page 20)

- Road Safety education could be included in the Curriculum for Excellence to ensure that high quality road safety information is shared at the earliest stages.

Recommendation 36

Fitness to Drive (Page 39)

- Police Scotland, DVLA and relevant health professionals should discuss and evaluate the processes currently in place regarding licence revoking and subsequent enforcement; D751 form processing and DVLA medical assessments to ensure they are all fit for purpose.

Recommendation 37 (Page 39)

- The introduction of mandatory reporting requirements for relevant medical professionals should be considered. Further research and discussions required with bodies including the DVLA, Royal College of General Practitioners and the General Medical Council around the benefits and challenges.

Recommendation 38

Seatbelts – Penalties. (Page 61)

- Not wearing a seatbelt should be made an endorsable offence and the current financial penalties should be increased. This may act as a further deterrent, particularly for younger drivers who will lose their licence if they reach six or more penalty points within two years of passing their test.

Recommendation 39

Driving Standards. (Page 59)

- Enhanced hazard perception training for drivers, directed particularly at the risk posed to Vulnerable Road Users (VRUs), should be incorporated into any discussions around altering and improving driver training standards.

Recommendation 40

Driving Offences – Young Drivers. (Page 37)

- Further engagement is required with young drivers to identify more effective ways to engage with this cohort and assist in developing effective preventative measures. When a young driver is convicted of a road traffic offence, a sentencing condition could be participation in a national working group where they are able to share thoughts and experiences. Discussion will be required with COPFS

Recommendation 41
Restrictions – Young Drivers. (Page 37)

- In light of the number of younger passenger fatalities in collisions involving younger drivers, consideration should be given to a Graduated Driver Licensing system that could place restrictions on driving times/number of passengers/zero tolerance approach to alcohol for new drivers

Recommendation 42
Older Drivers - Fit to Drive Assessment – Wider social Consideration for Older Road Users. (Page 40)

- The introduction of a form of cognitive assessment when licence renewal is required at 70 (and at agreed intervals thereafter) should be considered. Further research and review will be required. However, it should be noted such an assessment would undoubtedly lead to a reduction in older drivers and, therefore, lead to an increase in older pedestrians, cyclists and public transport users. It is imperative, therefore, that appropriate measures be put in place to ensure fatalities amongst these groups do not increase and that suitable, fit-for-purpose public transport infrastructure is available.

Recommendation 43
Eyesight Requirements – Older Road Users. (Page 40)

- The introduction of mandatory reporting requirements for relevant eyesight professionals should be considered. Further research and discussions required with bodies including the DVLA, Royal College of Ophthalmologists and College of Optometrists around the benefits and challenges.

Recommendation 44
Older Road Users. (Page 40)

- The introduction of mandatory eyesight tests for older drivers should be considered.

Recommendation 45
Older Road User. (Page 40)

- The processes and forms currently used for Group 2 licence renewals could be utilised and adapted to develop similar robust practices for older drivers.

Recommendation 46
Rider Standards – Motorcyclists. (Page 59)

- Working in conjunction with the Driver and Vehicle Standard Agency and DVLA, the potential impact of the introduction of a minimum period of learning and a requirement to demonstrate experience in different driving conditions via log books for motorcyclists should be further researched and reviewed.

Safe Vehicles

Education and Awareness

Recommendation 47

Driving Conditions – Winter / Summer Campaign. (Page 33)

- Police Scotland should continue 'Get Ready for Winter' campaigns and messaging to encourage drivers to ensure their vehicles are roadworthy and prepared for Winter driving conditions. However, consideration should be given to developing a similar national summer tyre safety campaign.

Recommendation 48

Enhanced Campaign - Car Seat. (Page 46)

- An enhanced campaign should be developed between Police Scotland, Transport Scotland and Good Egg Safety highlighting the importance of an age and size appropriate car seat that is properly-fitted as well as the benefits of rear-facing for younger children. Consider an enforcement period by Police Scotland to run alongside the campaign with increased roadside stops to check car seats.

Recommendation 49

Car Seat. (Page 46)

- Collaborative working between Transport Scotland, Police Scotland and Good Egg Safety to develop roadshows or drop-in points that parents and care givers can attend to ensure that they have an appropriate child restraint and to assist them with fitting

Action

Recommendation 50

Campaign – Tyre Safety – Summer. (Page 33)

- Increased policing patrols and roadside stops by Police Scotland Roads Policing officers in North East Division in conjunction with a summer tyre safety campaign with a particular focus on Aberdeenshire and Moray. Benefits may also be seen from a national campaign.

Recommendation 51

Tyre Safety. (Page 38)

- Increased roadside stops by Police Scotland Roads Policing officers to check tyre conditions

Recommendation 52

Driving for Work. (Page 45)

- Membership of the Scottish Occupational Road Safety Alliance (ScORSA) should be actively encouraged and promoted. Companies and employers who have responsibility for employees who drive as a part of their role must be reminded of their legal duty to ensure the safety of their employees. This

includes ensuring vehicles are safe and roadworthy and employees are fit to drive.

Funding and Grant Projects

Recommendation 53

Car Seat. (Page 46)

- The Scottish Government should consider the development of a grant project towards the cost of car seats. They are expensive items and the cost may mean some care-givers compromise safety as a result. This could be done in collaboration with major retailers.

Recommendation 54

Car Seat. (Page 46)

- Transport Scotland should work in partnership with retailers to raise awareness of already available free in-store car seat fitting and safety demo. This could involve the development of a financial incentive programme offering discounts or monetary vouchers which can be redeemed towards car seats when they participate in a fitting and safety demonstration

Legislation

Recommendation 55

Equality – In car Safety (Page 26)

- The UK and Scottish Governments should remain aware of the developments and impacts of the ongoing safety testing around the use of a female crash test dummy. If requirements are introduced into EU legislation to use such a seat evaluation tool, the UK Government should also introduce this to ensure optimum safety of UK manufactured vehicles

Recommendation 56

Vehicle Technology. (Page 62)

- The UK Government should adopt the vehicle safety provisions within the EU's Vehicle General Safety Regulation which includes AEBS, ISA and distraction monitoring and alert systems. This will ensure all new vehicles manufactured in the UK meet maximum safety standards and ultimately assist in preventing a potentially large number of road deaths.

Recommendation 57

Older Vehicles. (Page 63)

- The Scottish Government should consider the development of a pilot scheme similar to the Mobility and Scrappage Fund with a road safety focus on removing older and potentially less-safe vehicles from the roads.

Recommendation 58

Driving Standards. (Page 38)

- Inclusion of tyre and vehicle maintenance training as mandatory for learner drivers should be considered. An understanding of the importance of ensuring

a vehicle is roadworthy alongside practical training on practices such as checking and altering tyre pressure may have a positive impact. This could also form part of a theoretical and practical driving test.

Recommendation 59

In-vehicle Technology – Offences. (Page 64)

- Consideration should be given to the mandatory installation of Alco-lock devices to the vehicles of those convicted of a drink-driving offence

Recommendation 60

Young Drivers - In-vehicle Technology. (Page 64)

- Consideration should be given to mandatory installation of Alco-lock devices in vehicles of younger drivers. This could be established through requirements from insurance companies.

Safe Speeds

Education and Awareness

Recommendation 61

Speeding and Dangerous Driving Campaign. (Page 59)

- Campaigns highlighting the dangers of speeding and other risky driving behaviours should be targeted in areas frequented by young males – both physically and virtually. This could include sporting events, fast food chains, YouTube and TikTok.

Recommendation 62

Speeding – Offence Initiative. (Page 28)

- Development of a National Speed Awareness Course and referral programme which drivers who have been caught speeding must attend. Consideration should be given as to whether this would be offered as an alternative to prosecution or as a mandatory additional requirement.

Legislation

Recommendation 63

Speeding – Penalties. (Page 28)

- Consideration should be given to increasing the penalties for speeding offences (heavier fines and increased points) and increasing the time points remain on a driver's licence.

Recommendation 64

Speeding / Dangerous Driving – Penalties. (Page 28)

- Consider increasing penalties or bans for repeat offenders of speeding/careless driving/dangerous driving, such as a graduated endorsement system with increased points for each offence.

Safe Roads and Roadsides

Education and Awareness

Recommendation 65

Foreign Drivers Campaign / Material – Distraction. (Page 43)

- Materials/advertisements should be developed that remind tourists to avoid becoming distracted by scenery. These could be situated within service stations on main routes utilised by tourists including the A82, A9 and the North Coast 500 route

Recommendation 66

Signage – VRU. (Page 65)

- A review of signage on the A82 at Great Western Road should be conducted to ensure adequate signage is present relating to the presence of VRUs

Recommendation 67

Collaborative Approach to Roadside Safety. (Page 68)

- Police Scotland Roads Policing and Transport Scotland should liaise with Police Scotland's Counter Terrorism Security Advisor Team who carry out site visits to assess the requirement and feasibility of street furniture, bollards etc. to mitigate terrorist attack opportunities such as preventing a vehicle from mounting the pavement in a busy pedestrian area. Collaborative working may identify common areas of interest, resulting in cost saving and avoiding duplication of efforts.

Recommendation 68

Pedal Cyclists Infrastructure – Cycling. (Page 67)

- Transport Scotland and Police Scotland should work in partnership with organisations such as Cycling Scotland and Sustrans to continue to develop and improve cycling infrastructure on Scotland's roads.

Recommendation 69

Foreign Drivers Signage. (Page 43)

- The installation of road signs in non-British languages including Polish should be considered

Recommendation 70

Signage. (Page 43)

- A review of the signage on the A82 for foreign drivers/riders should be undertaken to ensure it is sufficient. Regular usage should be made of matrix signs to display messages reminding drivers to drive on the left. Consideration could be given to displaying this in different languages, particularly German and French

Post Crash Response

Recommendation 71

Data – Response times. (Page 51)

- Consult with partners (Public Health Scotland, Scottish Ambulance Service etc.) to identify suitable datasets for analysis relating to post-crash response.

8. Further Analysis

Road Traffic Fatalities Report

Recommendation 72

Data Maintenance

- Further analysis should be conducted on the available data for fatal collisions in 2021 and 2022 when traffic volumes were returning to more in keeping with pre-pandemic levels. This will further enhance the available picture and provide more up-to-date analysis.

Recommendation 73

Thematic Analysis

- Further in-depth analysis should be undertaken on the currently available data set to identify trends and subsequent recommendations for pedestrians, motorcyclists, pedal cyclists and child fatalities

Recommendation 74

Geographic Analysis

- Further analysis should be undertaken to identify more specific areas of deprivation and affluence where certain contributory factors are more prevalent. This will allow more specific targeting.

Recommendation 75

Hot Spot Analysis

- Further in-depth analysis should be conducted on fatal and serious collisions on the A82 at Great Western Road. Further risk assessment can then be conducted based on these findings

Additional analysis

In-Depth Analysis

Recommendation 76

- Further analysis should be undertaken on those involved in a fatal collision who were injured but not fatally. This may provide an insight into why some casualties sustain fatal injuries when others do not e.g. age factors, position within vehicle. If this data is not currently available, it is recommended that processes are developed to capture it.

Recommendation 77

In-Depth Analysis.

- The total number of occupants in vehicles involved in fatal collisions should be recorded at the scene. At present, only the number of casualties is recorded as per STATS19 form. This would allow further analysis on those who are involved in a fatal accident but are uninjured. This may provide an insight into why some casualties sustain fatal injuries when others do not e.g. age factors, position within vehicle.

Recommendation 78

In-Depth Analysis

- Further analysis should be conducted on the types of injuries sustained in serious injury collisions. This would enhance the body of evidence available on sex-related differences in injury type and inform research around inequalities in vehicle safety and design.

Recommendation 79

Evaluation of Previous Campaign – Eyesight

- Police Scotland undertook a National Driver Eyesight Campaign from 20th February to 12th March 2023 to raise awareness through education and enforcement campaigns highlighting the risks associated with defective vision. The results of this campaign should be analysed to enhance the available information around older drivers and defective eyesight

Recommendation 80

Thematic Analysis – Cyclists

- Further analysis should be undertaken to include the locations of serious and slight collisions involving pedal cyclists. This will help to further identify priority locations where the addition of a cycle lane may be most beneficial and assist with informing the scoring criteria required for infrastructure funding

Recommendation 81

Reduction of Speed

- Further analysis and research should be conducted on the stretches of road identified in this report for a potential reduction in the speed limit.

Recommendation 82

Prevention – Safety Cameras

- Further exploration of identified sites in this report for the potential addition of a speed camera should be undertaken to establish if they would reach the minimum site selection requirements as per the Scottish Safety Camera Programme Handbook. Any sites identified as potentially suitable by demonstrating a collision and speed history should be assessed and prioritised. Consideration will be required as to whether a fixed, mobile or average speed camera system would be most appropriate. This should include collision data for 2021 and 2022 prior to any decision making

Recommendation 83

Engineering – Barriers

- Further analysis and research should be undertaken on the stretches of road identified in this report for the addition of a barrier. Other alternatives should also be considered if barrier implementation is unsuitable, including the removal of trees or a change in road layout.

Recommendation 84

Increase Minimum Driving Age

- The potential impact of increasing the minimum driving age should be further researched. This report supports previous findings that younger drivers are disproportionately at fault for fatal collisions and are more likely to display risky driving behaviours. Therefore, an increase in the minimum driving age, until cognitive maturity may have improved, could have a positive impact on fatality numbers

Recommendation 85

Minimum Driving Period

- The potential impact of the introduction of minimum driver training hours with a licensed instructor should be further researched in conjunction with bodies such as The Driver and Vehicle Standards Agency, the DVLA and The Driving Instructors Association.

9. Appendices

Appendix A – Information Sources, Methodology And Limitations

Information Sources

The report utilised information held by Police Scotland to retrospectively review and assess the circumstances of fatal collisions on Scotland's roads from 1st January 2015 to 31st December 2020. No new information was gathered but it was reviewed in the context of the aims of the project. Data was reviewed for all road deaths on Scotland's roads over this time period.

Collision Investigation Reports

Collision Investigation reports were the main information source utilised to inform this study. Where a collision is fatal, likely to prove fatal or involves life-altering injury, Police Scotland Collision Investigators are deployed to the scene to carry out in-depth collision investigation. A report is then produced which will contain information including locus and vehicle examinations, scene photographs, collision reconstruction and speed calculations. The Collision Investigation reports provide a very detailed insight into the collision and include all relevant details and potential contributory factors. The size of and detail within a Collision Investigation report varies depending on the type and complexity of a collision.

A total of 786 Collision Investigation reports were available for the reporting period. In the majority of cases where reports were unavailable, collision investigation had not been instigated. This was often due to the collision initially appearing non-serious (and it therefore being deemed unnecessary to undertake full collision investigation) however the casualty has later died as a result of the injuries sustained. Further reasons for absence of Collision Investigation reports include there being sufficient third party evidence (including witnesses, CCTV and dashcam footage) or an absence of physical evidence around collision circumstances which would aid the investigation. In these cases, it is agreed that the existing evidence is sufficient to establish the circumstances of the collision and full collision investigation is not required. For the collisions where Collision Investigation reports were not available, data from Incidents of Note, 28 day updates and Completion Memorandums were used to populate the database and inform analysis.

Incidents Of Note/28 Day Update/Completion Memorandum

Incidents of Note (IoN) are completed following all fatal collisions on Scotland's roads. These provide an initial overview of the circumstances including the persons and vehicles involved, road layout, external conditions and preliminary assessed contributory factors. A 28 Day Notification Memo and subsequent Completion Memorandum enhance the initial overview and provide additional detail and final conclusion, respectively. Whilst these may not be as comprehensive as full Collision Investigation reports, they provide sufficient detail to assess contributory factors and assign potential countermeasures.

STATS 19
STATS19 forms completed by police officers following a collision provide information on three distinct elements – circumstances, vehicles and casualties. This includes crash location, local conditions such as weather and visibility, vehicle type and demographic details of the driver/riders and casualties. The forms also provide an overview of contributory factors.

Criminal History System (CHS)
The Criminal History System (CHS) is a tool to aid the police with crime detection, prevention and administration by providing access to structured data about individuals. Records held within the system provide detailed information about an individual's criminal history including the crime/offence and relevant disposal. This allows for analysis of the previous convictions of those at fault for fatal collisions.
977 drivers were found to be at fault for fatal collisions during the reporting period however only 201 CHS records were available. An individual's CHS record will only be retained for three years after death, therefore the records for many of those at fault who died in the collisions will no longer be held.

Methodology And Limitations
To compile the Police Scotland Fatal Collisions database, experienced Police Scotland Roads Policing officers reviewed the data held within the aforementioned information sources. Information was extracted to populate the databases, with great attention to detail, ensuring accuracy. The officers then assigned both contributory factors and countermeasures to each fatal collision based on all of the available information.
Processes were established to ensure that the database was quality reviewed, confirming that data had been input correctly and completely prior to being made available for analysis. Although the same set of values and descriptors were used by officers to assign contributory factors and countermeasures, an element of personal interpretation exists and any repetition of this data review by different officers may provide slight variations in results.
Fatal collisions that have been definitively ruled to be a suicide or a medical death have not been included for the purposes of this report. There were however occasions where it is not conclusive that the collision was a result of a suicidal act or a medical episode and these collisions have been included in the analysis.
The percentages in this report were rounded to the nearest whole number. For example: 62.213% was rounded to 62%.

The date period covered is 1st January 2015 to 31st December 2020.

The results of this analysis should be treated as an initial indicator for ways in which to reduce fatalities and a first step in understanding the evidence on how to prevent or reduce fatalities. Prior to any countermeasure implementation, the following should be considered:

Date period covered
The date period selected for this report includes 2020, the year in which the global Covid-19 pandemic placed various restrictions on travel. The figures must therefore be considered with this borne in mind.

Cost and feasibility of countermeasure implementation
This analysis did not consider the potential cost or feasibility of each countermeasure. The focus was to apply a countermeasure that could have independently prevented the fatality from occurring. Therefore, future cost benefit analysis will likely be required to ensure that any countermeasure implementation is both cost effective and feasible.

Responsibility for countermeasure implementation
Some of the countermeasures identified may be under the direct control of Transport Scotland (e.g. hazard management; barrier placement) and Police Scotland (e.g. improved policing profile/checks) however many others will fall within the remit of other partners such as Education or Health and vehicle manufacturers.
A multi-stakeholder approach will therefore be require to ensure relevant countermeasures are implemented effectively. Some identified countermeasures relate to reserved matters that can only be legislated by the UK Government and therefore wider discussion at a UK Government level will be necessary.

Appendix B: Countermeasure Assessment

Countermeasures were given a rating based on the confidence that the countermeasure would have been able to:

- Avoid the collision entirely
- Significantly reduce the severity of the collision (i.e reduce the fatality to at least serious injury)

The two aspects were assessed independently of each other and each given a score allowing a combined confidence score to be ascertained (See Table 2). As both collison avoidance and severity reduction meet the aims of the countermeasure – that is to prevent the fatality – it is suitable to assess both together.

The following likelihood scale was used for countermeasure confidence:

- 0 = Not Applicable
- 1 = Possible
- 2= Likely
- 3 = Almost Certain
- 4= Certain

This resulted in a combined score of between 1 and 8, with higher rankings indicating a higher level of overall confidence that the countermeasure would have been appropriate and effective.

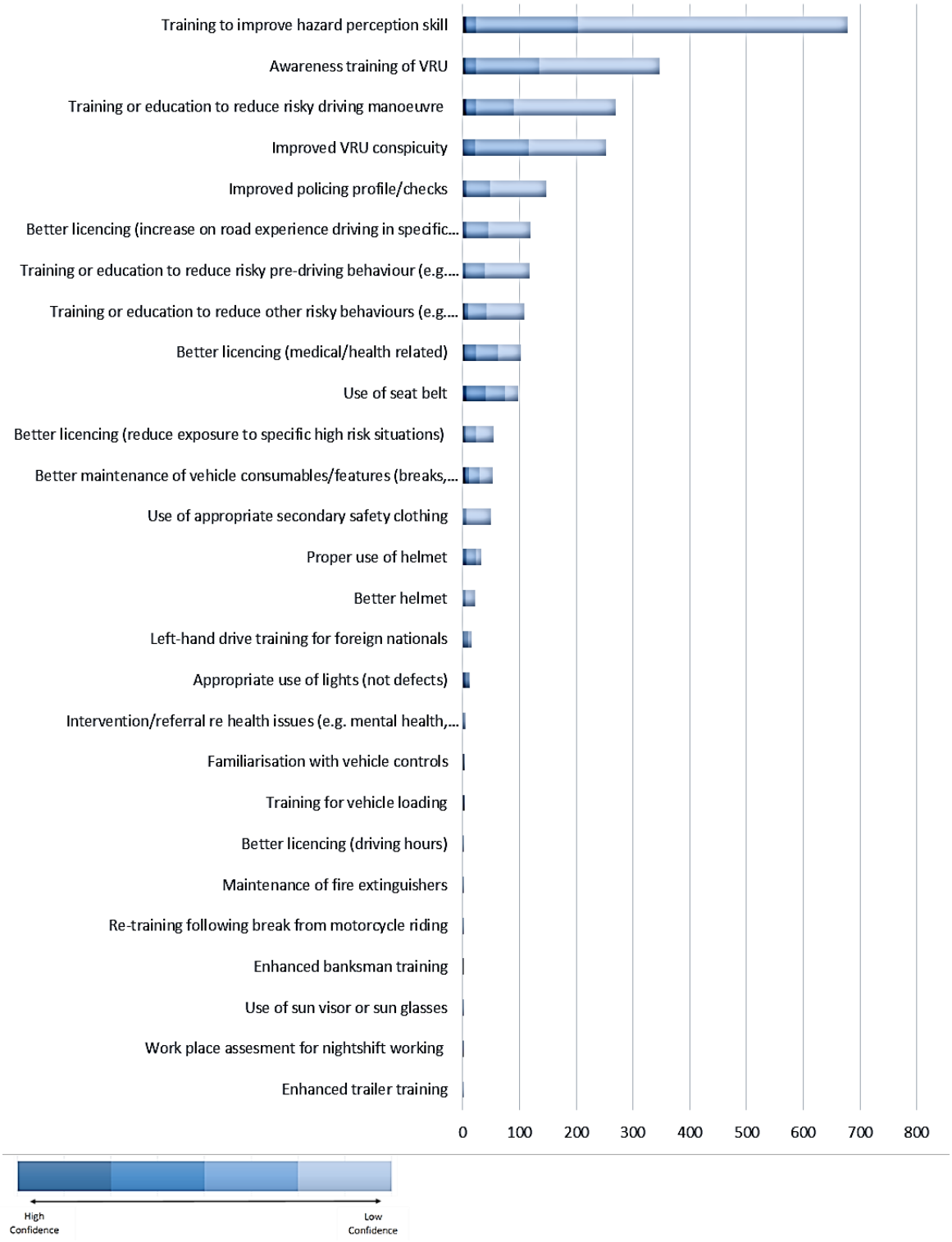
Example Countermeasure	**Countermeasure Confidence Collision Avoidance**	**Countermeasure Confidence Severity Reduction**	**Combined Confidence Score**
Use of seatbelt	0	3	3
Better maintenance of vehicle consumables/features (brakes, tyres, lights etc.)	1	1	2
Advanced Emergency Braking System (AEBS)	4	4	8

Table 2: Countermeasure confidence and scoring

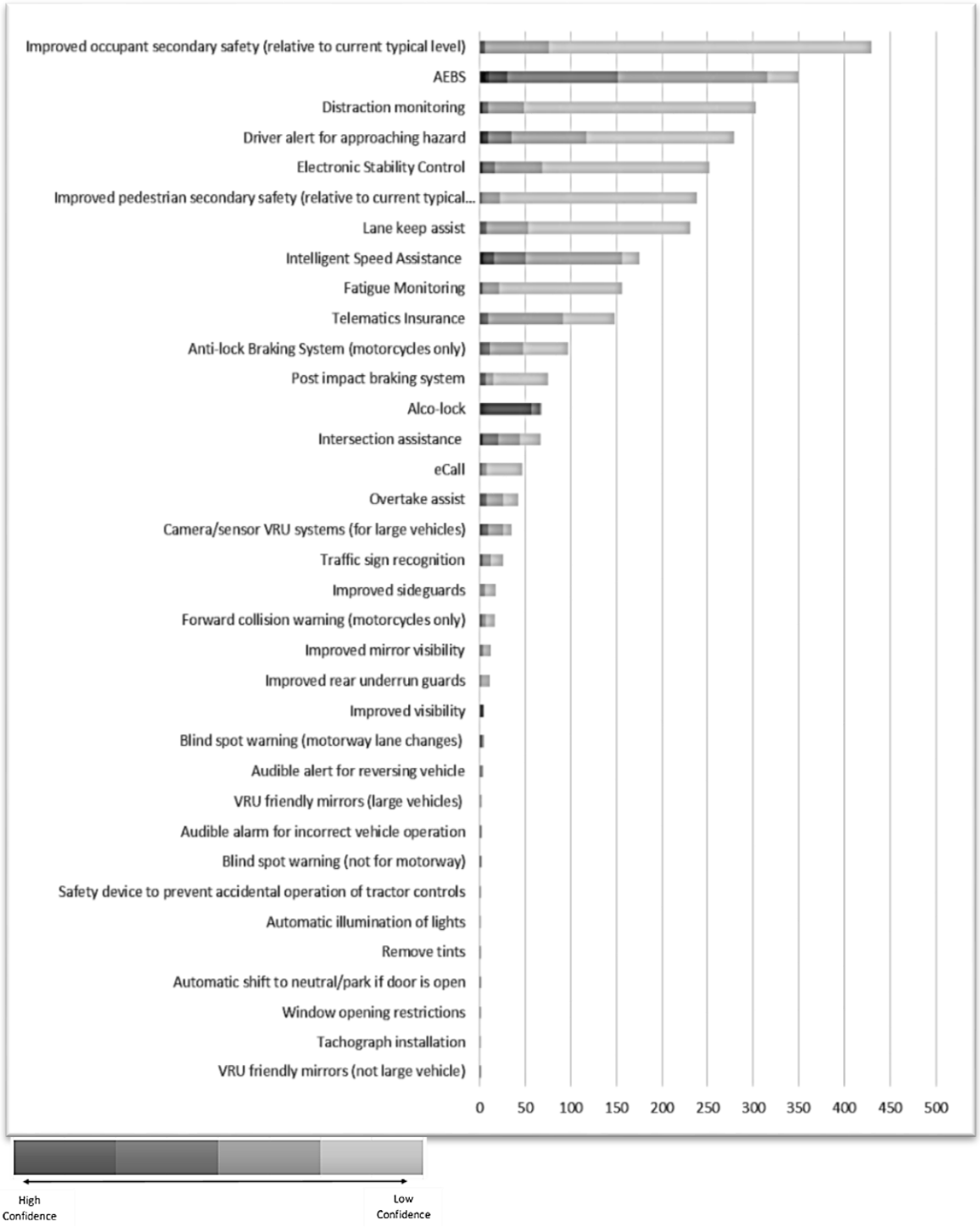
Appendix C: People Contributory Factors

Contributory Factor - People	No. Assigned
Careless, reckless or in a hurry	606
Failed to look properly	509
Loss of control	478
Poor turn or manoeuvre	424
Failed to judge others path/speed	396
Distraction in vehicle	333
Distraction outside vehicle	325
Travelling too fast for conditions	212
Exceeding speed limit	212
Fatigue	152
Swerved	137
Learner or inexperienced driver/rider	119
Aggressive driving	118
Illness or disability, mental or physical	107
Impaired by drugs (illicit or medicinal)	83
Impaired by alcohol	78
Sudden braking	54
Unfamiliar with model of vehicle	48
Disobeyed Give Way or Stop sign or markings	37
Too close to cyclist, horse or pedestrian	33
Following too close	32
Rain, sleet, snow or fog	30
Inexperience of driving on the left	29
Nervous, uncertain or panic	27
Stationary or parked vehicle(s)	26
Junction restart (moving off at junction)	25
Dazzling sun	24
Driver using mobile phone	24
Junction overshoot	22
Rider wearing dark clothing	21
Disobeyed double white lines	20
Possible Suicide	16
Illegal turn or direction of travel	14
Dazzling headlights	13
Racing	12
Vehicle travelling along pavement	11
Stolen vehicle	10
Disobeyed automatic traffic signal	10
Disobeyed pedestrian crossing facility	10
Cyclist entering road from pavement	9
Failed to signal or misleading signal	8
Visor or windscreen dirty, scratched or frosted etc.	8
Not displaying lights at night or in poor visibility	7
Vehicle in course of crime	7
Spray from other vehicles	6
Uncorrected/defective eyesight	6
Failed to stop for police	3
Vehicle door opened or closed negligently	2
No banksman	2
Involved in police pursuit	2
Inadequate restraint of child	1
Driver not in seated position in driver seat	1
Poor quality bike lamp fitted	1
Driving too slow for conditions or slow vehicle (e.g. tractor)	1
Vehicle using bus lane in operation	1
Driving hour offences	1
Inadequate training for loading vehicle/driving with loaded vehicle	1
Load retaining straps insecure	1
Suicide	1
Accidential Operation of Tractor Controls	1
Standing up on moving bus	1

Appendix D: All People Countermeasures By Frequency And Confidence Score



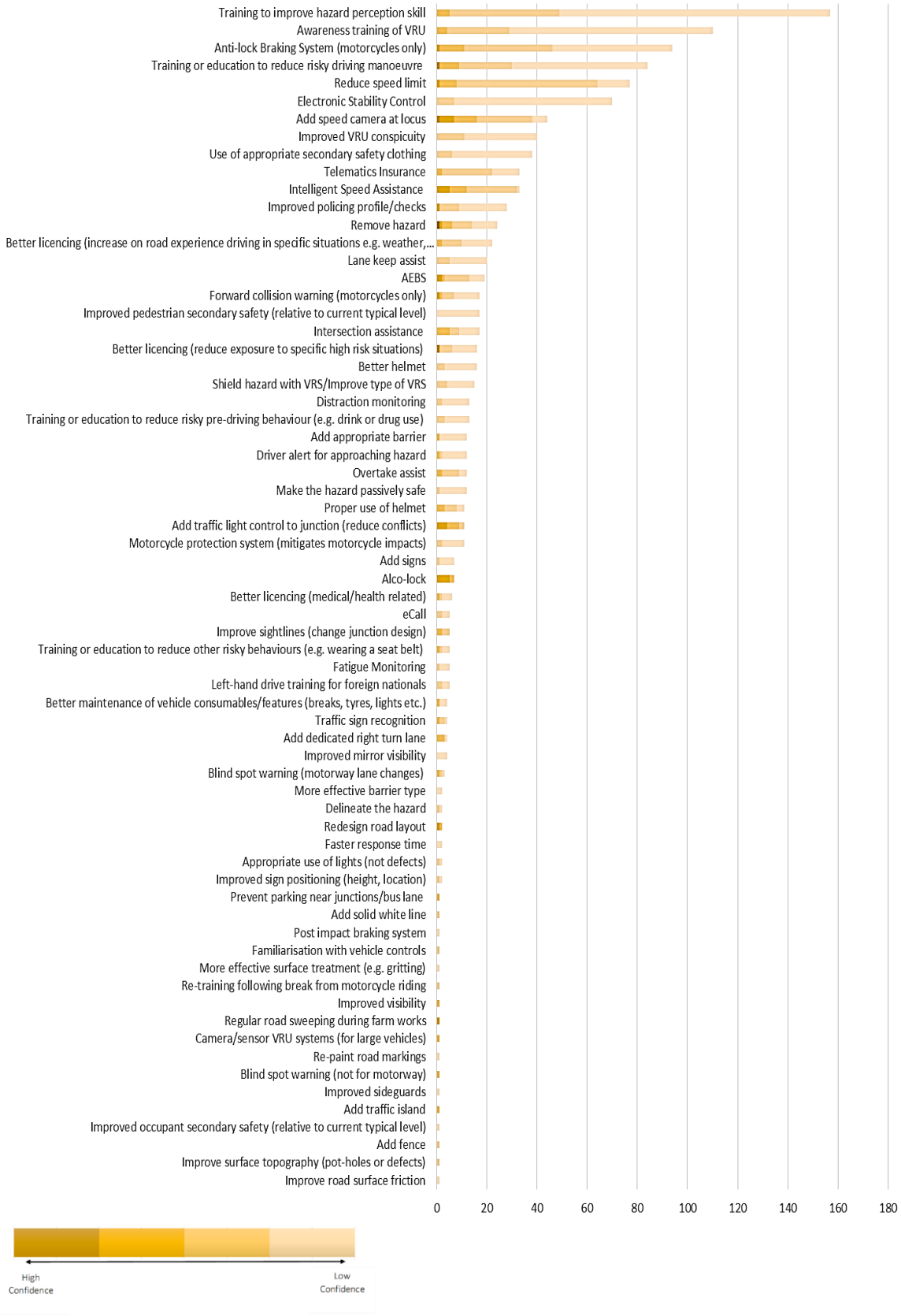
Appendix E: All Vehicle Countermeasures By Frequency And Confidence Score



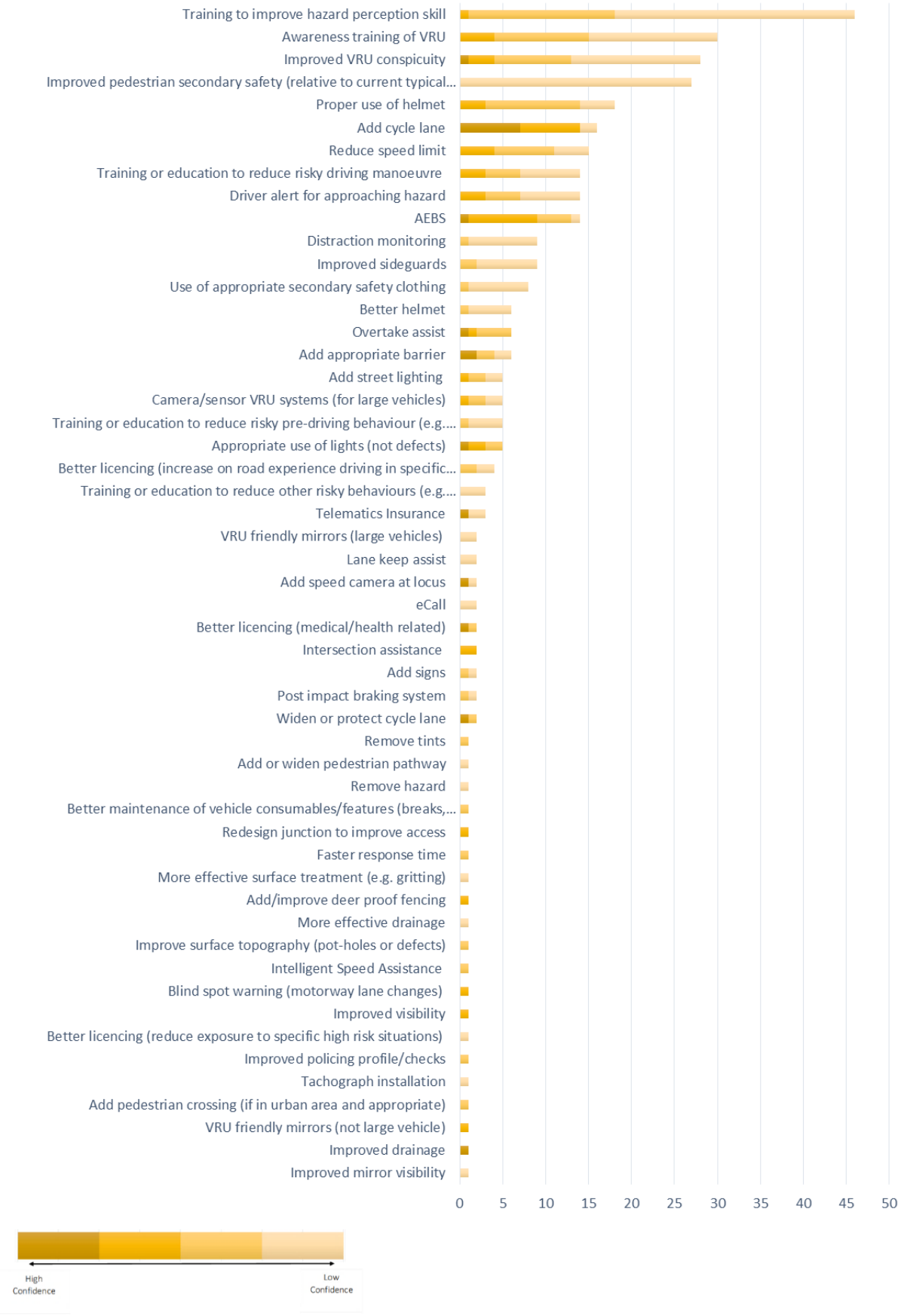
Appendix F: All Road Countermeasures By Frequency And Confidence Score

Appendix G: All Countermeasures By Frequency And Confidence Score For Pedestrian Fatalities

Appendix H: All Countermeasures By Frequency And Confidence Score For Motorcyclist Fatalities



Appendix I: All Countermeasures By Frequency And Confidence Score For Pedal Cyclist Fatalities



Appendix J: Top 'People' Countermeasures Application

	Training and Education[87]	Awareness Training of VRU	Better Licencing (Medical/Health related)	Use of Seatbelt	Proper Use of Helmet
Gender					
Female	195	78	19	30	3
Male	1060	271	84	72	27
Total	**1255**	**349**	**103**	**102**	**30**
Age					
<16	6	16	0	3	3
16-25	282	27	5	22	3
26-35	270	46	1	16	4
36-45	184	47	11	15	4
46-55	209	61	15	14	7
56-65	143	57	17	9	2
66-75	88	34	22	8	5
76-85	63	45	19	13	2
86>	10	15	13	2	0
Not Known[88]	1	0	0	0	
Total	**1255**	**349**	**103**	**102**	**30**
SIMD					
1	267	91	16	20	9
2	216	60	16	18	4
3	296	70	28	29	7
4	237	59	22	18	3
5	133	38	17	3	1
N/A[89]	106	31	4	14	6
Total	**1255**	**349**	**103**	**102**	**30**
Collision Type					
Collision with obstruction	7	1	0	0	0
Cornering - left hand bend	232	34	21	21	5
Cornering - right hand bend	156	15	9	21	2
Crossing (no turns)	24	7	3	1	2
Head on	31	4	8	4	1
Loss of control or off road (straight roads)	167	10	34	30	2
Merging	29	9	2	1	2

[87] This includes training or education to improve hazard perception skill; to reduce risky driving manoeuvre; to reduce risky pre-driving behaviour and to reduce other risky behaviours

[88] The age of one pedestrian involved in a collision was not recorded in any documents. This pedestrian had stepped into the path of a motorcyclist who then lost control, crashing their motorcycle and was fatally injured.

[89] SIMD data was not available for road users with home postcodes out with Scotland

	Training and Education[87]	Awareness Training of VRU	Better Licencing (Medical/Health related)	Use of Seatbelt	Proper Use of Helmet
Misc.	72	19	7	8	7
Overtaking and lane change	145	26	5	4	5
Pedestrian - Attending to vehicle	4	3	0	0	0
Pedestrian - Crossing road	154	126	2	0	0
Pedestrian - Entering or leaving vehicle	4	2	0	0	0
Pedestrian - In road	16	23	1	0	0
Pedestrian - Lying in road	9	12	0	0	0
Pedestrian - Playing	1	1	0	0	0
Pedestrian - Walking facing traffic	2	3	0	0	0
Pedestrian - Walking on footpath	14	2	1	0	0
Pedestrian - Walking with traffic	13	23	0	0	0
Rear end	67	4	7	7	3
Right turn against traffic	108	25	3	5	1
Total	**1255**	**349**	**103**	**102**	**30**
Vehicle Type					
Agricultural vehicle	10	2	0	1	1
Bus/Coach	25	0	0	10	0
Car	769	1	89	80	0
Electric Scooter	1	0	0	0	
HGV	64	0	0	2	0
Minibus	2	0	0	2	0
Mobility scooter	2	2	1	0	0
Motorcycle	220	113	5	0	10
Other	21	0	1	1	1
Pedal Cycle	30	31	0	0	18
Pedestrian	25	196	0	0	0
Quad		1	0	0	0
Van/LGV	87	2	7	6	0
Total	**1255**	**349**	**103**	**102**	**30**
Local Authority					
Aberdeen City	20	8	1		1
Aberdeenshire	110	18	6	11	1
Angus	40	9	6	6	0
Argyll & Bute	58	13	5	4	1

	Training and Education[87]	Awareness Training of VRU	Better Licencing (Medical/Health related)	Use of Seatbelt	Proper Use of Helmet
Clackmannanshire	6	6	2	0	0
Dumfries & Galloway	76	10	7	5	1
Dundee City	11	8	1	1	1
East Ayrshire	29	7	0	2	1
East Dunbartonshire	4	1	0	0	0
East Lothian	19	5	2	2	0
East Renfrewshire	3	1	0	0	0
Edinburgh, City of	47	23	1	2	3
Eilean Siar	5	2	0	1	0
Falkirk	18	6	2	1	1
Fife	70	22	5	6	4
Glasgow City	92	42	5	3	3
Highland	142	27	18	10	4
Inverclyde	14	7	1	2	0
Midlothian	14	3	2	0	0
Moray	42	9	1	8	0
North Ayrshire	15	4	2	1	0
North Lanarkshire	50	15	0	6	1
Orkney Islands	11	2	0	0	1
Perth & Kinross	69	15	13	5	1
Renfrewshire	17	9	2	1	0
Scottish Borders	63	18	2	4	2
Shetland Islands	8	4	0	0	0
South Ayrshire	37	4	6	4	
South Lanarkshire	77	24	7	8	1
Stirling	39	10	3	3	
West Dunbartonshire	10	7	1	1	1
West Lothian	39	10	2	5	2
Total	**1255**	**349**	**103**	**102**	**30**

Appendix K: Top ‘Vehicle’ Countermeasure Application

	Improved occupant secondary safety (relative to current typical level)	AEBS	Distraction monitoring	Intelligent Speed Assistance	Alco-lock
Sex					
Female	122	67	63	11	8
Male	316	289	241	171	60
Total	**438**	**356**	**304**	**182**	**68**
Age					
16-25	85	52	64	65	22
26-35	78	69	53	57	26
36-45	58	56	51	27	12
46-55	59	71	45	21	4
56-65	46	51	43	9	2
66-75	53	36	24	2	1
76-85	41	17	17	1	1
86>	18	4	7	0	0
Total	**438**	**356**	**304**	**182**	**68**
SIMD					
1	65	81	43	40	13
2	71	63	49	32	11
3	111	75	75	41	21
4	99	74	75	39	12
5	45	45	28	18	2
N/A	47	18	34	12	9
Total	**438**	**356**	**304**	**182**	**68**
Collision Type					
Collision with obstruction	4	4	1	0	0
Cornering - left hand bend	103	17	57	44	25
Cornering - right hand bend	71	7	36	32	18
Crossing (no turns)	6	6	3	2	0
Head on	24	1	11	3	3
Loss of control or off road (straight roads)	114	21	76	33	13
Merging	6	7	2	2	0
Misc.	19	21	12	6	4
Overtaking and lane change	29	17	12	20	2
Pedestrian - Attending to vehicle	0	2	1	0	0

	Improved occupant secondary safety (relative to current typical level)	AEBS	Distraction monitoring	Intelligent Speed Assistance	Alco-lock
Pedestrian - Crossing road	0	126	40	18	2
Pedestrian - In road	0	17	2	0	0
Pedestrian - Lying in road	0	15	2	1	0
Pedestrian - Playing	0	1	0	0	0
Pedestrian - Walking facing traffic	0	2	0	0	0
Pedestrian - Walking on footpath	0	0	2	1	0
Pedestrian - Walking with traffic	0	19	4	0	0
Rear end	36	48	29	8	1
Right turn against traffic	26	25	14	12	0
Total	**438**	**356**	**304**	**182**	**68**
Vehicle Type					
Agricultural vehicle	1	0	2	0	1
Bus/Coach	9	22	8	2	0
Car	385	243	236	132	58
HGV	9	28	20	7	0
Minibus	1	1	1	0	0
Motorcycle	0	18	3	34	7
Other	4	2	1	0	0
Van/LGV	29	42	33	7	2
Total	**438**	**356**	**304**	**182**	**68**
Local Authority					
Aberdeen City	5	10	7	4	1
Aberdeenshire	38	18	25	16	3
Angus	19	13	12	8	3
Argyll & Bute	21	10	13	6	3
Clackmannanshire	3	5	2	3	0
Dumfries & Galloway	30	11	19	11	2
Dundee City	1	9	0	2	0
East Ayrshire	12	4	3	3	1
East Dunbartonshire	0	2	1	0	0
East Lothian	8	4	2	2	0
East Renfrewshire	1	0	0	1	0
Edinburgh, City of	7	18	10	8	0
Eilean Siar	2	2	0	0	1
Falkirk	4	5	2	3	0

	Improved occupant secondary safety (relative to current typical level)	AEBS	Distraction monitoring	Intelligent Speed Assistance	Alco-lock
Fife	25	29	16	9	10
Glasgow City	7	44	13	11	4
Highland	64	27	37	23	10
Inverclyde	4	9	0	1	1
Midlothian	7	5	6	2	0
Moray	14	9	12	8	3
North Ayrshire	8	8	5	3	0
North Lanarkshire	14	21	13	11	3
Orkney Islands	4	1	1	3	2
Perth & Kinross	30	15	23	6	3
Renfrewshire	2	10	6	2	1
Scottish Borders	25	6	15	5	3
Shetland Islands	2	4	3	0	0
South Ayrshire	19	6	10	9	4
South Lanarkshire	27	22	21	8	4
Stirling	16	13	12	4	2
West Dunbartonshire	2	5	2	2	0
West Lothian	17	11	13	8	4
Total	**438**	**356**	**304**	**182**	**68**

Appendix L: Reduce Speed Limit – Full Details Of Identified Locations

Road	E	N	Posted Speed Limit	Area Command	Collision Type	Applicable to	Casualty Class
A9	260112	863915	60	North	Loss of control or off road (straight roads)	Van/LGV	Car Occupant
A9	260435	864536	60	North	Rear end	Car	Car Occupant
A9	288556	764317	60	North	Loss of control or off road (straight roads)	Car	Car Occupant
A9	290613	763742	60	North	Rear end	HGV	Car Occupant
A9	299391	749864	60	North	Head on	Car	Car Occupant
A9	299506	749633	60	North	Loss of control or off road (straight roads)	Motorcycle	Motorcycle Occupant
A82	234822	697072	60	West	Loss of control or off road (straight roads)	Motorcycle	Motorcycle Occupant
A82	234457	700276	60	West	Overtaking and lane change	Motorcycle	Motorcycle Occupant
A82	233839	700664	60	West	Right turn against traffic	Car	Car Occupant
A82	260326	838856	60	North	Loss of control or off road (straight roads)	Car	Car Occupant
A82	262363	841616	60	North	Cornering - left hand bend	Car	Car Occupant
A82	235330	688297	60	West	Right turn against traffic	Bus/Coach	Car Occupant
A82	261753	840613	60	North	Collision with obstruction	Car	Car Occupant
A82	235741	691660	60	West	Loss of control or off road (straight roads)	Car & Minibus	Car Occupant
A82	234856	696924	60	West	Right turn against traffic	Motorcycle	Motorcycle Occupant

Appendix M: Add Speed Camera At Locus – Full Details Of Identified Locations

Road	E	N	Posted Speed Limit	Area Command	Collision Type	Applicable to	Casualty Class
A92	375918	765760	60	North	Right turn against traffic	Motorcycle	Motorcycle Occupant
U	320560	670680	30	East	Misc.	Car	Car Occupant
A882	334923	950861	60	North	Cornering - left hand bend	Car	Car Occupant

Appendix N: Add Cycle Lane – Full Details Of Identified Locations

Road	E	N	Posted Speed Limit	Area Command	Collision Type	Applicable to	Casualty Class
A68	338111	666078	60	East	Rear end	Car/Pedal Cyclist	Pedal Cyclist
A82	247352	672860	50	West	Misc.	Car/Pedal Cyclist	Pedal Cyclist
A8	324670	673670	20	East	Loss of control or off road (straight roads)	Minibus/Pedal Cyclist	Pedal Cyclist
A80	269073	669790	50	West	Merging	Car/Pedal Cyclist	Pedal Cyclist
U	325860	670990	30	East	Misc.	Car/Pedal Cyclist	Pedal Cyclist
A862	253288	844104	60	North	Misc.	Car/Pedal Cyclist	Pedal Cyclist
A73	284543	650410	30	West	Crossing (no turns)	Car/Pedal Cyclist	Pedal Cyclist
A8	247082	668595	50	West	Loss of control or off road (straight roads)	Car/Pedal Cyclist	Pedal Cyclist
B9152	287757	809915	60	North	Rear end	Car/Pedal Cyclist	Pedal Cyclist
B6415	330018	674376	30	East	Misc.	HGV/Pedal Cyclist	Pedal Cyclist
A917	350588	700617	60	East	Overtaking and lane change	Car/Pedal Cyclist	Pedal Cyclist
A830	211715	776581	40	North	Overtaking and lane change	HGV/Pedal Cyclist	Pedal Cyclist
A913	333142	717264	60	East	Rear end	Van/Pedal Cyclist	Pedal Cyclist
A814	233618	678277	60	West	Overtaking and lane change	Car/Pedal Cyclist	Pedal Cyclist
A90	412641	840977	60	North	Misc.	Van/Pedal Cyclist	Pedal Cyclist
A6105	381609	654146	60	East	Rear end	Car/Pedal Cyclist	Pedal Cyclist

Appendix O: Add Appropriate Barrier (Vehicle Left Road And Hit Tree) - Full Details Of Identified Locations

Road	E	N	Posted Speed Limit	Area Command	Collision Type	Applicable to	Casualty Class
M9	279657	689358	70	East	Loss of control or off road (straight roads)	Car	Car Occupant
A985	298868	687156	60	East	Cornering - left hand bend	Car	Car Occupant
M9	283668	687473	70	East	Loss of control or off road (straight roads)	Car	Car Occupant
M9	300693	678024	70	East	Loss of control or off road (straight roads)	Car	Car Occupant
A915	332987	697998	60	East	Loss of control or off road (straight roads)	Car	Car Occupant
A915	331671	696876	60	East	Loss of control or off road (straight roads)	Car	Car Occupant
M9	278106	692476	70	East	Loss of control or off road (straight roads)	Car	Car Occupant
A985	302990	686637	60	East	Loss of control or off road (straight roads)	Car	Car Occupant

Appendix P: Add Appropriate Barrier (A82) – Full List Of Identified Locations

Road	E	N	Posted Speed Limit	Area Command	Collision Type	Applicable to	Casualty Class
A82	226724	753728	60	North	Loss of control or off road (straight roads)	Car	Car Occupant
A82	212334	775385	40	North	Misc.	HGV	Pedal Cyclist
A82	262363	841616	60	North	Cornering - left hand bend	Car	Car Occupant
A82	210487	758581	60	North	Cornering - left hand bend	Motorcycle	Motorcycle Occupant
A82	221273	756003	60	North	Pedestrian - In road	Pedestrian	Pedestrian
A82	222846	788482	50	North	Cornering - right hand bend	Car	Car Occupant
A82	247352	672860	50	West	Pedestrian - Crossing road	Pedestrian	Pedestrian
A82	241169	675308	40	West	Loss of control or off road (straight roads)	Car	Car Occupant
A82	233027	732168	60	East	Loss of control or off road (straight roads)	Van/LGV	Van Occupant
A82	215186	777802	60	North	Cornering - left hand bend	Car	Car Occupants
A82	253464	669645	30	West	Pedestrian - Crossing road	Pedestrian	Pedestrian
A82	251936	669997	30	West	Pedestrian - Crossing road	Pedestrian	Pedestrian

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