A needs assessment of road safety in Gloucestershire

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Background

Being able to travel safely is essential for the health, wellbeing and economic strength of our communities. For the past 20 years, national road-safety efforts have focused on reducing the number of people who are killed or seriously injured on our roads. Although there was strong progress between 2000 and 2010, improvements have slowed in many areas since then. Sadly, the risk of serious harm on the roads remains a real and ongoing issue, which is why road safety continues to be a major Public Health priority.

Vision Zero is an international movement that aims to eliminate all deaths and serious injuries caused by transport. It includes a commitment to cutting these incidents by half by 2030, with the long-term goal of reaching zero deaths and serious injuries caused by transport. Gloucestershire is among the local authorities that have adopted this approach. Vision Zero is built on the "Safe System" — a way of designing and managing roads that accepts people will make mistakes on the road, and ensures those mistakes do not result in death or serious harm. The Safe System brings together five key areas: safe roads and roadsides, safe road users, safe speeds, safe vehicles and effective emergency response.

This report uses detailed data to look at road-safety in Gloucestershire and sets out recommendations to help reduce deaths and serious injuries on the county's roads.

Key findings

We used a set of data called STATS-19 which provides information about road traffic collisions in Gloucestershire. Our analysis shows that the number of people killed or seriously injured on Gloucestershire's roads overall has not changed since 2017. The report identifies four groups of road users who face the highest risk of harm. These groups are younger drivers and riders, motorcyclists, pedal cyclists and pedestrians. Across all groups, two themes stand out: the importance of safe road design and the impact of people's behaviour on the roads. A significant difference in risk between

men and women is also evident, with men more likely to be killed or seriously injured on the roads. This difference is also reported in other parts of the country, and developing a better understanding of why we see this will be important in designing effective safety interventions to prevent deaths and serious injuries. The importance of continuing to target the 'Fatal Four' offences of drink and drug driving, speeding, using a mobile phone and seatbelt wearing is also highlighted within this report.

This assessment is intended to be the first step on our journey to having safer roads in Gloucestershire. Further areas of work are suggested to deepen our understanding, including listening to the real-life everyday experiences of people who use the road system. It is also important that organisations work in partnership, because improving road safety is the responsibility of everyone.

Recommendations

These recommendations are about general findings:

Recommendation 1: Focus efforts on reducing serious injuries and deaths among the groups of road users that this needs assessment shows are most at risk.

Recommendation 2: Work out how we will measure progress for each part of the safe-system approach. Decide what information needs to be collected for these measures and how often they should be reviewed to measure our improvement over time.

Recommendation 3: Consider reviewing Gloucestershire County Council's current road safety policy to make sure it matches the findings off this needs assessment.

(Click here to go to key findings for general recommendations)

These recommendations are about addressing knowledge gaps:

Recommendation 4: Carry out further analysis to explore whether people living in more deprived areas of the county are more likely to be seriously injured or killed in road traffic crashes.

Recommendation 5: Carry out work with local communities to understand what everyday life is like for people using the roads. Pay particular attention to those who are most at risk, such as pedestrians, cyclists, and other groups identified as vulnerable.

Recommendation 6: Think about setting up a panel with representatives from different organisations involved in road safety, such as the police and ambulance service, to review fatal road

collisions so we can learn more about how to prevent them. This could be informed by looking at how other local areas already run similar panels and what they've learned from them.

(Click here to go to key findings on knowledge gaps and data considerations)

This recommendation is about monitoring of how many people are killed or injured on the roads:

Recommendation 7: Keep tracking how many people are injured or killed in road traffic collisions each year and use the county's mid-year population figures so the numbers can be fairly compared over time.

(Click here to go to key findings on monitoring of casualty rates)

This recommendation is about differences in risk between men and women:

Recommendation 8: Build a clearer picture of how the risks on our roads differ for men and women, so that safety measures and public messages can be tailored to address those specific needs.

(Click here to go to key findings on casualty sex)

These recommendations are based on the time of day and time of year that road traffic collisions occur:

Recommendation 9: Build a stronger understanding of how to help drivers be aware of and behave more safely around cyclists and motorcyclists, so everyone can share the road safely.

Recommendation 10: Keep supporting training and education that help cyclists build the skills they need to stay safe. It may also be useful to raise awareness of programmes like Bikeability for cyclists and BikeSafe for motorcyclists, especially at times of year when more people are out on bikes or motorbikes.

(Click here to go to key findings on time of day and year)

These recommendations are based on the places where road traffic collisions occur:

Recommendation 11: Use an approach that recognises the differences between rural and urban roads in each district, so that the actions taken are suited to the specific safety challenges of each road type.

Recommendation 12: Look into ways to improve how emergency services and other responders deal with road crashes across the county, paying extra attention to the challenges of reaching and helping people on rural roads.

(Click here to go to key findings on district and road speed limit)

This recommendation is based on the types of road users who are harmed:

Recommendation 13: Work with businesses that use the roads to find out what they are doing well and how everyone can raise safety standards. Also think about how to involve people who use their own vehicles for work, as well as gig-economy drivers and riders, so their needs and experiences are included and addressed.

(Click here to go to key findings on injury-fatality matrix)

This recommendation is based on the causes of road traffic collisions:

Recommendation 14: Keep focusing on reducing the "fatal four" driving offences while also identifying specific ways to tackle driver mistakes and unsafe behaviour. It may also help to use established models of how and why people make errors on the road, along with behavioural-science tools which help us understand why we behave the way we do in certain situations and how we can change our behaviour.

(Click here to go to key findings on contributory factors)

This recommendation is about motorcyclists:

Recommendation 15: Look at the results and guidance from Project PRIME in Scotland and think about whether the same approach could work on Gloucestershire's roads.

(Click here to go to key findings on motorcyclists)

These recommendations are about younger drivers and riders:

Recommendation 16: Look at the advanced motorcycle training currently available in the county to see if it properly meets the needs of younger motorcyclists and moped riders. Also think about whether barriers like cost might discourage them from taking part in these important skills courses.

Recommendation 17: Make sure the specific things that put young drivers and riders at higher risk are directly tackled with safety measures designed for them. These measures should also look at how sex can affect driving behaviour and risk-taking on the road.

(Click here to go to key findings on younger driver/riders)

These recommendations are about pedal cyclists:

Recommendation 18: Think about using tools like CycleRAP to strengthen the ongoing checks of cycling routes, with extra attention on busy urban roads, junctions, and roundabouts where risks can be higher.

Recommendation 19: Gloucestershire County Council's road safety policy says that 20mph should be the normal speed in areas where cars mix with vulnerable road users, like pedestrians and cyclists. We should think about whether more roads need their speed limits checked and possibly lowered. These reviews should be guided by ongoing assessments of cycle routes, with the main aim of making cyclists less vulnerable and improving their safety.

(Click here to go to key findings on pedal cyclists)

These recommendations are about pedestrians:

Recommendation 20: Gloucestershire County Council's road safety policy says that 20mph should be the normal speed in areas where cars mix with vulnerable road users, like pedestrians and cyclists. We should think about reviewing speed limits more widely across the road network and work with local communities to find ways to cut traffic levels and reduce reliance on cars.

Recommendation 21: Assess what type of crossings are available and how many there are around the county. We should think carefully about what makes people more or less likely to use different types of crossings and make sure to consider the needs and experiences of a wide range of people.

Recommendation 22: Think about carrying out a check of how easy it is to get around on foot in the parts of the county where the most pedestrians are injured. Use recognised accessibility standards to spot places where the road layout is especially difficult or unsafe for disabled people to move around safely.

(Click here to go to key findings on pedestrians)

Executive summary (Technical version)

The ability to travel safely is a crucial factor in ensuring the health, connection and economic stability of our communities. For the past two decades, national road safety policy has been strongly focussed on reducing the rates of people who are killed or seriously injured on the roads. While steady progress was made overall in reducing casualty rates between 2000 and 2010, since this time further significant advancements have not occurred in many parts of the country. Unfortunately, risk of death and serious injury remain a consistent feature of using the roads, and improving road safety is identified as a key Public Health priority. This report uses a data-driven approach to examine current road safety challenges in Gloucestershire and presents a series of recommendations to guide strategic action aiming to reduce death and serious injury on the roads.

Vision Zero is a global road safety initiative aiming to eliminate all transport-related fatalities and serious injuries within the road system. Central to Vision Zero is a commitment to achieving a 50% reduction on people being killed or seriously injured on the roads by 2030, and to have zero deaths or serious injuries on the roads by 2030. A Vision Zero approach to road safety has been adopted by a number of local authorities including Gloucestershire. Underlying Vision Zero is the concept of the Safe System which is a holistic approach to road management. In the Safe System five key pillars of road system safety (safe roads and roadsides; safe road users; safe speeds; safe vehicles; post-crash response) work together as one to anticipate human error and minimise its consequences. The implementation of a Safe System approach is generally considered to be a prerequisite to achieving Vision Zero.

Analysis shows that overall, there has been little change in the numbers of people dying or being seriously injured because of road traffic collisions in Gloucestershire since 2017. Identification of locally relevant key performance indicators alongside the ongoing monitoring of casualty rates will help to make certain that steady progress is made towards achieving Vision Zero going forwards. Four particularly vulnerable road user groups were identified; younger drivers/riders, motorcyclists, pedal cyclists and pedestrians. Specific recommendations relating to each of these groups are made within the needs assessment. The critical role of both road system infrastructure and behaviour of road users within the road system are consistent themes affecting road safety across all vulnerable road user groups. An exploration of how working partnerships can be developed with commercial

users of the road system is warranted to promote optimal safe road use. A stark disparity in sex-based risk on the roads is also highlighted within this report, with men being more likely to die or be seriously injured. This mirrors what is also observed within national data. Understanding and accounting for sex-based differences in road risk will be essential to crafting targeted interventions and addressing unsafe behavioural patterns.

While this work provides a detailed assessment of road safety using STATS-19 data[1] it is intended that this is viewed as the first step in a journey towards better road safety. Additional data insights looking at the role of socioeconomic deprivation in road traffic collision outcomes and exploring the lived experience of those using the road system will add greatly to our depth of knowledge and understanding. This juncture also presents excellent opportunities for strengthening partnership working, recognising that our shared responsibilities and expertise are necessary to bring the whole picture into focus.

The following general recommendations are made:

Recommendation 1: Prioritise for strategic action a reduction in the rate of KSIs among those road user groups identified by this needs assessment as facing a disproportionate burden of serious injury and death within the road system.

Recommendation 2: Identify and develop key performance indicators related to each pillar of the Safe System. This should include consideration of what data should be collected and the time frame over which each indicator is assessed.

Recommendation 3: Consider undertaking an interim review of the road safety policy to ensure strategic alignment with the findings of this needs assessment.

(Click here to go to key findings for general recommendations)

The following recommendations are made based on key findings related to knowledge gaps and further data considerations:

Recommendation 4: Undertake additional data analysis to investigate the association between deprivation and serious injury and death resulting from road traffic collisions in the County.

[1] The STATS-19 dataset contains all personal injuries resulting from road traffic collisions that are reported to the police, and is considered to be the main source of casualty data in Great Britain.

Recommendation 5: Undertake community insights work to better understand the lived experience of those who are using the road system, with a particular focus on vulnerable road users as identified by the hierarchy of road user vulnerability.

Recommendation 6: Consider the formation of a Safe System Fatal Review Panel to augment learning and insight into prevention based on a review of the experience of other Local Authority areas who are currently using Safe System Fatal Review Panels.

(Click here to go to key findings on knowledge gaps and data considerations)

The following recommendation is made based on key findings related to ongoing monitoring of casualty rates:

Recommendation 7: Continue to monitor rates of all types of casualty resulting from road traffic collisions in the county using mid-year population estimates to allow direct comparability across different years.

(Click here to go to key findings on monitoring of casualty rates)

The following recommendation is made based on key findings related to casualty sex:

Recommendation 8: Develop a better understanding of differences in risk between men and women to allow for targeted interventions and communications to address sex-based risk.

(Click here to go to key findings on casualty sex)

The following recommendations are made based on key findings related to time of day and time of year that collisions occur:

Recommendation 9: Develop a better understanding of ways to improve driver awareness and behaviour relating to cyclists and motorcyclists.

Recommendation 10: Continue to support the provision of targeted skills training and education for cyclists. Consider increasing the visibility of training programmes such as Bikeability (for cyclists) and BikeSafe (for motorcyclists) to coincide with likely seasonal increases in the number of pedal cyclists and motorcyclists using the road system.

(Click here to go to key findings on time of day and year)

The following recommendations are made based on key findings related to district and road speed limit:

Recommendation 11: Use a tailored approach to identify strategic options for action that accounts for the specific features and safety challenges of rural and urban road networks within different districts of the county.

Recommendation 12: Explore mechanisms for strengthening post-crash response across the county, with a particular focus on rural road systems.

(Click here to go to key findings on district and road speed limit)

The following recommendation is made based on key findings related to the injury-fatality matrix:

Recommendation 13: Engage with businesses using the road system commercially to identify examples of best practice and explore ways of working towards embedding optimal safety culture and practice. Consider how to engage with grey-fleet drivers and gig-economy workers to ensure they are adequately represented.

(Click here to go to key findings on injury-fatality matrix)

The following recommendation is made based on key findings related to contributory factor analysis:

Recommendation 14: Continue to prioritise a reduction in fatal four offences alongside the identification of targeted interventions to address driver error and driver behaviour. Consider the use of a theoretical model of human failure alongside behavioural science tools to guide options for strategic action and their prioritisation.

(Click here to go to key findings on contributory factors)

The following recommendation is made based on key findings related to motorcyclist casualties:

Recommendation 15: Review the outcome data and installation toolkit relating to Project PRIME in Scotland, and consider if the recommended approach is transferrable to the road system in Gloucestershire.

(Click here to go to key findings on motorcyclists)

The following recommendation is made based on key findings related to younger driver/rider casualties:

Recommendation 16: Review the offer of advanced motorcycle training available in the County to assess if the needs of younger motorcyclist and moped riders are adequately met. Consider the role

of additional barriers such as cost in encouraging younger motorcyclist and moped riders to participate in advance skills training.

Recommendation 17: Ensure that factors that are relevant to generating excess risk among younger drivers and riders are explicitly addressed through targeted interventions for this population group. This should include the consideration of the role of sex relating to road safety behaviours and risk taking.

(Click here to go to key findings on younger driver/riders)

The following recommendations are made based on key findings related to pedal cyclist casualties:

Recommendation 18: Consider the use of tools such as CycleRAP to augment the current rolling programme of cycle route assessments with a specific focus on analysis of urban routes, junctions and roundabouts.

Recommendation 19: The Gloucestershire County Council current road safety policy considers that 20mph should be the accepted speed for drivers in places where vulnerable road users and vehicles mix. Consider the need for additional speed limit reviews across the road network as informed by the rolling programme of cycle route assessments with a specific focus on reducing the vulnerability of cyclists

(Click here to go to key findings on pedal cyclists)

The following recommendations are made based on key findings related to pedestrian casualties:

Recommendation 20: The Gloucestershire County Council current road safety policy considers that 20mph should be the accepted speed for drivers in places where vulnerable road users and vehicles mix. Consider the need for additional speed limit reviews across the road network, and in collaboration with local communities, explore options for supplemental initiatives aimed at reducing traffic volume and car dependency.

Recommendation 21: Undertake a review of the frequency of crossing facilities and the type of crossing facilities available within the county. In particular, consider barriers and facilitators that may either inhibit or promote the use of certain types of crossing facility from the perspectives of a diverse group of pedestrians.

Recommendation 22: Consider undertaking a mobility audit using inclusive mobility standards in areas of the county with the highest proportions of pedestrian casualties to identify areas of the road system that are particularly dangerous for disabled road users to navigate safely.

(Click here to go to key findings on pedestrians)

1. Introduction

1.1 Purpose

A needs assessment involves collating and analysing a range of data and information to gain a 'snapshot' understanding of the needs of a population or community at the time. Findings can be used to make recommendations for service review and planning, address particular issues or challenges, or compare with future data to understand changes that may have occurred.

This document sets out a needs assessment for road safety within Gloucestershire. It's intended purpose is as follows:

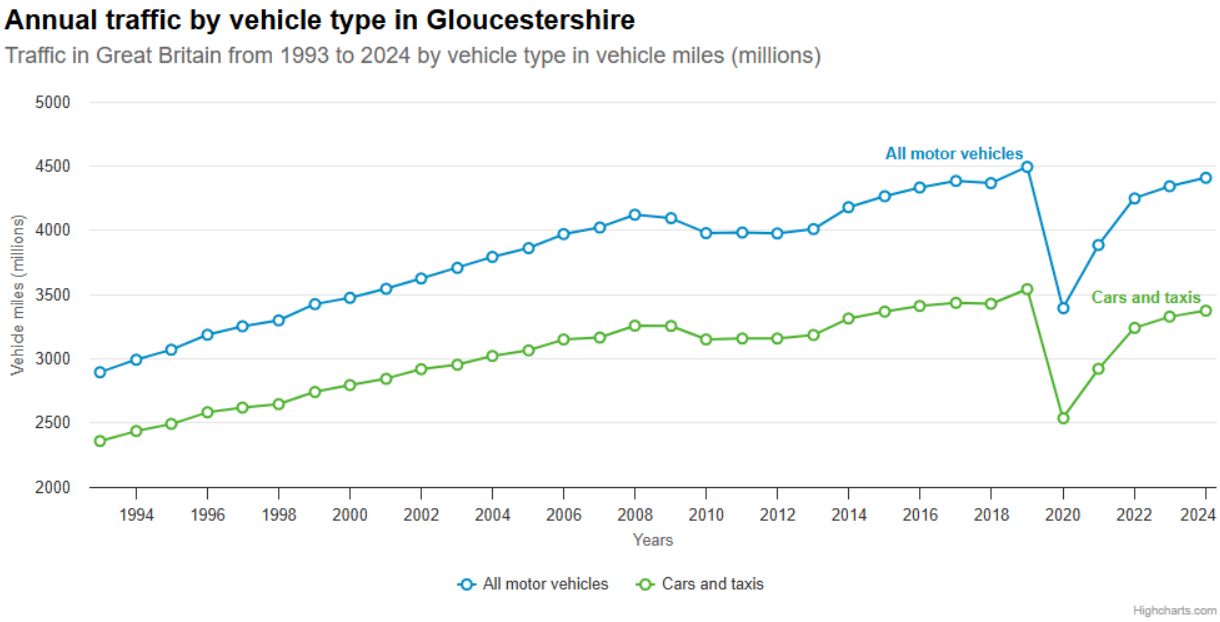
1. To provide a comprehensive data-driven appraisal of the current road safety profile of Gloucestershire.
2. To use this data-driven approach to identify key recommendations to inform the priorities and work of the Road Safety Partnership going forwards.

1.2 Background

The need to travel is an inherent part of modern life, and numerous journeys are undertaken each day by residents of Gloucestershire. Ideally our health and wellbeing should never be compromised by the need to travel, however, it remains a too common occurrence that people are injured or killed on the roads. Improving road safety for all road users therefore remains an urgent priority.

Analysis by the Department of Transport shows that 4.41 billion vehicle miles were travelled within Gloucestershire in 2024, suggesting that as a county it has some of the busiest road network activity in the South West (1). While the use of all motor vehicles decreased in 2020 due to Covid-19 lockdown restrictions, from 2021 onwards there has been a return to pre-Covid levels with a steady increase in motor vehicle traffic on the roads overall since 1993 as shown by Figure 1.

Figure 1. Annual traffic by vehicle type in Gloucestershire (graph taken from Department for Transport Road Traffic Statistics)



Progress towards improvements in road safety is commonly measured and tracked based on the numbers of people who are killed or seriously injured (KSI or KSI casualties) as a result of road traffic collisions. National data shows that in Great Britain in 2023 there were (2):

- 1,624 fatalities, a decline of 5% compared to 2022
- 29,711 killed or seriously injured (KSI) casualties, little change compared to 2022
- 132,977 casualties of all severities, a decline of 2% compared to 2022

The data presented in Table 1 show the cost of road traffic collisions in the UK in 2022 as estimated by the International Transport Forum at the OECD (3).

Table 1. Estimated cost of road traffic collisions in the United Kingdom in 2022

	Unit Cost (GBP)	Total cost (GBP)
Fatalities	2.52 million	4.0 billion
Seriously injured	0.29 million	6.8 billion
Slight injuries	0.03 million	2.4 billion
Property damage costs of non-injury crashes	0.002 million	4.4 billion
Non-fatal crashes not reported to the police		25.6 billion
Total	..	43.2 billion
Total as % of GDP	..	1.4 %

This demonstrates that substantial economic cost that is incurred from road traffic collisions, in addition to the significant human cost.

For the past two decades Government road safety policy and strategy has focussed on reducing the rates of KSI casualties. Progress across all local authority areas in reducing numbers of KSI casualties from road traffic collisions between 2009-2011 and 2017-2019 is shown in Table 2 (4). This comparison highlights that nationally Gloucestershire was one of the least effective local authority areas for casualty reduction.

Table 2. The weakest performing local authorities in England, Wales and Scotland for casualty reduction comparing number of casualties from road traffic collisions in 2017-2019 to 2009-2011.

Rank	In England	%age Change	In Scotland	%age Change	In Wales	%age Change
1.	Torbay	+53%	East Lothian	-10%	Caerphilly	+28%
2.	Devon	+46%	Moray	-20%	Monmouthshire	+27%
3.	Plymouth	+40%	North Ayrshire	-20%	Newport	+25%
4.	Luton	+32%	Edinburgh	-22%	Conwy	+21%
5.	Cornwall	+29%	Midlothian	-22%	Denbighshire	+16%
6.	Gloucestershire	+27%	East Renfrewshire	-24%	Torfaen	+8%
7.	City of London	+22%	West Lothian	-26%	Carmarthenshire	+5%
8.	Barking and Dagenham	+22%	North Lanarkshire	-26%	Powys	+1%
9.	West Sussex	+19%	West Dunbartonshire	-26%	Blaenau Gwent	0%
10.	Surrey	+18%	Glasgow City	-27%	Ceredigion	-1%

The most recent road safety statement published by the Government in 2019 outlines an ambition to develop a new culture of road safety that should last a lifetime, covering every step walked, every bicycle or horse ride, and every mile travelled by vehicle (5). Within this road safety statement is a commitment to reduce avoidable death and injury on the roads through a whole systems approach.

2. Vision Zero and principles of the safe system

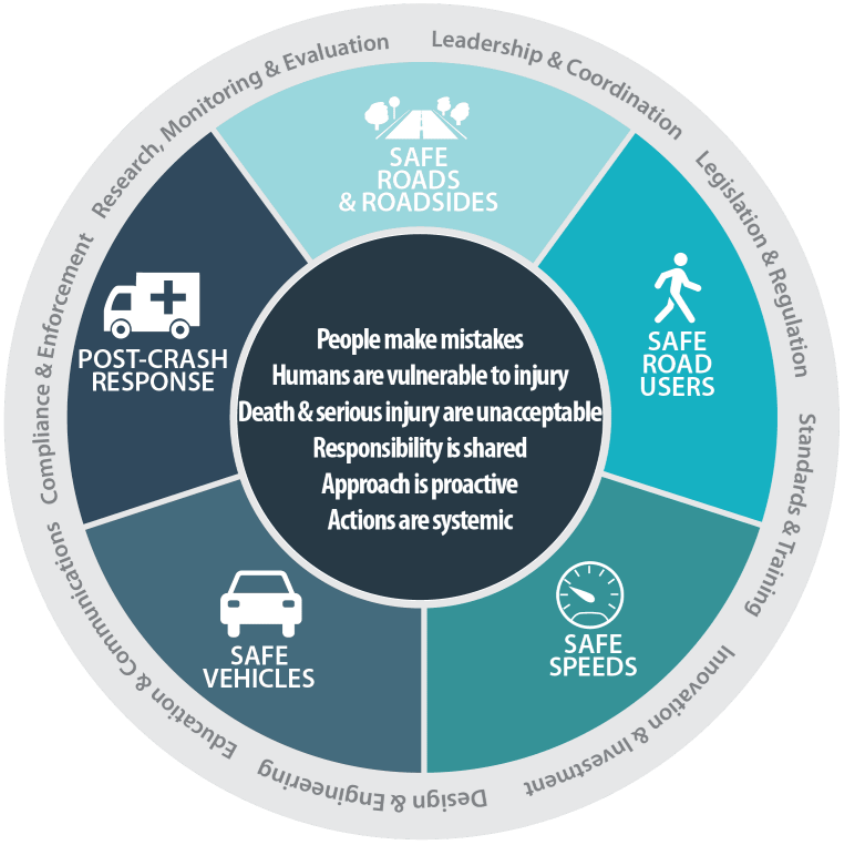
Vision Zero is a global road safety initiative aiming to eliminate all transport-related fatalities and serious injuries within the road system (6). Underlying Vision Zero is the concept of the Safe System which is a holistic approach to road management. In the Safe System five pillars of the road system (safe roads and roadsides; safe road users; safe speeds; safe vehicles; post-crash response) work together as one to minimise risk.

The following principles are integral to Vision Zero and Safe System approaches:

1. Transport-related fatalities and serious injuries are preventable, and no loss of life on the roads is acceptable.
2. Humans make mistakes and road systems should be designed to minimise the consequences of those mistakes.
3. Human bodies are vulnerable and the road system should account for human physical limitations in surviving collisions.
4. Improving road safety is a shared responsibility and all stakeholders are required to participate and take action.
5. A systemic approach to reducing road danger is taken, strengthening all parts of the system, so that where there are inevitable failures in one part of the system, the rest of the system is able to minimise the outcomes.
6. Actions are proactive as risks are identified and controlled before they result in harm.

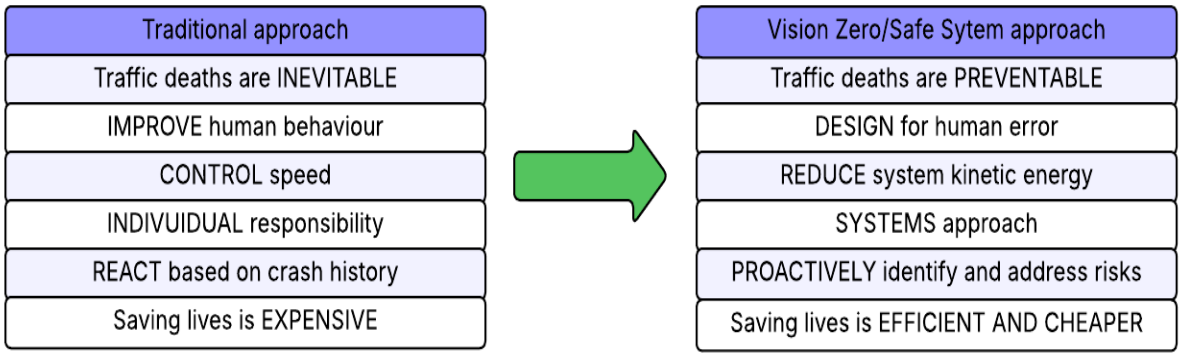
A schematic illustration of the components of the Safe System, and the principles that underpin the Vision Zero and Safe Systems approach is shown in Figure 2 (7).

Figure 2: The five pillars of the safe system and the principles that underpin the Vision Zero and Safe System approach.



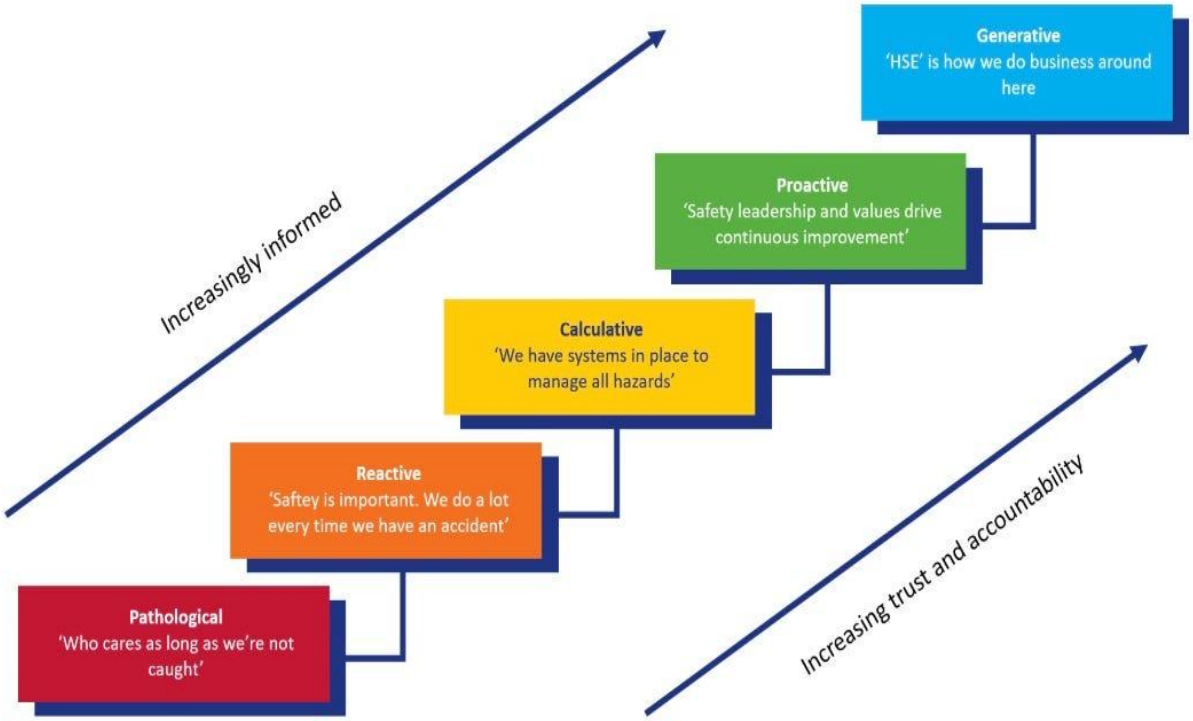
Vision Zero and Safe Systems approaches represent a significant departure from the assumptions and actions of more traditional road safety approaches. The main points of comparison between these approaches are shown in Figure 3 (8).

Figure 3: A comparison of traditional approaches to road safety vs Vision Zero or Safe System approaches to road safety.



The Hearts and Minds Model proposed by Hudson and Parker explains the necessary steps that organisations and systems need to evolve through to reach a state of optimal safety culture (9). This model is shown in Figure 4. Although most commonly applied to workplace health and safety, it is increasingly used as part of road safety to gauge the necessary amount of cultural change within a system. It highlights the need to move from a reactive approach to a proactive approach whereby road safety becomes embedded as part of our core ways of working.

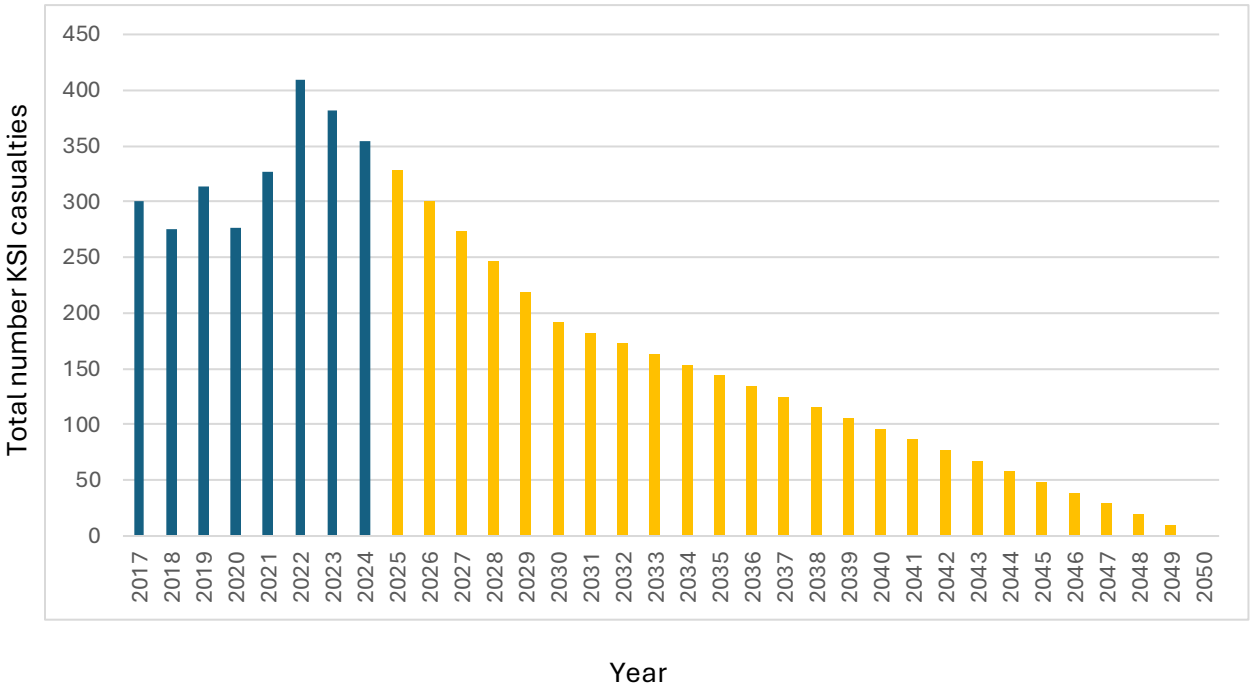
Figure 4. The Hearts and Minds model of optimal safety culture*



**Nb: in Figure 4 the acronym 'HSE' refers to accounting for Health, Safety and Environmental risks.*

Gloucestershire County Council has chosen to adopt a Vision Zero approach within its road safety strategy (10). This is a commitment to achieving a 50% reduction in people being killed or seriously injured on the roads by 2030, and to have zero deaths or serious injuries on the roads by 2050. The graph presented in Figure 5 shows the total number of people who are killed or seriously injured as a result of road traffic collisions in the county in blue for the years for which data are available, and a projection of how numbers of casualties who are killed or seriously injured would need to fall to meet Vision Zero objectives in yellow. This highlights that significant efforts to reduce KSI casualties will be required in or to achieve Vision Zero targets in Gloucestershire.

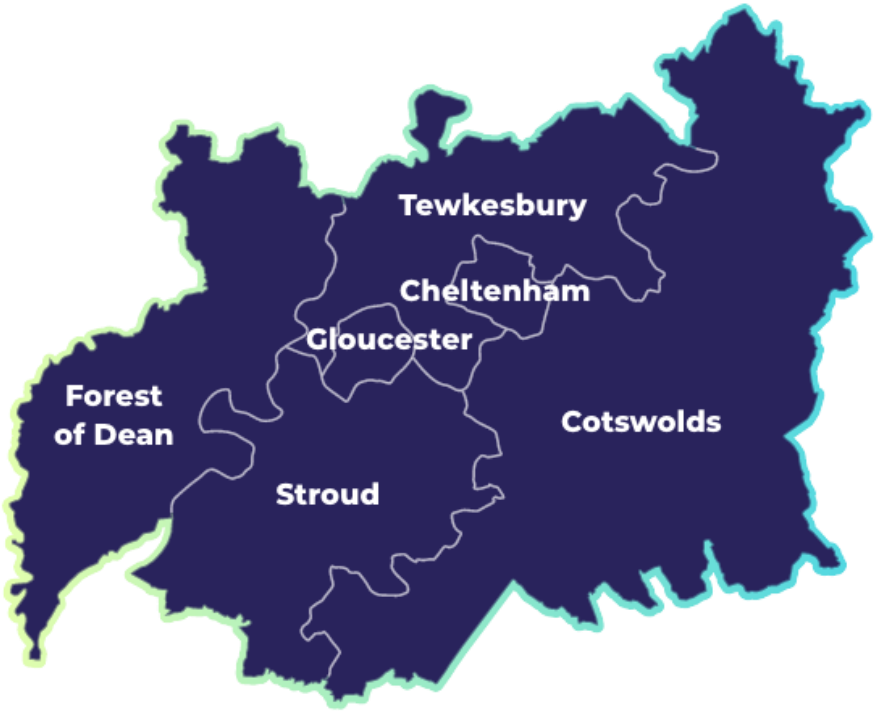
Figure 5. Projection of the necessary reduction in KSI casualties required to achieve Vision Zero targets in Gloucestershire



3. Profile of Gloucestershire

Gloucestershire is an English county situated at the northern edge of the southwest region of the United Kingdom. It covers an area of 1,025 square miles and is essentially a rural country with two urban areas; Gloucester and Cheltenham which lie at the heart of the county. There are six districts, which are the Forest of Dean, Tewkesbury, Stroud, Gloucester City, Cheltenham, and the Cotswolds. The geographical relationship between different districts in Gloucestershire is shown in Figure 6.

Figure 6. Geographical relationship between different districts in Gloucestershire

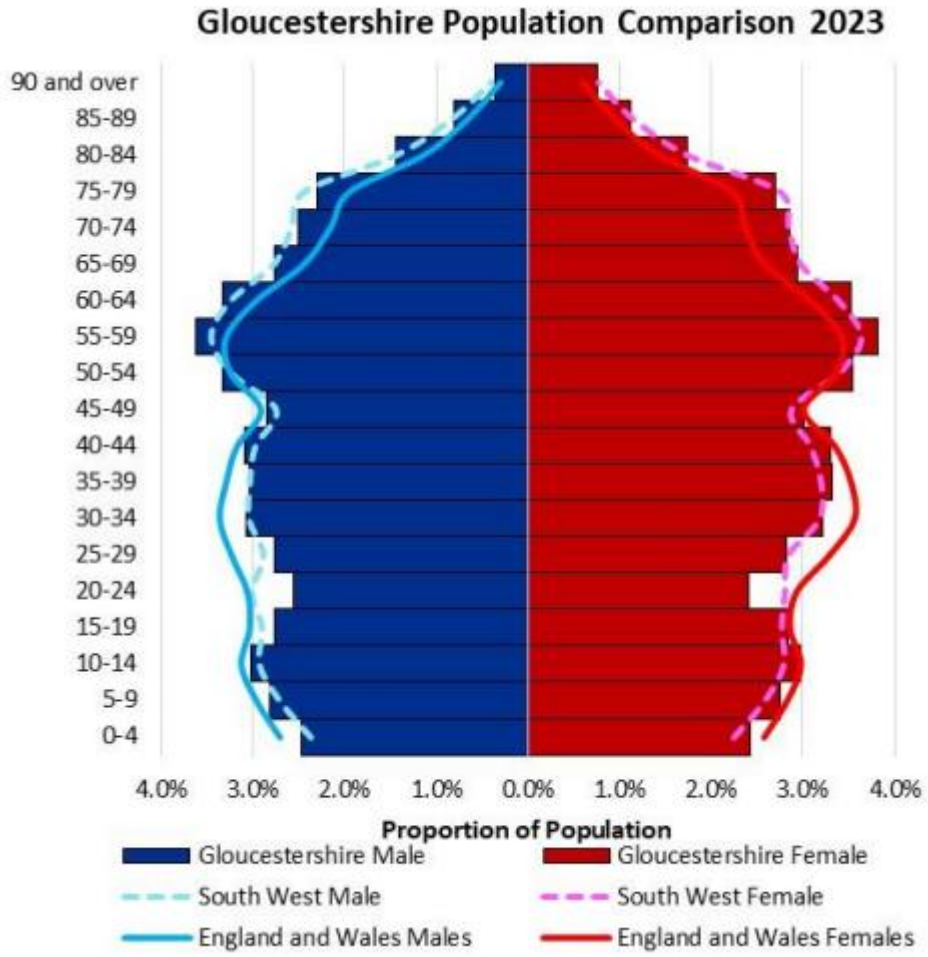


3.1 Population structure

The Office for National Statistics (ONS) estimates that at mid-year 2023 the population of Gloucestershire was 659,276 (11). This is an increase of 1.01% between mid-2022 and mid-2023, which is higher than the South West population growth of 0.77% and in line with the overall England and Wales population growth of 1.01%. Gloucester continues to have the largest population with 134,991 people and Forest of Dean the smallest with 89,104. Between mid-2022-23, Tewkesbury had the highest population growth at 1.92% followed by the Forest of Dean with an increase of 1.33%. All districts saw growth in their population sizes.

The population pyramid shown in Figure 7 illustrates the current structure of the population as well as the sex balance (11). Gloucestershire's population pyramid indicates it has an ageing population, indicated by the wider top half of the pyramid and narrowing base. The overall sex distribution for Gloucestershire is 48.90% males and 52.10% females. In comparison, England and Wales has a 49.03% share of males and the South West has a 48.96% share of males.

Figure 7. Population pyramid of Gloucestershire, the South West and England and Wales using mid-2023 population estimates



3.2 Disability

Under the Equality Act (2010) a person has a disability if they have a physical or mental impairment which has a substantial and long-term adverse effect on that person's ability to carry out normal day-to-day activities. This is consistent with the Census definition of a limiting long-term health problem.

According to the 2021 Census 16.8% of Gloucestershire residents reported a disability under the Equality Act. 6.4% reported that their activities were limited ‘a lot’ and 10.4% reported their activities were limited ‘a little’. At a household level, 30.3% of households had at least one person with a long-term limiting health problem or disability (11).

Dementia is one of the main causes of disability among older people. Estimated projections suggest that in 2025 there will be approximately 11,249 people aged 65 years and older living with dementia in Gloucestershire (11). The proportion of people living with dementia increases with age, so given the ageing population of the county, the number of people living with dementia is likely to increase in the future.

3.3 Deprivation

The Index of Multiple Deprivation 2019 (IMD) is the official measure of relative deprivation for small areas (also called Lower Super Output Areas or LSOAs) in England[2]. The IMD describes deprivation across five quintiles, with quintile 1 the most deprived LSOA areas and quintile 5 representing the most affluent LSOA areas.

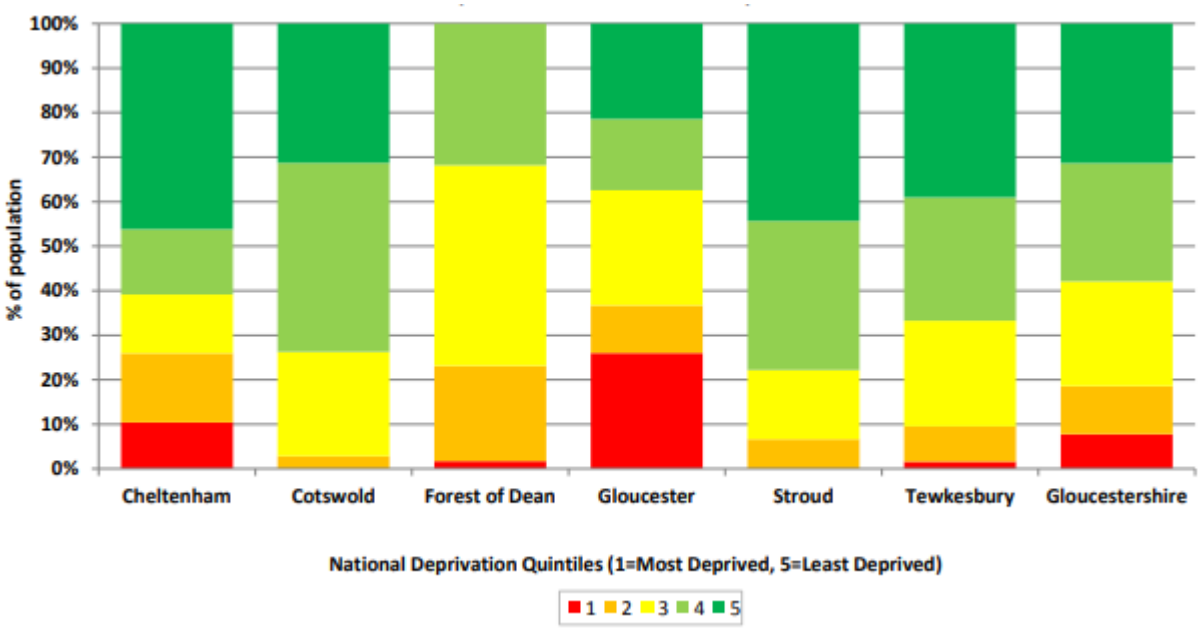
Compared with other areas of England, Gloucestershire is a relatively affluent county. There are however 12 areas of Gloucestershire om the most deprived nationally for the overall IMD, and relatively higher level of deprivation seen in urban areas of the county compared to rural areas. This data is presented in Table 3 and Figure 8 (12).

[2] IMD 2019 is used in this report as it was the most up-to-date version available at the time of analysis. IMD 2019 has now be superseded by IMD 2025, which may mean that some information presented in this report no longer matches information presented elsewhere in the public domain.

Table 3. Overall Index of Multiple Deprivation 2019 - The 12 areas of Gloucestershire in the most deprived 10% nationally (* did not appear in 2015 IMD)

LSOA	District	National Rank (1 most deprived)
Podsmead 1	Gloucester	621
Matson and Robinswood 1	Gloucester	735
Westgate 1	Gloucester	1,183
Kingsholm and Wotton 3	Gloucester	1,456
Westgate 5	Gloucester	1,579
St Mark's 1	Cheltenham	2,178
Moreland 4	Gloucester	2,221
St Paul's 2	Cheltenham	2,368
Cinderford West 1 *	Forest of Dean	2,729
Tuffley 4 *	Gloucester	2,801
Matson and Robinswood 5	Gloucester	2,948
Barton and Tredworth 4	Gloucester	3,126

Figure 8. Overall Index of Multiple Deprivation 2019 – Percentage of Population by Quintile and District



4. Data Analysis

4.1 Data sources

The data source used in this needs assessment is the STATS19 dataset which consists of data collected by the police attending the scene of any road traffic collision using a standardised data collection form. The STATS19 dataset is compiled by the Department for Transport and is considered the main source of data about road traffic collision in Great Britain, and is widely used for road safety research, policy development and transport planning. The Department for Transport stipulates that STATS19 collision data should only consist of collisions that were recorded by the police, occurred on a public highway, involved a human death or personal injury, involved one or more vehicles and were notified to the police within 30 days of occurrence (13).

The information recorded within STATS19 includes:

- **Collision details**: Date, time, location (with geographic coordinates), road type, weather, lighting, and road surface conditions.
- **Casualty information**: Age, sex, severity of injury, mode of transport, and whether the person was a driver, passenger, pedestrian, etc.
- **Vehicle data**: Type of vehicle, manoeuvre at the time of the crash.
- **Contributory factors**

Within STATS19 casualty severity is classified as Killed, Serious (Very, Moderate or Less serious) and Slight.

4.2 Data Methods

Descriptive statistics (numbers and proportions) were used to describe the demographic characteristics of casualties and collisions, including by casualty severity classification and road user type. Where it was deemed appropriate, data was disaggregated to district level. Differences in the proportion of collisions occurring in spring and summer months compared to autumn and winter months were assessed using chi-squared test[3] for difference in proportions, and results were taken to be statistically significant at the 5% confidence level[4]. Spring/Summer months were considered to be April to September inclusive, and Autumn/Winter months were considered to be October to

[3] The chi-squared test is a type of statistical test that allows us to compare differences between two or more groups.
[4] The 5% confidence level is part of a statistical test that helps assess if the differences between two groups are real or if they are more likely to have come about by chance.

March inclusive. Rates[5] of total casualties, and rates of those killed, seriously or slightly injured were calculated per 100,000 population using ONS mid-year population estimates as the denominator for the relevant year. The rate of KSI casualties per 100,000 population was calculated for each population age band using ONS mid-year age-band specific population estimates for 2023 as the denominator (ref). The 95% confidence interval was estimated for all rates calculated[6].

To investigate contributory factors, the 78 contributory factor codes included within the STATS19 dataset were assigned to one of ten thematic groups. The proportion of times that one or more codes relating to one of the thematic groups was assigned to a collision in the dataset was calculated for all collisions categorised as fatal or serious (indicating that at least one casualty died or was seriously injured). Pedestrian specific contributory factor codes were used when investigating factors associated with pedestrian casualties. Codes relating to collision type and manoeuvres undertaken at the time of a collision were assigned to one of four categories. Codes were not considered to be mutually exclusive, and the proportion of times one or more codes relating to one of the four categories was assigned to a casualty was calculated.

4.3 Limitations

The main limitations of STATS19 are as follows:

- There is no obligation for members of the public to report all personal injury collisions to the police. This means that many minor collisions and those not resulting in personal injury remain unrecorded. While comparisons between STATS19 and ONS death registration data suggests that very few, if any, road traffic collision fatalities are not included in the dataset, comparison with hospital data and insurance claims data suggest that a much higher proportion of non-fatal casualties are not known to the police. The implication of this is that there may parts of the road network that have a large number of minor collisions that are not easily identifiable from STATS19 data alone. From the perspective of building a safe system, understanding these types of collisions is as important as understanding collisions resulting in death and serious injury as they are acting as a 'red flag' indicating safety failure.

[5] Rates of casualty by type were calculated as this is the most accurate way to look at changes over time, and also allows for direct comparison between different groups of the population.
[6] The 95% confidence interval provides a range of number (upper and lower estimate) within which the true result value may lie. If the confidence interval is narrow we can be more confident that the result is accurate.

- There has been some historical concern about under-reporting of some casualty types within the STATS19 dataset, with collisions involving cyclists being most likely to be affected. Collisions involving at least one motorised vehicle are often more consistently recorded. The implication of this is that there may be a higher burden of both cyclist casualties, and pedal cycle collisions resulting in pedestrian casualties than the data currently shows.
- The severity of injury recorded within the STATS19 dataset is based on police assessment at the scene, which may differ from medical evaluation undertaken at a later time point. The implication of this is potential for misclassification, especially between "serious" and "slight" injuries. Inconsistences in injury classification may also make assessment of trends in casualty numbers over time more challenging to interpret.
- While STATS19 captures a large amount of structured data, it may not always reveal the full picture as to why a collision occurred. Additional information gathered from subsequent deep-dive collision investigations in addition to qualitative data insights may provide additional relevant contextual information relating to road safety issues.
- It was not possible to include an assessment of the socioeconomic status of casualties or the distance that a collision occurred from the casualty's home address due to the availability of partial postcodes only within the dataset. National data and academic literature shows both a relationship between deprivation and injury risk from road traffic collisions, and that many collisions occur on roads close to home.

5. Data findings

5.1 Rates and temporal trends for casualties resulting from road traffic collisions

The rate of total casualties per 100,000 population for road traffic collisions for each year of complete data is shown in Figure 10. The rate of KSI per 100,000 population for road traffic collisions for each year of complete data is shown in Figure 10 and the rate of casualties per 100,000 population for road traffic collisions for each year of complete data by casualty type (fatality; serious injury; slight injury) is shown in Figure 11, 12 and 13 respectively.

Figure 9. Rate of total casualties per 100,000 population for RTCs each year of complete data

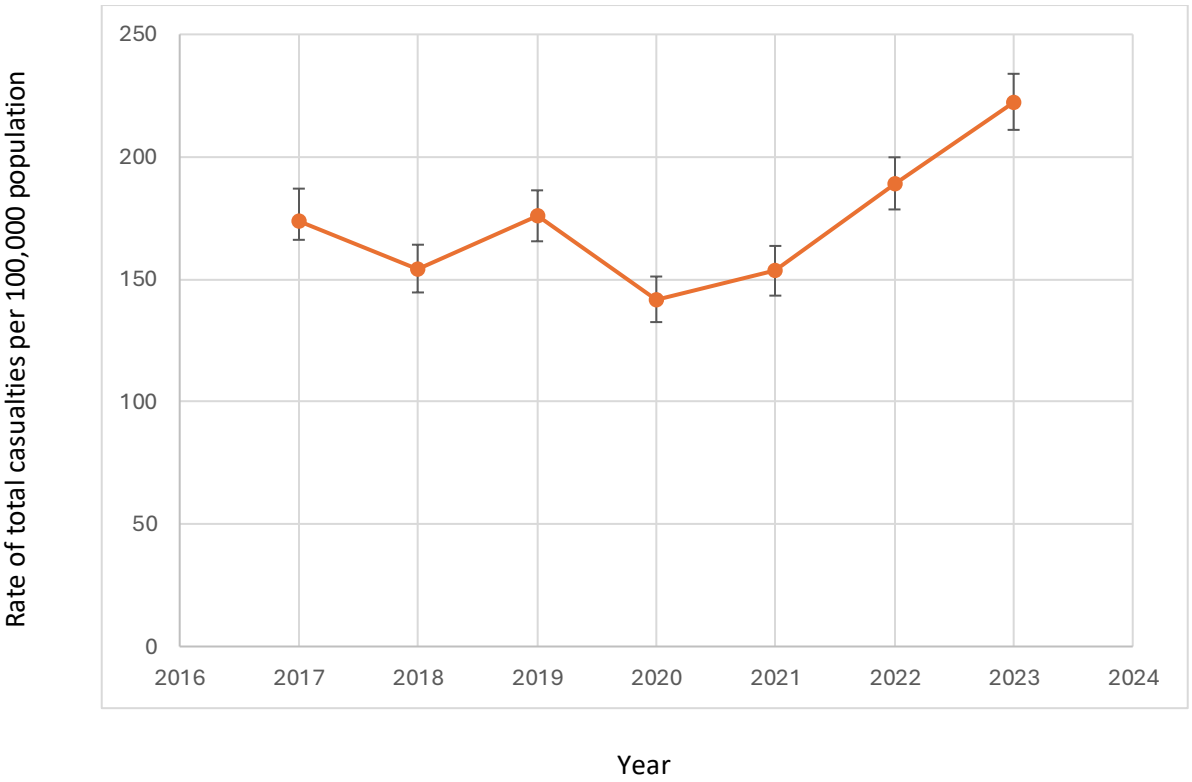


Figure 10. Rate of KSI per 100,000 population for RTCs for each year of complete data

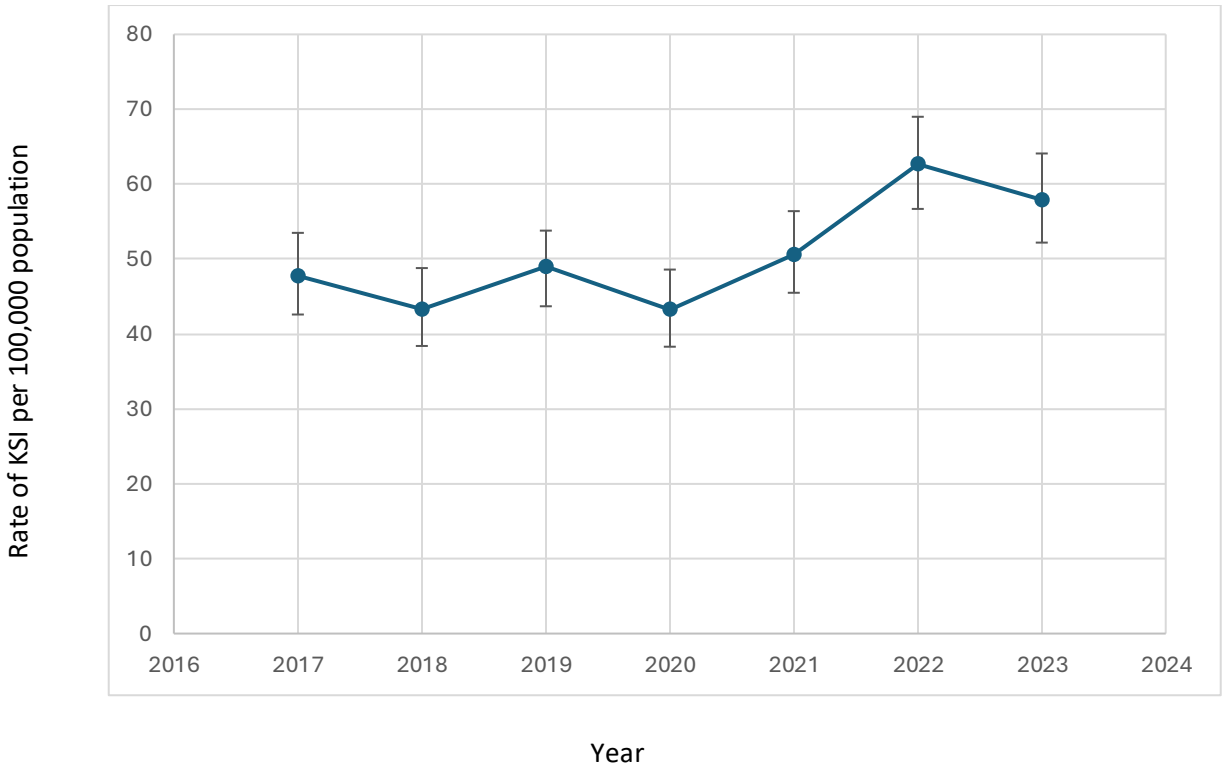


Figure 11. Rate of fatalities per 100,000 population for RTCs for each year of complete data

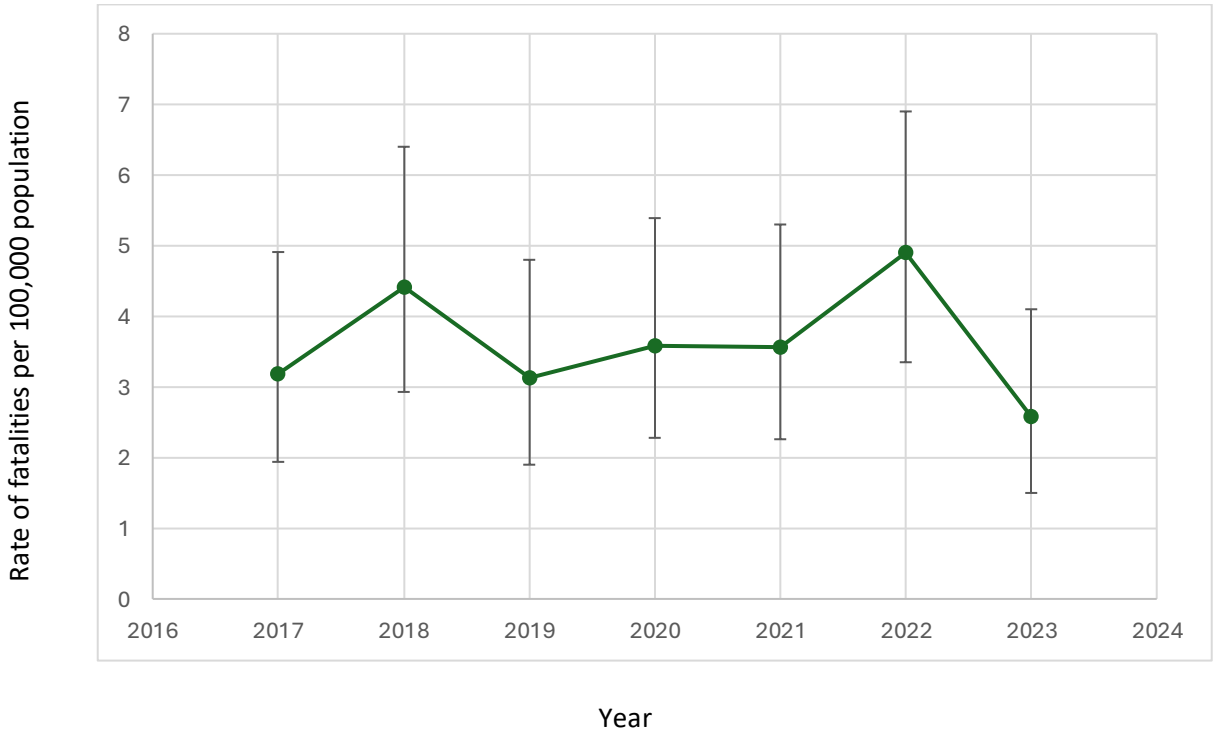


Figure 12. Rate of serious injuries per 100,000 population for RTCs for each year of complete data

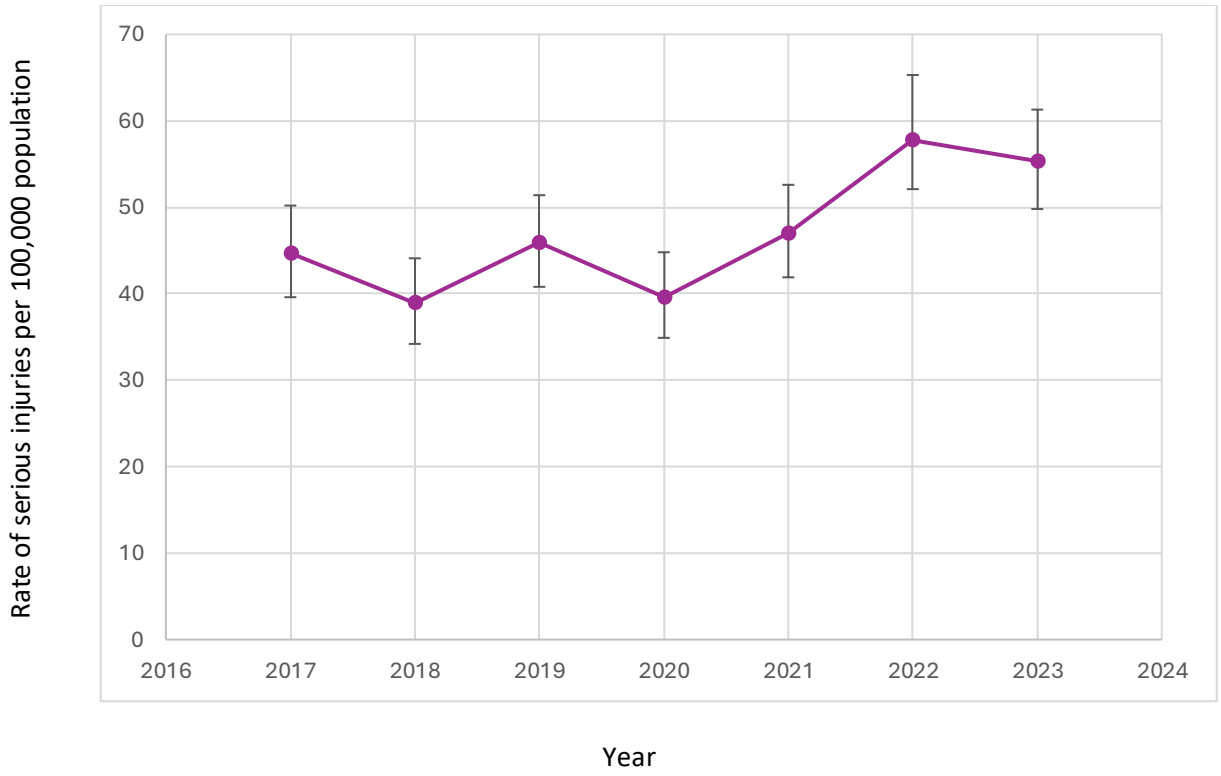
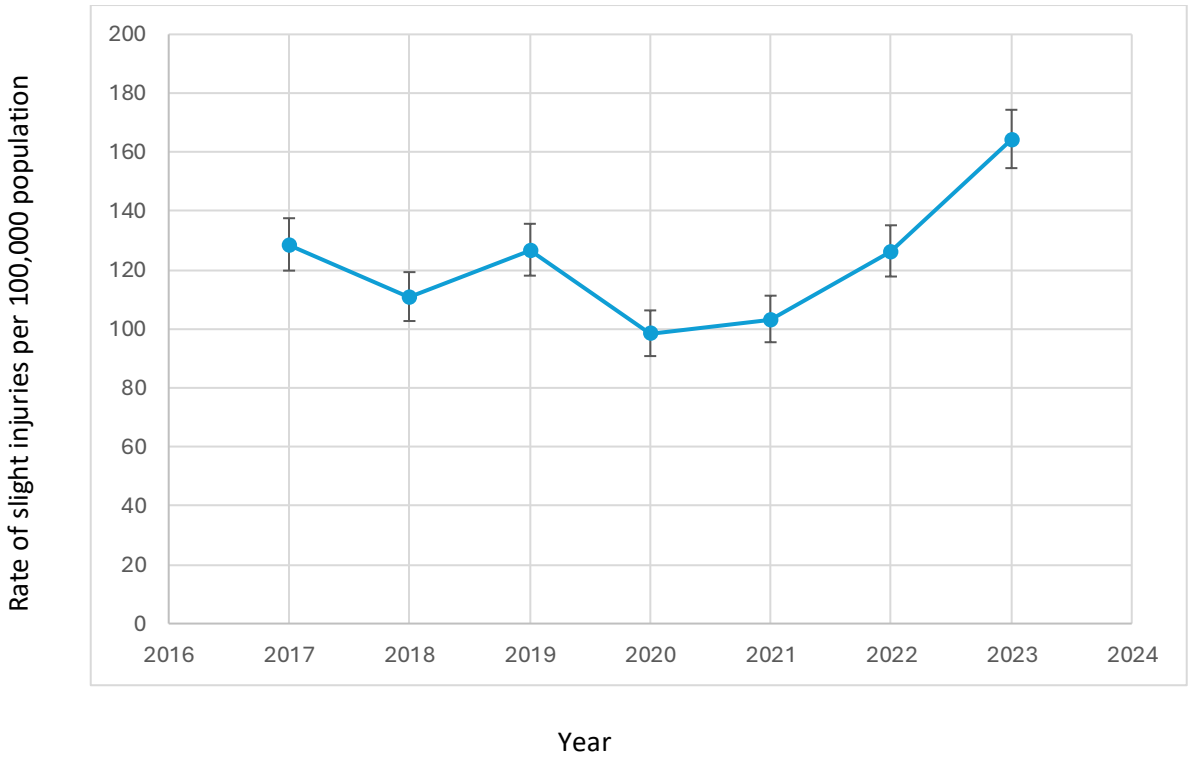


Figure 13. Rate of slight injuries per 100,000 population for RTCs for each year of complete data



Overall, the rate of total casualties is observed to increase across the time period for which data was available. This increase in rate was particularly apparent for the years 2022 and 2023, with the rate of total casualties in 2023 being statistically significantly higher in 2023 compared to all other years. The increase in the rate of total casualties appears to be driven by an increase in the rate of slight injuries which was also observed to increase in later years. Similarly to the rate of total casualties, the rate of slight injuries was statistically significantly higher in 2023 compared to all other years. In contrast to trends described for total casualties and slight injuries, the rate of KSI did not appear to significantly change across the time period for which data was available.

5.2 Demographic profile of casualties

5.2.1 Age

The median[7] age of all casualties arising from RTCs was 39 years (interquartile range[8] 28 years), and the median age of KSI casualties arising from RTCs was 40 years (interquartile range 40 years). The

[7] The median is the middle number in a group of numbers when they are put in order from smallest to largest.
[8] Interquartile range is a measure of how spread out the data is. It is calculated by subtracting the value of the data at the 25th centile from the value of the data at the 75th centile.

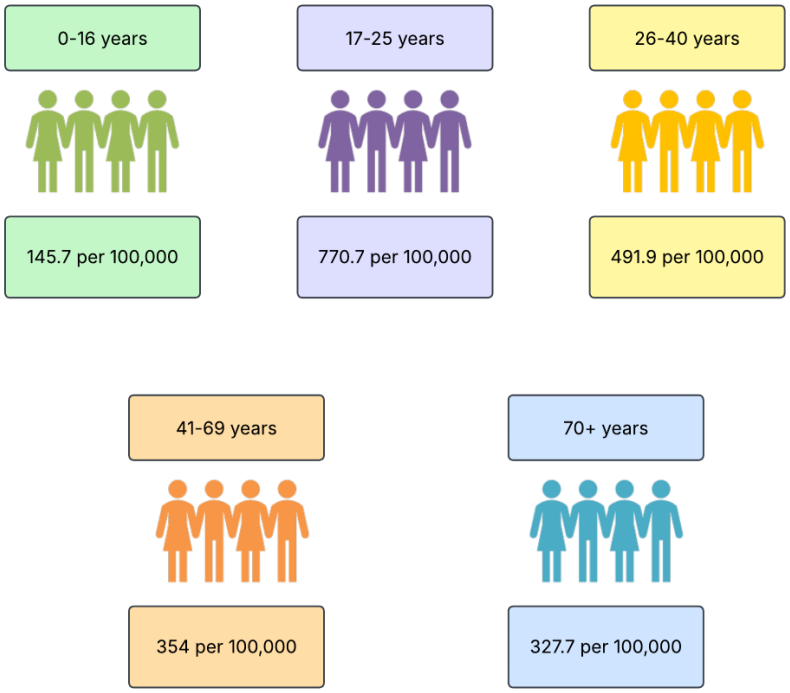
rate of KSI per 100,000 population was calculated for each population age band as shown in Table 4 and Figure 14.

Table 4. Rate of KSI per 100,000 population for each population age band

Age band	Killed or seriously injured (n)	ONS population estimate for age band	Killed and seriously injured		Killed		Seriously injured	
			Rate	95% confidence interval	Rate	95% confidence interval	Rate	95% confidence interval
0 – 16 years	177	121,511	145.7	125 to 168.8	2.47	0.51 to 7.2	143.2	122.7 to 161.1
17 – 25 years	469	60,856	770.7	702.5 to 843.7	46.0	30.6 to 66.5	724.7	658.6 to 795.6
26 – 40 years	585	118,915	491.9	452.9 to 533.5	27.8	19.1 to 39.0	464.3	426.3 to 504.6
41 – 69 years	867	244,891	354.0	330.9 to 378.4	28.6	22.3 to 36.1	325.5	303.2 to 348.9
70+ years	349	106,493	327.7	294.2 to 364	33.8	23.7 to 46.8	293.9	262.3 to 328.3

The rate of KSI was observed to be highest among those aged 17 to 25 years followed by adults aged 26 to 40 years. There was no significant difference between the rate of KSI among adults aged 41 – 68 years and those aged 70 and above. When categorised by severity of casualty, those aged 17 to 25 years old remained at highest risk of both being killed or seriously injured as a result of RTCs.

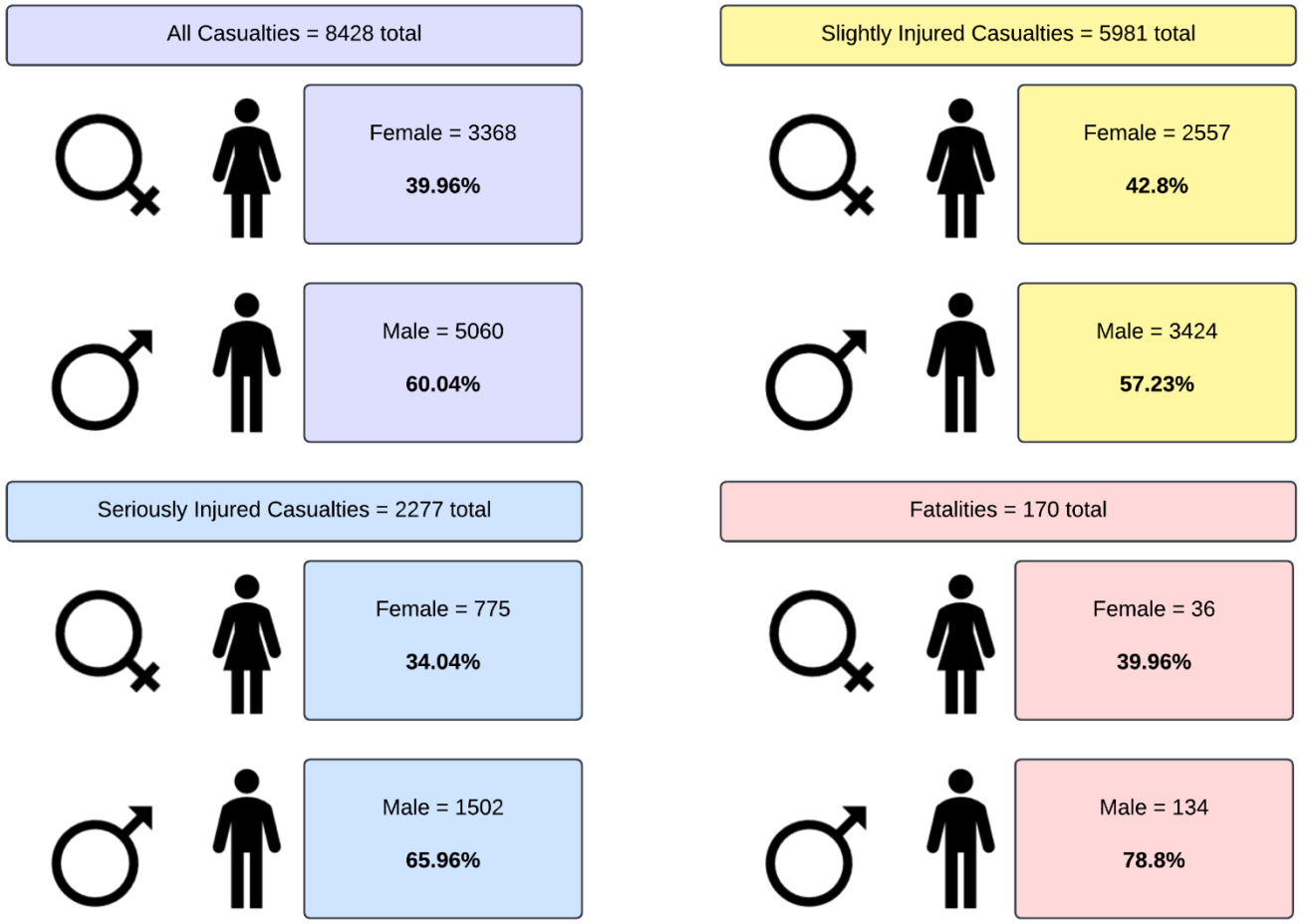
Figure 14. Rate of KSI per 100,000 population for each population age band



5.2.2 Sex of casualty

The proportion of casualties for all RTCs, and by categorisation of severity of casualty was assessed by recorded sex of the casualty and is shown in Figure 15.

Figure 15. Proportion of all casualties by casualty type for road traffic collisions by recorded sex of the casualty



Overall, a higher proportion of male casualties occurred as a result of RTCs than female casualties, with 60% of all casualties being male and 40 % of all casualties being female. There was a marked gradient observed with regard to casualty severity and sex. 57.2% of slight injuries were among male casualties, 66% of serious injuries were among male casualties, and 78.8% of fatalities were among male casualties.

5.3 Time of year

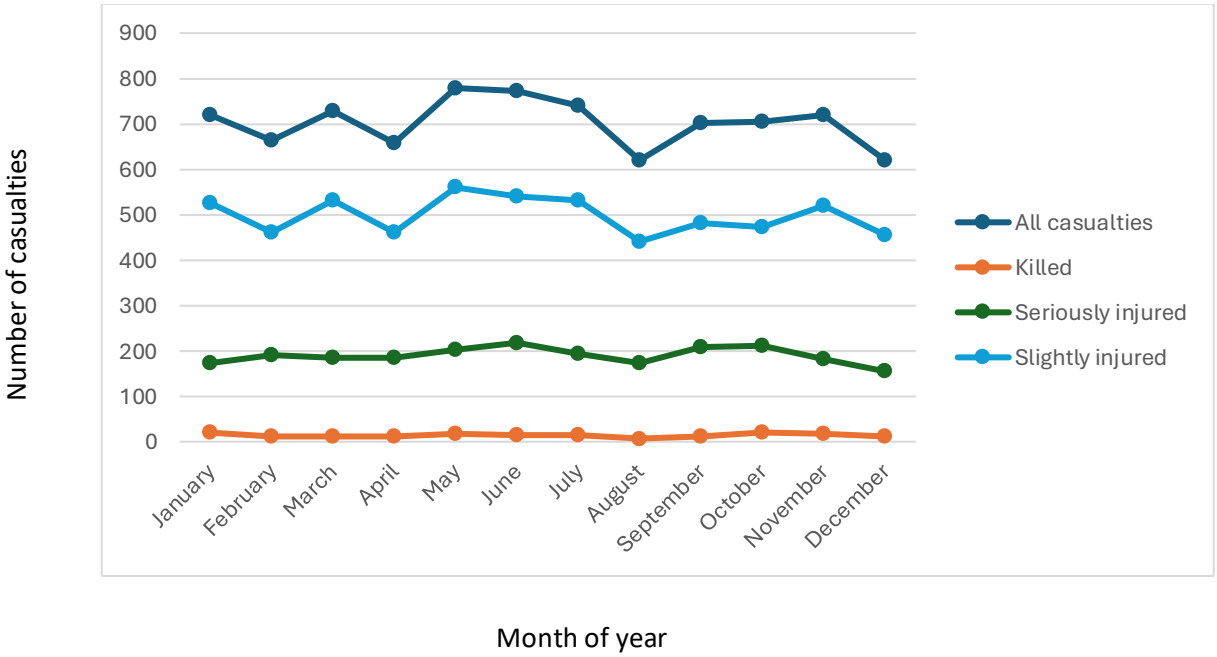
The number of all casualties occurring across the different months of the year was assessed as shown in Table 5 and Figure 16. There is very little variation observed in total casualty numbers across any month of the year. 49.3% of all casualties resulted from RTCs in the Autumn and Winter months, and 50.7% of all casualties resulted from RCTs in the Spring and Summer months, and this was not a statistically significant difference at the 5% confidence level (p-value for differences in proportions = 0.06).

A similar pattern was observed for fatalities with 52.9% of fatalities occurred in Autumn and Winter months, and 47.1% of fatalities occurred in Spring and Summer months. This was not a statistically significant difference at the 5% confidence level (p-value for differences in proportions = 0.2). For casualties classified as seriously injured, 48.3% resulted from RTCs in the Autumn and Winter months and 51.7% resulted from RTCs in the Spring and Summer months. This difference in proportions was significant at the 5% confidence level (p-value for differences in proportions = 0.02) meaning that serious injuries as a result of RTCs are more likely to occur in the Summer and Spring months.

Table 5. Number of casualties resulting from RTCs by month of year

	All casualties	Killed	Seriously injured	Slightly injured
January	721	20	174	527
February	664	12	191	461
March	727	11	184	532
April	659	13	186	460
May	779	17	202	560
June	772	15	218	539
July	741	15	193	533
August	620	7	172	441
September	701	13	207	481
October	704	19	212	474
November	720	17	183	520
December	620	11	155	454

Figure 16. Number of casualties resulting from RTCs by month of year for all casualties and by casualty severity



5.4 District and road speed limit

The proportions of all casualties resulting from RTCs across different districts of Gloucestershire, and within district by speed limit of the road where the RTC occurred is shown in Table 6. The proportion of all KSIs resulting from RTCs across different districts of Gloucestershire, and within district by speed limit of the road where the RTC occurred is shown in Table 7. The district with the overall highest proportion of casualties (for all casualties and for KSI casualties) is highlighted in blue. Within each district the road speed limit with the highest proportion of all casualties and KSIs is highlighted in red.

Table 6. Proportions of all casualties resulting from RTCs across different districts of Gloucestershire, and within district by speed limit of the road where the RTC occurred

District	Casualties for all RTCs		Road speed 20		Road speed 30		Road speed 40		Road speed 50		Speed limit 60mph		Road speed 70	
	n	%*	n	%**	n	%**	n	%**	n	%**	n	%**	n	%**
Gloucester	1,546	18.3	107	6.9	979	63.3	353	22.8	28	1.8	50	3.2	29	1.9
Stroud	1,357	16.1	72	5.3	417	30.7	221	16.3	159	11.7	350	25.8	138	10.2
Tewkesbury	1,445	17.1	16	1.1	360	24.9	196	13.6	362	25.1	310	21.5	201	13.9
Cotswold	1,858	22.0	40	2.2	291	15.7	102	5.5	233	12.5	1,106	59.5	86	4.6
Cheltenham	1,094	13.0	15	1.4	855	78.2	184	16.8	6	0.5	26	2.4	8	0.7
Forest	1,128	13.4	25	2.2	336	29.8	109	9.7	259	23.0	380	33.7	19	1.7

** Proportion of total n=8428*

*** Proportion of total n for district*

Table 7. Proportions of all KSIs resulting from RTCs across different districts of Gloucestershire, and within district by speed limit of the road where the RTC occurred

District	Killed and seriously injured		Road speed 20		Road speed 30		Road speed 40		Road speed 50		Speed limit 60mph		Road speed 70	
	n	%$	n	%$$	n	%$$	n	%$$	n	%$$	n	%$$	n	%$$
Gloucester	384	15.7	22	5.7	231	60.2	107	27.9	4	1.0	13	3.4	7	1.8
Stroud	396	16.2	14	3.5	29	7.3	64	16.2	55	13.9	108	27.3	35	8.8
Tewkesbury	391	16.0	3	0.8	94	24.0	46	11.8	102	26.1	92	23.5	54	13.8
Cotswold	653	26.7	10	1.5	110	16.8	36	5.5	89	13.6	386	59.1	21	3.2
Cheltenham	291	11.9	5	1.7	238	81.8	40	13.7	0	0.0	8	2.7	0	0.0
Forest	332	13.6	5	1.5	88	26.5	36	10.8	73	22.0	122	36.7	8	2.4

$ Proportion of total n=2277

$$ Proportion of total n for district

Overall, the highest proportion of all casualties resulting from RTCs occurred in Cotswold district (22%). This was followed by Gloucester (18.3%), Tewkesbury (17.1%), and Stroud (16.1%), with the lowest proportions in Forest (13.4%) and Cheltenham (13%). A similar distribution was observed for KSIs resulting from RTCs with the highest proportion occurring in Cotswold district (26.7%), followed by Stroud (16.2%), Tewkesbury (16%), and Gloucester (15.7%) with the lower proportion in Forest (13.6%) and Cheltenham (11.9%).

When disaggregated by speed limit on the road where the RTC occurred, marked differences between the districts were observed. In Cheltenham and Gloucester, a very high proportion of all casualties occurred on roads where the speed limit was 30mph (63.3% of casualties in Gloucester and 72.8% of casualties in Cheltenham). In contrast 59.5% of casualties in Cotswold district were from RTCs occurring on roads where the speed limit was 60mph. A similar pattern was observed for KSIs with the majority of KSIs occurring on 30mph roads in Gloucester and Cheltenham, and on 50 or 60mph roads in all other districts. This finding may to some extent be related to the rural and urban area classification of the different districts and the likely predominant road type within them, with rural roads being more likely to have higher speed limits than roads in urban settings. The number and proportions of KSIs for each district disaggregated by rural-urban area classification is shown in Table 8. The Cotswold district (purple) and Gloucester district (green) are highlighted to illustrate the likely differences in road networks in different areas of the county.

Table 8. Number and proportions of KSIs for each district disaggregated by rural-urban area classification

District	Killed and seriously injured (n)	Number of KSI casualties categorised as occurring in Rural location		Number of KSI casualties categorised as occurring in Urban location	
		n	%*	n	%*
Gloucester	384	0	0.0	385	100.0
Stroud	396	206	52.0	190	48.0
Tewkesbury	391	245	62.7	146	37.3
Cotswold	653	611	93.6	40	6.1
Cheltenham	291	2	0.7	289	99.3
Forest	332	271	81.6	61	18.4

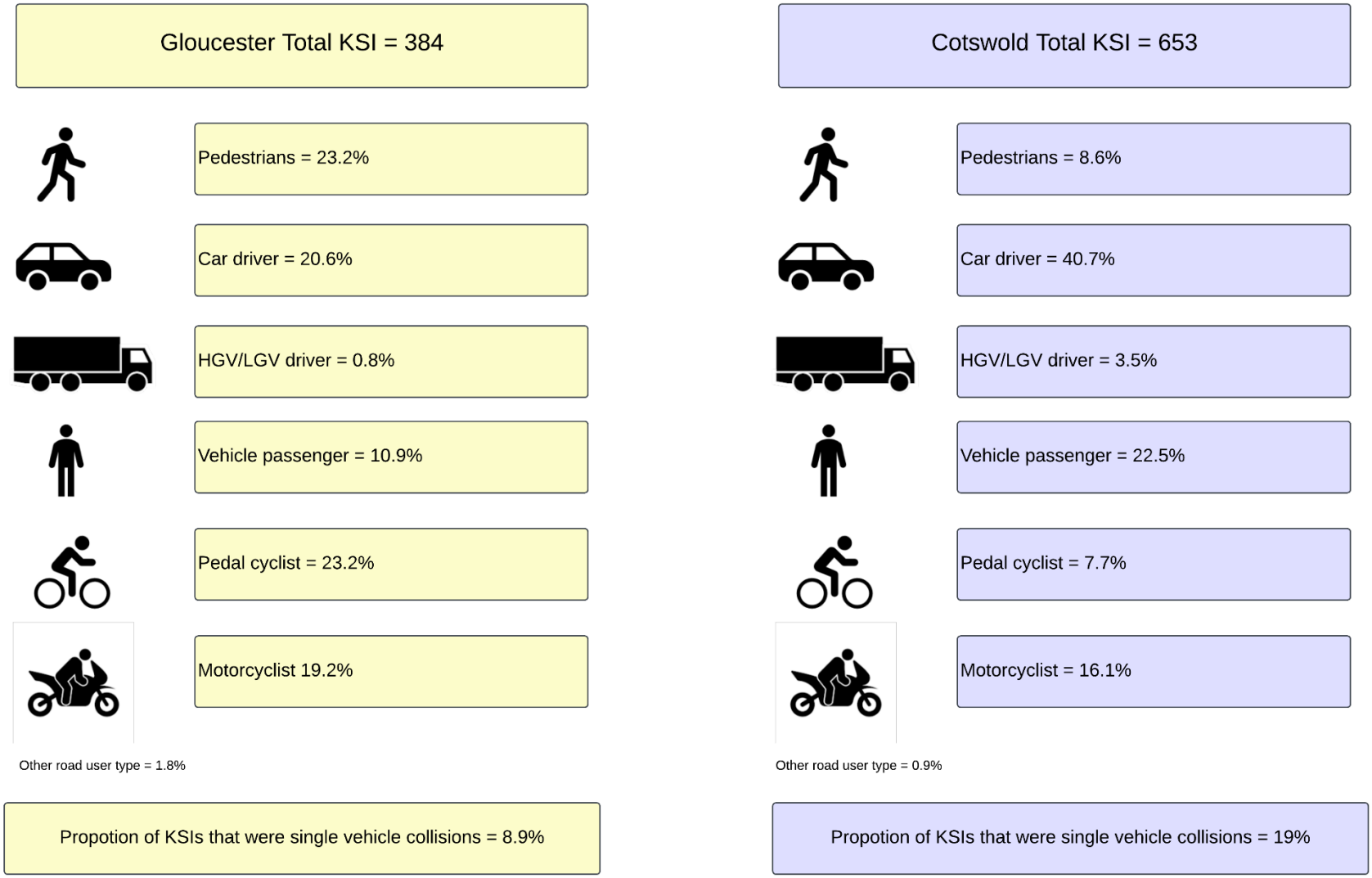
** Proportion of total n for district*

For Gloucester and Cheltenham, the vast majority of KSI casualties occurred in an area that was classified as an urban location, whereas in Forest, Tewkesbury and Cotswold the highest proportions of KSIs occurred in areas classified as being rural locations. This is important because action to

reduce risk of high-speed rural routes, is unlikely to substantively reduce KSI rates in predominately urban settings where the greatest proportions of KSIs are occurring in 30mph zones. The data presented in Table 8 highlights that although Gloucestershire is a largely rural county, 45.4% of KSIs happen in locations that are categorised as being urban. A bespoke approach to reducing KSIs for both rural and urban settings and road types is required.

The need for a bespoke approach is also highlighted by consideration of the proportion of casualties representing different road user types within each district comparing Gloucestershire and Cotswold as examples as shown in Figure 17.

Figure 17. Proportion of casualties representing different road user types for Gloucester and Cotswold districts

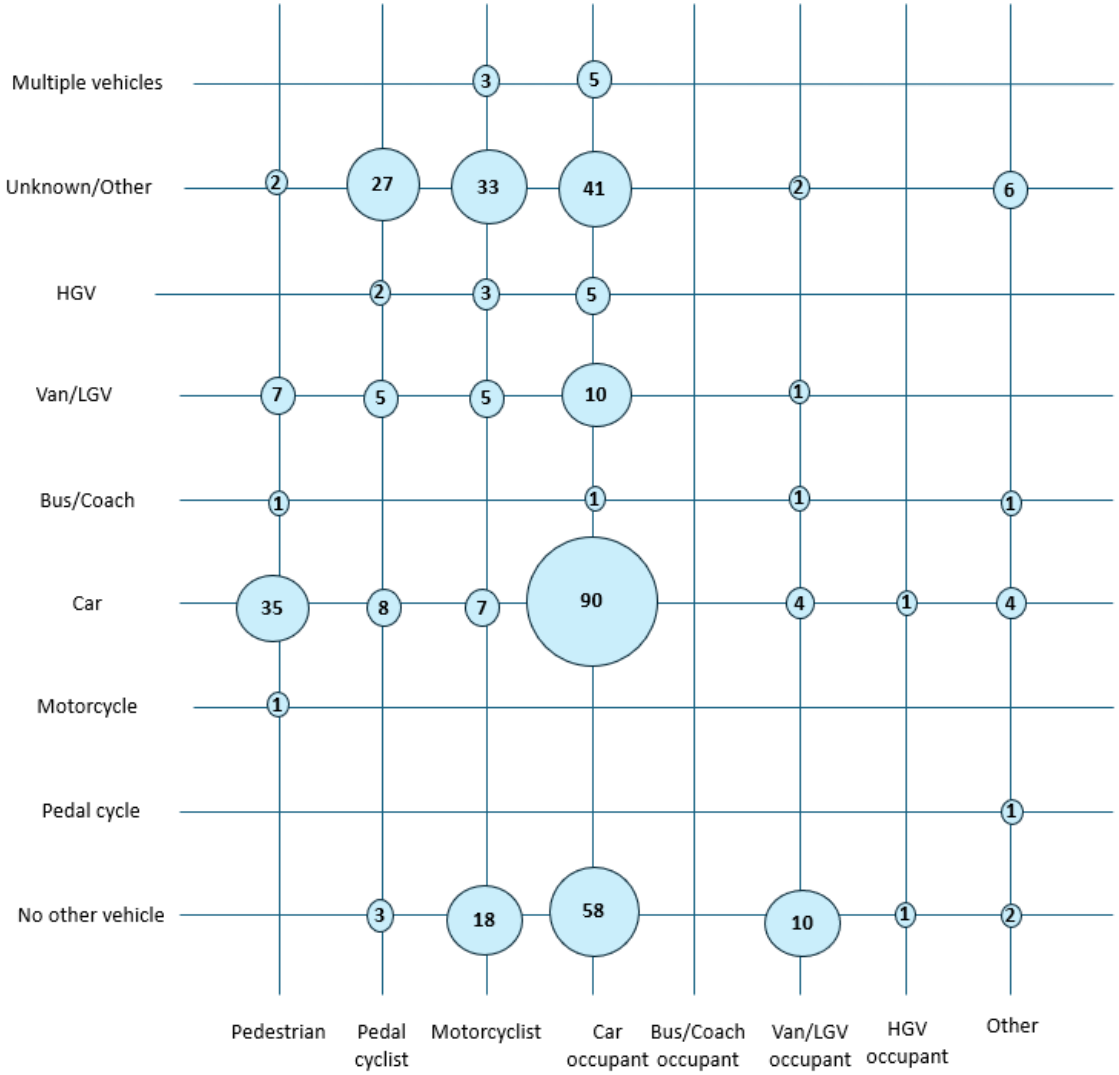


In Gloucester a higher proportion of KSI casualties are from pedestrian and pedal cycle groups compared to Cotswold. This suggests that for Gloucester district it would be important that approaches to improving road safety are structured around the safety needs of pedal cyclists and pedestrians in the first instance to be most impactful. In contrast a much higher proportion of KSIs came from car drivers, vehicle passengers and were as a result of single vehicle collisions. This suggests that for Cotswold district focusing on these elements of improving road safety would be most impactful in the first instance.

5.5 Injury-Fatality matrix

An injury-fatality matrix was constructed for all KSIs in 2022 as shown in Figure 16. This type of visualisation plot vehicle type causing injury or death against the type of road user who is harmed. It is valuable for helping to understand which modes of transport confer the highest risk of death and serious injury, and which road users are most vulnerable. An injury-fatality matrix for all KSIs in 2022 is shown in Figure 18. It should be noted that for some casualties recorded in the Stats-19 dataset it is not possible to identify all vehicle/transportation types based on what information is recorded. In these instances, the vehicle type has been categorised as other/unknown but it should be noted that cars as the predominant vehicle type in the road system probably make up the majority of vehicles in the other/unknown category.

Figure 18. Injury-fatality matrix for all KSI casualties in Gloucestershire in 2022



As a crude proportion, cars are responsible for causing a substantive burden of injury and death within the road system not only to car occupants themselves, but also to all other types of road user. As explained above it is likely that cars form a large group within the other/unknown vehicle category; the contributive risk posed by cars is even starker when considering this.

This injury-fatality matrix demonstrates that some road system users are more likely to be harmed and some are more likely to do harm. For example, motorcyclists, pedal cyclists and pedestrians are often harmed by other road user types but are much less likely to be the source of harm themselves. Cars and Larger vehicle types such as LGVs/HGVs in particular pose a high risk of harm to other more vulnerable users of the road system.

The data presented here also demonstrates that approximately one fifth (22.5%) of KSIs in 2022 were from single-vehicle collisions, and the causative factors and events leading to this this type of collision may differ from collisions involving multiple vehicles or road users. Collisions involving pedestrians are not considered single vehicle collisions.

5.6 Contributory factors

A reporting officer attending the scene of a RTC can assign up to six contributory factors they believe have contributed to that collision. These can be related to vehicles, drivers, casualties, pedestrians and to the road system environment. While it is accepted that in-depth post-collision investigation may change the consensus on contributory factors, or reveal new factors, an analysis by the Department of Transport showed that for most collisions the contributory factors identified at the scene were upheld following post-collision investigation.

For the purposes of this analysis, the different contributory factors were grouped according to the following categories:

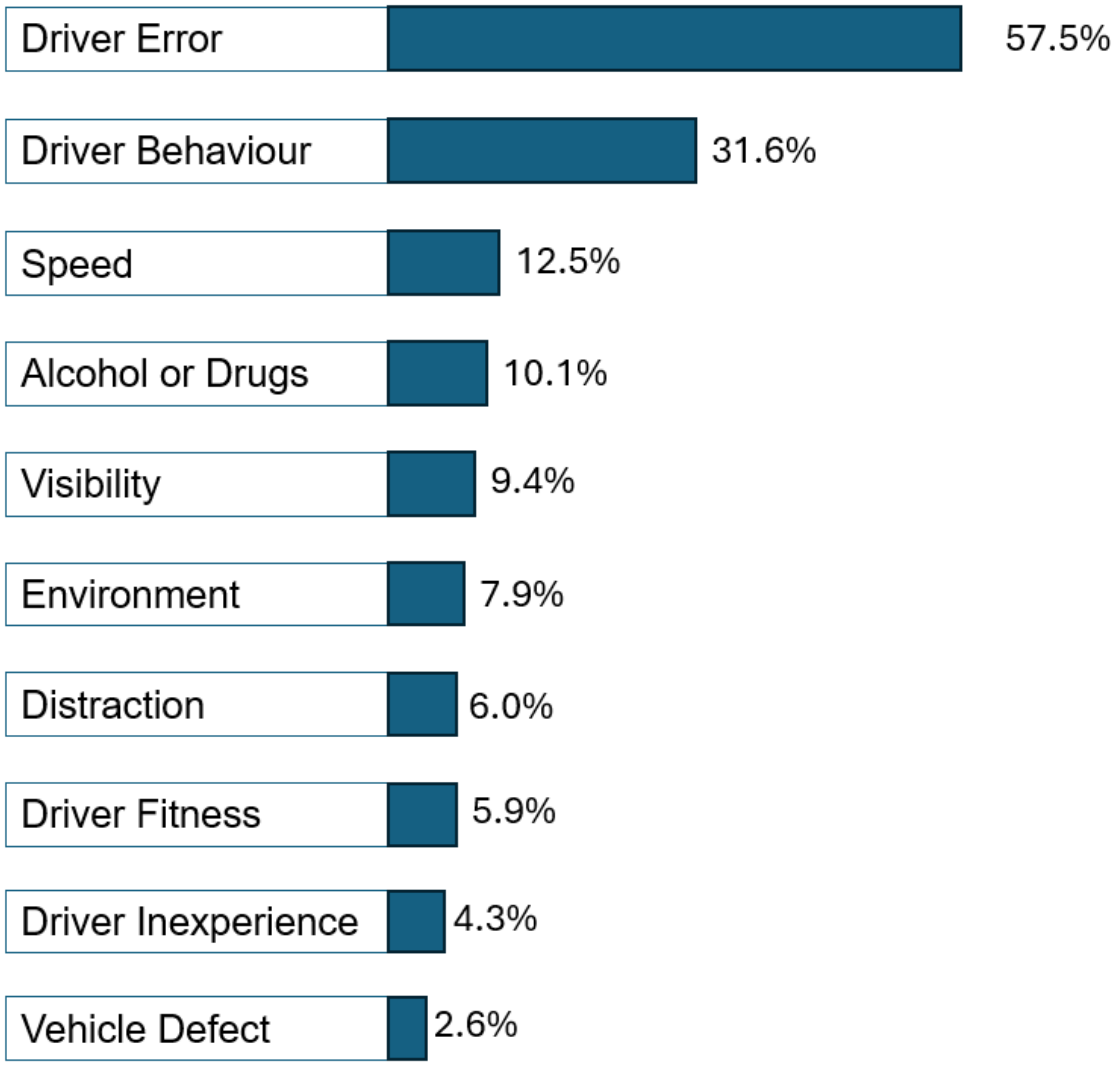
1. Road environment
2. Vehicle defects
3. Speed or following too close
4. Alcohol or drugs
5. Driver behaviour
6. Distraction including mobile phone use
7. Driver error
8. Visibility

9. Driver fitness
10. Driver inexperience

For all collisions categorised as fatal or serious (indicating that at least one casualty died or was seriously injured), the assigned contributory factors were assessed as shown in Figure 19. Pedestrian specific contributory codes are covered in the following section on vulnerable road users.

The contributory factors assigned to a total of 2152 collisions were assessed as part of this analysis.

Figure 19. Assigned contributory factor codes for all collisions categorised as fatal or serious



A driver error contributory factor code was assigned to 57.7% of KSI collisions and a driver behaviour code was assigned to 31.6% of collisions. Following this speed (12.5% of collisions), Alcohol and drugs (10.1% of collisions) and visibility (9.4% of collisions) were the most assigned contributory

factor codes to KSI collisions. Road environment, distraction, driver fitness, driver inexperience and vehicle defect codes were assigned less than 8% of the time to KSI collisions.

The 'Fatal Four' are offences that are prioritised within the National Police Chiefs Council (NPCC) Road Policing Strategy to reduce the number of people killed or seriously injured on the roads. Fatal four offences include speeding, driving under the effect or substances (alcohol or drugs), not wearing a seatbelt, and mobile device use. When considering the contribution of the fatal four to KSIs in Gloucestershire, out of a total of 2152 KSI collisions 543 (25.2%) had one or more contributory factor code relating to speeding, alcohol and drugs or driver distraction. Of 157 collisions that were classified as fatalities, 53 (33.8%) had one or more contributory factor code relating to speeding, alcohol and drugs or driver distraction. While information about seatbelt wearing is recorded at the scene of a collision, this is not available in the STATS19 dataset used for this data analysis. These findings highlight that the fatal four are important contributory factors in KSIs in Gloucestershire, and should continue to be prioritised as part of a strategy to reduce KSIs in the county. The contribution of other factors however, particularly driver error and driver behaviour cannot be ignored, and should be incorporated into any forward action plan.

5.7 Motorcyclists

A total of 482 KSIs (19.7%) were motorcyclist riders or passengers. Of these 35 were fatalities and 447 were serious injuries. Motorcyclists accounted for 19.5% of all KSIs in the county during this time period, despite motorcycles being estimated to be only 3% of registered vehicles on the roads nationally.

5.7.1 Age

The number and proportion of motorcyclist casualties who were killed or seriously injured by age group is shown in Table 9 along with the rate of KSI within the age band based on ONS population size estimate for the age band.

Table 9. Number and proportion of motorcyclist casualties who were killed or seriously injured by age group

Age band	Killed or seriously injured		ONS population size estimate for age band	Killed and seriously injured	
	n	%		Rate per 100,000 population	95% confidence interval
0 – 16 years	13	2.7	121,511	10.70	5.7 to 18.3
17 – 25 years	135	28.0	60,856	221.84	186 to 262.6
26 – 40 years	129	26.8	118,915	108.48	90.6 to 128.9
41 – 69 years	184	38.2	244,891	75.14	64.7 to 86.8
70+ years	21	4.4	106,493	19.72	12.2 to 30.1

The highest proportion of KSI casualties for motorcyclists occurred in the 41–69 year age band (38.2%), followed by 17- 25 year age band (28%) and the 26 – 40 year age band (26.8%). The lowest proportion of motorcyclist KSIs were in the 70+ age group and those under the age of 16. When considered as a rate based on the population size of the associated age band, it can be seen that younger motorcycle rider and passengers face a significantly disproportionately high risk of death or serious injury. The rate of KSI among those aged 17-25 years was 221.8 per 100,000, and 108.5 per 100,000 for those aged 26 – 40 years compared to a rate of 75.1 per 100,000 for those aged 41 – 69 years.

5.7.2 Sex

Of the 482 motorcyclist KSIs, 446 were male (4 classified as a passenger), and 36 female (10 classified as a passenger).

5.7.3 District and road speed limit

The proportion of motorcyclist KSIs across different districts of Gloucestershire, and within district by speed limit of the road where the RTC occurred is shown in Table 10. The district with the overall highest proportion of casualties is highlighted in blue. Within each district the road speed limit with the highest proportion of KSIs is highlighted in red.

Table 10. Proportion of motorcyclist KSIs across different districts of Gloucestershire, and within district by speed limit of the road where the RTC occurred

District	Killed and seriously injured		Road speed 20		Road speed 30		Road speed 40		Road speed 50		Speed limit 60mph		Road speed 70	
	n	%*	n	%**	n	%**	n	%**	n	%**	n	%**	n	%**
Gloucester	78	16.2	3	3.8	51	65.4	22	28.2	1	1.3	1	1.3	0	0.0
Stroud	92	19.1	2	2.2	15	16.3	23	25.0	18	19.6	32	34.8	2	2.2
Tewkesbury	83	17.2	0	0.0	18	21.7	13	15.7	27	32.5	18	21.7	7	8.4
Cotswold	110	22.8	1	0.9	11	10.0	7	6.4	18	16.4	68	61.8	5	4.5
Cheltenham	48	10.0	0	0.0	39	81.3	8	16.7	0	0.0	1	2.1	0	0.0
Forest	71	14.7	1	1.4	23	32.4	9	12.7	18	25.4	20	28.2	0	0.0

** Proportion of total n=482*

*** Proportion of total n for district*

The highest proportion of motorcyclist KSIs occurred in the Cotswold district (22.8%), followed by Stroud (19.1%) and Tewkesbury (17.2%). The lowest proportion of motorcyclist KSIs occurred in Cheltenham (10%). Differences in the distribution of KSIs by road speed limit was observed between different districts. The highest proportion of KSIs in Cheltenham (81.3%), Gloucester (65.4%) and Forest (32.4%) occurred on roads where the speed limit was 30mph. The highest proportions of KSIs in Cotswold (61.8%) and Stroud (34.8%) occurred on roads where the speed limit was 60mph, while in Tewkesbury the highest proportion of KSIs (32.5%) occurred on roads where the speed limit was 50mph. Overall, 51% of motorcyclist KSIs occurred on 20, 30 or 40mph roads, and 49% occurred on roads where the speed limit was 50pmh or above. This again highlights that any strategy to improve road safety for motorcyclists on high-speed rural routes will not necessarily impacts rates of KSIs occurring on slower or more urban roads; a bespoke and multifaceted approach is required.

5.7.4 Time of day

The number of motorcycle KSIs occurring at different times of the day was assessed and is shown in Table 11. The times of the day associated with the highest numbers of KSIs are highlighted in red.

Table 11. Number of motorcycle KSIs occurring at different times of the day

Day of week	Time of day							
	0000-0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2359
Monday	0	1	11	8	13	11	6	3
Tuesday	0	3	9	8	17	20	11	3
Wednesday	0	2	7	8	10	20	11	3
Thursday	0	0	15	10	11	20	17	7
Friday	2	1	5	2	14	14	21	11
Saturday	3	1	2	12	19	13	11	3
Sunday	9	0	4	11	25	21	7	6
Column total	**14**	**8**	**53**	**59**	**109**	**119**	**84**	**36**

Motorcyclist KSIs most commonly occur between the hours of midday and 9pm, with a clustering observed between the hours of midday and 6pm (highlighted in red). These are plausibly the times of the day when the road system may be busiest, suggesting that traffic volume is also an important consideration when considering how to reduce risk of KSI among motorcyclists.

5.7.5 Time of year

The number and proportion of motorcycle KSIs occurring across different months of the year is shown in table 12.

Table 12. Number and proportion of motorcycle KSIs occurring across different months of the year

Month of year	Motorcycle KSI	
	n	%
January	25	5.2
February	29	6.0
March	41	8.5
April	42	8.7
May	51	10.6
June	51	10.6
July	44	9.1
August	37	7.7
September	58	12.0
October	36	7.5
November	39	8.1
December	29	6.0

Overall, 58.7% of motorcyclist KSIs occurred in the Spring and Summer months, while 41.3% occurred in the Autumn and Winter months. This difference was statistically significant at the 5% confidence level (p-value for differences in proportions = <0.001) and suggests that motorcyclists are at higher likelihood of being in a RTC resulting in KSI in the Spring and Summer months compared to the Autumn and Winter months.

5.7.6 Collision type and manoeuvres

109 (22.6%) motorcyclist who were killed or seriously injured were classified as single vehicle collisions, while 373 (77.4%) were as a results of collisions involving the motorcyclist and one or more other vehicles.

Collision type and manoeuvres were also considered under the following four categories:

1. Collision occurring at a junction, roundabout or as part of a turning manoeuvre (including exiting from a side road and joining from a slip road).
2. Collision occurring during overtaking
3. Collision resulting from loss of control
4. Collision categorised as head-to-head or head-to-tail

It should be noted that for overtaking, this code could apply to the motorcyclist overtaking another vehicle or from another vehicle overtaking a motorcyclist. It should also be noted that the codes are not mutually exclusive.

Overall, 460 (95.4%) motorcycle KSIs involved one or more of the collision type/manoeuvre categories above. 63.3% of motorcycle KSIs occurred at a junction, roundabout or in conjunction with a turning manoeuvre. 23.7% of motorcycle KSIs occurred during overtaking. 22.8% of motorcycle KSIs resulted from a loss of control and 15.1% were either a head-to-head or a head-to-tail collision.

5.8 Younger drivers and riders

A total of 646 (26.4%) KSIs involved a casualty aged 25 years and below. Of these KSIs, 31 were fatalities and 615 were serious injuries.

60 young people were pedal cyclists and 108 were pedestrians; findings related to these groups are covered in subsequent sections of this report on pedestrian casualties and pedal cyclist casualties. The remainder of this section will focus on the 478 younger person KSIs who were categorised as driver/rider or passenger.

5.8.1 Age

76 (15.9%) younger person KSIs were in those aged 16 years and under, while 402 (84.1%) were in those aged 17-25 years. Among KSIs in those aged 16 years and under, 62 were passengers and the remaining 14 were classified as driver/rider (1 car driver; 10 moped/motorcycle riders; 1 horse rider; 2 electric scooter riders). Among KSIs in those aged 17-25 years, 102 were passengers and the remaining 300 were classified as driver/rider (148 car drivers; 13 Van/LGV/HGC drivers; 135 moped/motorcycle riders; 1 horse rider; 2 tractor drivers; 1 electric scooter rider).

Overall, among younger person KSIs where the young person was classified as a driver/rider, 46% of KSIs were younger people riding motorcycles or mopeds. This again illustrates the specific risk associated with motorcycle travel among younger people.

5.8.2 Sex

Of 478 younger person KSIs 141 were female and 337 were male. When considering those younger people classified as driver/rider 65 (20.7%) were female and 249 (79.2%) were male. This again highlights the sex-based disparity in KSIs between male and female road system users across the County.

5.8.3 District and road speed limit

The proportion of younger person KSIs across different districts of Gloucestershire, and within district by speed limit of the road where the RTC occurred is shown in Table 13. The district with the overall highest proportion of casualties is highlighted in blue. Within each district the road speed limit with the highest proportion of KSIs is highlighted in red.

Table 13. Proportions of younger person KSIs across different districts of Gloucestershire, and within district by speed limit of the road where the RTC occurred

District	Killed and seriously injured		Road speed 20		Road speed 30		Road speed 40		Road speed 50		Speed limit 60mph		Road speed 70	
	n	%*	n	%**	n	%**	n	%**	n	%**	n	%**	n	%**
Gloucester	68	14.23	4	5.9	37	54.4	23	33.8	1	1.5	2	2.9	1	1.5
Stroud	86	17.99	2	2.3	12	14.0	22	25.6	16	18.6	26	30.2	8	9.3
Tewkesbury	96	20.08	0	0.0	18	18.8	10	10.4	27	28.1	25	26.0	16	16.7
Cotswold	113	23.64	0	0.0	10	8.8	9	8.0	18	15.9	73	64.6	3	2.7
Cheltenham	40	8.37	1	2.5	31	77.5	7	17.5	0	0.0	1	2.5	0	0.0
Forest	75	15.69	2	2.7	19	25.3	11	14.7	16	21.3	25	33.3	2	2.7

** Proportion of total n=478*

*** Proportion of total n for district*

The highest proportion of KSIs among younger people are observed to occur in Cotswold district (23.5%). Again, there is evidence of patterning for the proportion of KSI with a district based on road speed. A higher proportion younger person KSIs in urban areas occur on roads with a speed limit of 30mph, while the greatest proportion of younger-person KSIs in more rural areas are happening on higher speed routes.

5.8.4 Time of day

The number of younger-person KSIs occurring at different times of the day was assessed and is shown in Table 14. The times of the day associated with the highest numbers of KSIs are highlighted in red.

Table 14. Number of younger person KSIs occurring at different times of the day

Day of week	Time of day							
	0000-0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2359
Monday	2	1	9	9	5	8	10	7
Tuesday	2	1	11	3	10	18	11	4
Wednesday	7	2	10	5	8	11	12	8
Thursday	1	3	7	8	5	13	15	16
Friday	3	3	3	7	5	13	23	12
Saturday	12	7	4	7	16	15	10	16
Sunday	16	6	5	9	7	16	10	11
Column total	**43**	**23**	**49**	**48**	**56**	**94**	**91**	**74**

It is notable that collisions involving younger people resulting in death or serious injury were more common in the evenings and weekends.

5.8.5 Time of year

The number and proportion of younger person KSIs occurring across different months of the year is shown in Table 15.

Table 15. Number and proportion of younger person KSIs occurring across different months of the year

Month of year	Younger person KSI	
	n	%
January	29	6.1
February	36	7.5
March	32	6.7
April	52	10.9
May	41	8.6
June	38	7.9
July	29	6.1
August	37	7.7
September	50	10.5
October	48	10.0
November	45	9.4
December	41	8.6

51.7% of younger person KSIs occurred in Spring and Summer months, and 48.3% of younger person KSIs occurred in Autumn and Winter months. There was no statistically significant difference between the proportion of KSIs occurring in Spring and Summer months and those occurring in Autumn and Winter months (p-value for differences in proportions = 0.9).

5.8.6 Collision type and manoeuvres

162 (33.9%) younger person KSIs were classified as single vehicle collisions, while 316 (66.1%) were as a result of collisions between two or more vehicles. The categories of collision type/manoeuvres described in section 7.6 were also used assess the contribution of different collision types and manoeuvres to younger person KSIs.

Overall, 472 (98.7%) of younger person KSIs involved one or more of the collision type/manoeuvre categories described in section 7.6. 48.5% of younger person KSIs occurred at a junction, roundabout or in conjunction with a turning manoeuvre and 13.1% of younger person KSIs occurred during overtaking. 46.2% of younger person KSIs resulted from a loss of control and 29.2% were either a head-to-head or a head-to-tail collision.

5.9 Pedal cyclists

A total of 338 KSIs (13.8%) involved a pedal cyclist casualty, and of these 11 were fatalities and 327 were serious injuries.

5.9.1 Age

The number and proportion of pedal cyclist casualties who were killed or seriously injured by age group is shown in Table 16 along with the rate of KSI within the age band based on ONS population size estimate for the age band.

Table 16. Number and proportion of pedal cyclist casualties who were killed or seriously injured by age group and rate of KSI within each population age-band

Age band	Killed or seriously injured		ONS population size estimate for age band	Killed and seriously injured	
	n	%		Rate per 100,000 population	95% confidence interval
0 – 16 years	33	9.8	121,511	27.16	18.7 – 38.1
17 – 25 years	27	8.0	60,856	44.37	29.2 – 64.6
26 – 40 years	87	25.7	118,915	73.16	58.6 – 90.2
41 – 69 years	167	49.4	244,891	68.19	58.2 – 79.3
70+ years	24	7.1	106,493	22.54	14.4 – 33.5

The highest proportion of pedal cyclist KSIs occurred in the 41 to 69 year old age group (49.4%). When considered as a rate based on the population size estimate for the age band, however, it can be seen that the risk of KSI for pedal cyclists is equally elevated among all those aged between 17 and 69 years. The lowest rates of KSI for pedal cyclists were among the younger (0-16 year) and older (70+ year) age groups with no appreciable difference in risk level between these two cohorts.

5.9.2 Sex

Of 338 pedal cyclist KSIs 61 (18%) were female cyclists and 277 (82%) were male. This again highlights the sex-based disparity in KSIs between male and female road system users across the county.

5.9.3 District and road speed limit

The proportion of pedal cyclist KSIs across different districts of Gloucestershire, and within district by speed limit of the road where the RTC occurred is shown in Table 17. The district with the overall highest proportion of casualties is highlighted in blue. Within each district the road speed limit with the highest proportion of KSIs is highlighted in red.

Table 17. Proportion of pedal cyclist KSIs across different districts of Gloucestershire, and within district by speed limit of the road where the RTC occurred

District	Killed and seriously injured		Road speed 20		Road speed 30		Road speed 40		Road speed 50		Speed limit 60mph		Road speed 70	
	n	%*	n	%**	n	%**	n	%**	n	%**	n	%**	n	%**
Gloucester	89	26.3	5	5.6	53	59.6	27	30.3	2	2.2	2	2.2	0	0.0
Stroud	59	17.5	2	3.4	30	50.8	6	10.2	4	6.8	15	25.4	0	0.0
Tewkesbury	52	15.4	2	3.8	20	38.5	12	23.1	11	21.2	5	9.6	2	3.8
Cotswold	50	14.8	1	2.0	22	44.0	6	12.0	3	6.0	17	34.0	1	2.0
Cheltenham	76	22.5	2	2.6	66	86.8	8	10.5	0	0.0	0	0.0	0	0.0
Forest	12	3.6	0	0.0	5	41.7	1	8.3	2	16.7	4	33.3	0	0.0

** Proportion of total n=338*

*** Proportion of total n for district*

The highest proportion of pedal cyclist KSIs occurred in Gloucester (26.3%), followed by Cheltenham (22.5%) and Stroud (17.5%). The lowest proportion of pedal cyclist KSIs occurred in the Forest of Dean (3.6%). When considering proportion of KSIs by road speed limit, the highest proportion of pedal cyclist KSIs occurred on roads where the speed limit was 30mph across all districts.

The number and proportion of pedal cyclists who were killed and those who were seriously injured across roads with different speed limits is shown in Table 18.

Table 18. Number and proportion of pedal cyclists who were killed and those who were seriously injured across roads with different speed limits

Pedal cyclist casualty category	Road speed limit											
	20		30		40		50		60		70	
	n	%	n	%	n	%	n	%	n	%	n	%
Seriously injured	13	3.8	192	56.8	56	16.6	21	6.2	40	11.8	3	0.9
Killed	0	0.0	4	1.2	4	1.2	1	0.3	2	0.6	0	0

The data presented here shows that for pedal cyclists 57.9% of fatalities or serious injuries are occurring on 30mph roads and 17.8% are occurring on 40mph roads. When considering the location of pedal cyclist KSIs, 231 (68.3%) occurred in a location that was classified as urban and 107 (31.7%) occurred in a location classified as rural.

5.9.4 Time of day

The number of pedal cyclist KSIs occurring at different times of the day was assessed and is shown in Table 19. The times of the day associated with the highest numbers of KSIs are highlighted in red.

Table 19. Number of pedal cyclist KSIs occurring at different times of the day

Day of week	Time of day							
	0000-0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2359
Monday	0	1	10	8	4	14	3	3
Tuesday	0	0	9	9	12	14	3	2
Wednesday	0	1	13	6	8	22	4	4
Thursday	0	1	6	11	6	16	12	7
Friday	1	0	10	7	7	6	5	5
Saturday	0	0	7	9	12	8	7	6
Sunday	0	0	3	9	12	9	3	3
Column total	**1**	**3**	**58**	**59**	**61**	**89**	**37**	**30**

79% of pedal cyclist KSIs are occurring between the hours of 6am and 6pm (highlighted in red), and the highest proportion overall (26.3%) are occurring between 3pm and 6pm.

5.9.5 Time of year

The number and proportion of pedal cyclist KSIs occurring across different months of the year is shown in table 20.

Table 20. Number and proportion of pedal cyclist KSIs occurring across different months of the year

Month of year	Pedal cyclist KSI	
	n	%
January	25	7.4
February	29	8.6
March	20	5.9
April	26	7.7
May	34	10.1
June	51	15.1
July	33	9.8
August	34	10.1
September	28	8.3
October	25	7.4
November	15	4.4
December	18	5.3

Overall, 60.9% of pedal cyclist KSIs occurred in the Spring and Summer months and 39.1% of pedal cyclist KSIs occurred in the Autumn and Winter months. This difference was statistically significant at the 5% confidence level (p-value for differences in proportions = <0.001) and suggests that pedal cyclists are more likely to be involved in a RTC resulting in KSI in the Spring and Summer months compared to the Autumn and Winter months.

5.9.6 Collision type and manoeuvres

15 (4.4%) of pedal cyclist KSIs involved only the pedal cyclist themselves, and 323 (95.6%) involved a collision between a pedal cyclist and another vehicle. The categories of collision type/manoeuvres described in section 7.6 were also used assess the contribution of different collision types and manoeuvres to pedal cyclist KSIs.

Overall, 320 (94.7%) of pedal cyclist KSIs involved one or more of the collision type/manoeuvre categories described in section 7.6. 68% of pedal cyclist KSIs occurred at a junction, roundabout or in conjunction with a turning manoeuvre, and 26.6% of pedal cyclist KSIs were associated with an overtaking manoeuvre. Only 5% of pedal cyclist KSIs were ascribed to loss of control, and 13% were either a head-to-head or head-to-tail collision.

5.10 Pedestrians

A total of 350 KSIs (14.3%) were among pedestrians, and of these 28 were fatalities and 322 were serious injuries.

5.10.1 Age

The number and proportion of pedestrian casualties who were killed or seriously injured by age group is shown in Table 21 along with the rate of KSI within the age band based on ONS population size estimate for the age band.

Table 21. Number and proportion of pedestrian casualties who were killed or seriously injured by age group and rate of KSI within each population age-band

Age band	Killed or seriously injured		ONS population size estimate for age band	Killed and seriously injured	
	n	%		Rate per 100,000 population	95% confidence interval
0 – 16 years	68	19.4	121,511	55.96	43.5 – 71
17 – 25 years	40	11.4	60,856	65.73	47 – 89.5
26 – 40 years	56	16.0	118,915	47.09	35.6 – 61.2
41 – 69 years	106	30.3	244,891	43.28	35.4 – 52.4
70+ years	80	22.9	106,493	75.12	59.6 – 93.5

The highest proportion of pedestrian KSIs was among the 41-69 year age group however, the rate of KSI was the lowest among this age band overall. The highest rate of pedestrian KSI was among the 70+ year age group, with the rate in this age group being significantly higher than among the 41-69 year age group (who as the largest group of casualties can be considered the reference group). This suggests that pedestrians over the age of 70 years old are particularly vulnerable to being killed or seriously injured as a result of RTCs in Gloucestershire.

5.10.2 Sex

149 (42.6%) pedestrian KSIs were female and 201 (57.4%) pedestrian KSIs were male. While a difference in casualty sex is still present for pedestrian KSIs, this difference is not as stark as for other casualty groups.

5.10.3 District and road speed limit

The proportion of pedestrian KSIs across different districts of Gloucestershire, and within district by speed limit of the road where the RTC occurred is shown in Table 22. The district with the overall highest proportion of casualties is highlighted in blue. Within each district the road speed limit with the highest proportion of KSIs is highlighted in red.

Table 22. Proportion of pedestrian KSIs across different districts of Gloucestershire, and within district by speed limit of the road where the RTC occurred

District	Killed and seriously injured		Road speed 20		Road speed 30		Road speed 40		Road speed 50		Speed limit 60mph		Road speed 70	
	n	%*	n	%**	n	%**	n	%**	n	%**	n	%**	n	%**
Gloucester	90	25.7	8	8.9	65	72.2	15	16.7	0	0.0	2	2.2	0	0.0
Stroud	45	12.9	6	13.3	28	62.2	5	11.1	1	2.2	2	4.4	3	6.7
Tewkesbury	39	11.1	1	2.6	25	64.1	1	2.6	8	20.5	3	7.7	1	2.2
Cotswold	56	16.0	7	12.5	36	64.3	1	1.8	4	7.1	6	10.7	2	4.4
Cheltenham	85	24.3	1	1.2	74	87.1	9	10.6	0	0.0	1	1.2	0	0.0
Forest	35	10.0	3	8.6	19	54.3	1	2.9	5	14.3	7	20.0	0	0.0

** Proportion of total n=350*

*** Proportion of total n for district*

The highest proportion of pedestrian KSIs occurred in Gloucester (25.7%), followed by Cheltenham (24.3%) and Cotswold (16.0%). The lowest proportion of pedestrian KSIs occurred in Forest (10%). When considering proportion of KSIs by road speed limit, the highest proportion of pedestrian KSI occurred on roads where the speed limit was 30mph across all districts.

The number and proportion of pedestrians who were killed and those who were seriously injured across roads with different speed limits is shown in Table 23.

Table 23. Number and proportion of pedestrians who were killed and those who were seriously injured across roads with different speed limits

Pedestrian casualty category	Road speed limit											
	20		30		40		50		60		70	
	n	%	n	%	n	%	n	%	n	%	n	%
Seriously injured	25	7.1	235	67.1	27	7.7	14	4.0	17	4.9	4	1.1
Killed	1	0.3	12	3.4	5	1.4	4	1.1	4	1.1	2	0.6

The data presented here shows that for pedestrians 70.5% of fatalities or serious injuries are occurring on 30mph roads (highlighted in red). When considering location of pedestrian KSIs, 258 (73.3%) occurred in a location that was classified as urban and 92 (26.3%) occurred in a location that was classified as rural.

5.10.4 Time of day

The number of pedestrian KSIs occurring at different times of the day was assessed and is shown in Table 24. The times of the day associated with the highest numbers of KSIs are highlighted in red.

Table 24. Number of pedestrian KSIs occurring at different times of the day

Day of week	Time of day							
	0000-0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2359
Monday	1	1	5	6	11	14	9	1
Tuesday	1	0	10	6	12	12	6	1
Wednesday	0	2	5	5	18	8	5	3
Thursday	2	0	8	6	7	10	12	2
Friday	0	0	10	6	7	11	10	9
Saturday	3	3	2	9	9	3	17	3
Sunday	3	1	1	3	6	4	12	1
Column total	**10**	**7**	**41**	**41**	**70**	**62**	**71**	**20**

The highest proportions of pedestrian KSIs are occurring between the hours of 12pm and 9pm (highlighted in red). These times may represent peak travel times with higher traffic volumes increasing the exposure of pedestrians to traffic and increasing the likelihood of resultant harm. These times of the day may also represent times when risk could be compounded by additional factors such as changing light levels resulting in poor visibility which could make pedestrians particularly vulnerable.

5.10.5 Time of year

The number and proportion of pedestrian KSIs occurring across different months of the year is shown in table 25.

Table 25. Number and proportion of pedestrian KSIs occurring across different months of the year

Month of year	Pedestrian KSI	
	n	%
January	33	9.4
February	33	9.4
March	35	10.0
April	14	4.0
May	24	6.9
June	27	7.7
July	21	6.0
August	21	6.0
September	25	7.1
October	42	12.0
November	45	12.9
December	30	8.6

Overall, 37.7% of pedestrian KSIs occurred in Spring and Summer months and 62.3% occurred in Autumn and Winter months. This difference was statistically significant at the 5% confidence level

(p-value for difference in proportions = <0.001) and suggests that pedestrians are more likely to be involved in a RTC resulting in a KSI in the Autumn and Winter months compared to the Spring and Summer months.

5.10.6 Pedestrian location

The location of a pedestrian at the time of a RTC is recorded as a data field in Stats-19. 348 pedestrian casualties had a location descriptor code recorded in the dataset which were categorised as follows:

- 41 (11.8%) KSIs on the pavement or verge and 2 were on refuge (including central island or central reservation)
- 191 (54.9%) were categorised as crossing elsewhere or crossing within 50m of a crossing
- 42 (12.1%) categorised as using a crossing facility
- 57 (16.4%) were categorised as in the middle of the road or in the road not crossing
- 17 (4.9%) categorised as other

5.10.7 Contributory factors

Within the STATS19 dataset there are 10 pedestrian-specific contributory codes that can be assigned by the reporting officer to RTCs involving a pedestrian. From 350 pedestrian KSIs a total of 352 pedestrian-specific contributory codes were recorded in the dataset as shown in Table 26.

Table 26. Assigned pedestrian-specific contributory codes

Pedestrian specific code	Number of codes in dataset	%
801 Crossed road masked by stationary or parked vehicle	25	7.1
802 Failed to look properly	129	36.6
803 Failed to judge vehicle's path or speed	66	18.8
804 Wrong use of pedestrian crossing facility	6	1.7
805 Dangerous action in carriageway (eg playing)	16	4.5
806 Impaired by alcohol	30	8.5
807 Impaired by drugs (illicit or medicinal)	4	1.1
808 Careless/Reckless/In a hurry	49	13.9
809 Pedestrian wearing dark clothing at night	21	6.0
810 Disability or illness, mental or physical	6	1.7

The most commonly recorded pedestrian specific code was 'Failed to look properly', followed by 'Failed to judge vehicle's path or speed' and 'Careless/Reckless/In a hurry'. This demonstrates that pedestrian behaviour is an important potential contributory factor to risk within the road system,

however, the components of the road system should be designed in such a way as to minimise or mitigate pedestrian behaviour risks as one of the most vulnerable groups of road system users

It is also important to note that for 191 (54.6%) of pedestrian KSIs, a contributory factor code relating to driver error, driver behaviour, excess speed, driver distraction or driver intoxication was also recorded against the collision. This highlights the important point that the safety of vulnerable road users is often dependent on the risk posed by less vulnerable users of the road system over which the individual pedestrian is unlikely to have any control. This is particularly pertinent in light of the data findings presented in section 10.6 showing that 23.9% of pedestrian KSIs occurred at a location recorded as 'pavement', 'verge/refuge' or 'crossing facility' which should arguably be some of the safest parts of the road system for pedestrians.

5.11 Older drivers

Older car drivers are defined by the Department of Transport as those age 70 years or older. Drivers over the age of 70 often have decades of experience, and tend to be more cautious and less likely to engage in risk-taking behaviours compared to younger drivers. Age-related changes such as slower reaction times, problems with vision, and reduced mobility can all impair driving performance. Regular assessment of age-related health conditions and fitness to drive is recommended by the Older Driver's Forum as one component of improving road safety relating to older drivers (16). Other considerations for designing inclusive road systems such as clear signage, good lighting and lower speed limits in residential areas could also help older drivers to navigate the road system more safely (17).

It is challenging to assess the significance of advanced driver age to the risk of road traffic collisions in Gloucestershire from the available STATS-19 data. This is because the dataset does not record information about non-injured persons involved in road traffic collisions, which can lead to incomplete data about drivers involved in collisions. Even in the absence of robust local data, however, the needs and safety considerations of older drivers is pertinent. This is because data from the Department of Transport shows that drivers over the age of 70 are involved in a growing proportion of KSI collisions, with those over the age of 80 more likely to be at fault when a collision occurs (14). Furthermore, findings from the Road Safety Observatory show that when older drivers are injured in a collision, factors relating to frailty can worsen the severity of any injuries experienced by older drivers (15) leading to worse outcomes for this group of the population.

5.12 Post-crash response

Post crash response is an integral pillar of the safe system, however, it is not possible to use STATS19 data to provide information about this. There is, however, a growing body of literature available for which relevant knowledge can be drawn.

There is known to be a trimodal distribution of death following serious trauma; immediate deaths (approx. 50%), early deaths (occurring within 2 hours of trauma) and late deaths (occurring within 4 weeks of trauma) (18). Immediate and early deaths are most likely to occur as a result of haemorrhage, cardiac arrest and airways obstruction. The provision of immediate first responder care, which may be provided either by members of the public or emergency service personnel, is therefore vital to reducing trauma deaths.

It is also well established that the treatment received by trauma patients within the first-hour can largely determine a critically-injured person's chances of survival. Collisions on rural roads are not necessarily more severe that collisions in urban areas, however, rurality is often observed to negatively impact survival (19). This is because that almost all part of optimal post-crash response (early recognition and call for help, early rescue, early initial care, early transport and early hospital care and rehabilitation) can be adversely affected by rurality (20). This is commonly called the rural paradox: those most likely to benefit from timely, high-quality trauma care are also the least likely to receive it (20). There is a strong imperative to consider how other pillars of the safe system can be modified to account for the negative impact of rurality on post-crash response.

6. Summary of key findings and recommendations

6.1 General recommendations

The following general recommendations are made based on the overarching findings arising from the needs assessment:

Recommendation 1: Prioritise for strategic action a reduction in the rate of KSIs among those road user groups identified by this needs assessment as facing a disproportionate burden of serious injury and death within the road system.

Recommendation 2: Identify and develop key performance indicators related to each pillar of the safe system. This should include explicit consideration of what data should be collected and the time frame over which each indicator is assessed.

Recommendation 3: Consider undertaking an interim review of the road safety policy to ensure strategic alignment with the findings of the needs assessment.

Out of 2447 KSI casualties, 1130 (46.1%) are classified as car drivers or passengers and 1160 (47.4%) are classified as either motorcyclists, pedestrians or pedal cyclists. This means that although car drivers and passengers form the overall largest proportion of KSI casualties, an equal burden is formed from KSIs among vulnerable road user groups. Taking into account the concept of the safe systems approach, it is likely that any interventions that improve safety for the most vulnerable road users will also improve safety for other road user groups including car drivers. These observations provide the rationale for recommending an approach focussed on pursuing improved safety for vulnerable road user groups in the first instance.

6.2 Knowledge gaps and further data considerations

6.2.1 Data on deprivation

It was not possible to include any analysis looking at the relationship between socioeconomic deprivation and road traffic collisions due to only having partial postcodes in the STATS19 dataset held by the Local Authority. There is however, robust evidence within national road traffic collision data and the academic literature of a strong association between socioeconomic deprivation and risk of death or serious injury resulting from road traffic collisions (21, 22, 23). There is no reason to believe that this particular inequality would not also be present within Gloucestershire, and further data analysis to better understand this would plausibly help to refine the future efforts of the Road Safety Partnership.

Recommendation 4: Undertake additional data analysis to investigate the association between deprivation and serious injury and death resulting from road traffic collisions in the County.

6.2.2 Qualitative data and community insights

The scope of this needs assessment was limited to an analysis of quantitative data contained within the STATS19 dataset as it was not possible to include qualitative data collection within the given time frames. It is acknowledged however, that undertaking community insights work would provide additional insight into areas of the safe system where action could be focussed. In particular it is a priority to better understand the lived experience of those road users who are particularly vulnerable so that the system can be designed to best meet their needs. The vulnerability of different road user groups is illustrated by the hierarchy of road user vulnerability and responsibility as shown in Figure 20. This hierarchy demonstrates that those who can do the greatest harm have the greatest responsibility to reduce the danger they may pose to others.

Figure 20. Hierarchy of road user vulnerability and responsibility

Recommendation 5: Undertake community insights work to better understand the lived experience of those who are using the road system, with a particular focus on vulnerable road users as identified by the hierarchy of road user vulnerability.

6.2.3 Safe System Fatal Review Panels

A critical incident review is a structured muti-professional process that aims to provide systems level insights into potentially preventable events, particularly those resulting in harm or near-

miss situations. While the data contained within STATS19 dataset provides a robust starting point for understanding the current picture relating to road safety within the county, the role of critical incident review in providing an enhanced understanding of systems issues and safety failures should be considered.

The use of a Safe System Fatal Review Panel (SSFPR) is currently being trialled by Cambridgeshire and Peterborough Vision Zero Partnership (24). The aim of the Safe System Fatal Review Panels is to understand fatal road traffic collisions with a Safe System perspective and to identify the systemic actions that can be taken forward both at the local and national level to proactively reduce the risk of fatal and serious injury in the future. Importantly, the focus of this activity is not to establish culpability, but rather to identify systemic failures contributing to death and serious injury on the roads and to identify whole system mechanisms to improve future safety outcomes.

Recommendation 6: Consider the formation of a Safe System Fatal Review Panel to augment learning and insight into prevention based on a review of the experience of other Local Authority areas who are currently using Safe System Fatal Review Panels.

6.3 Key findings relating to rates of road traffic collision casualties

There was observed to be a significant increase in the total number of road casualties across the time-period across which data was available, which appears to be attributable to an increase in slight casualties. This may represent a change in data collection practices with more slight casualties being recorded within the STATS19 data, however, a true increase in slight casualties cannot be discounted. Trends in the rates of all types of casualty should continue to be monitored closely. There has been no appreciable change in the rate of KSI across the time-period for which data was available. This suggests that unless there is a continued focussed effort across all system partners to prevent death and serious injury within the road system Vision Zero targets will not currently be met.

Recommendation 7: Continue to monitor rates of all types of casualty resulting from road traffic collisions in the County using mid-year population estimates to allow direct comparability across different years.

6.4 Key findings relating to casualty sex

A marked gradient was observed with regards to casualty severity and sex. The proportion of male casualties was higher for all casualty types, and the difference in proportion between men and women widened as casualty severity categorisation increased. It is not possible to determine the reason for these observed differences from this data alone. It is plausible that there are sex-based differences in the ways in which men and women use the road system, or behave within the road system, driving this observation (25, 26, 27). The role of sex in generating excess risk within the road system should be carefully considered and taken into account when designing interventions to improve road safety.

Recommendation 8: Develop a better understanding of differences in risk between men and women to allow for targeted interventions and communications to address sex-based risk.

6.5 Key findings relating to time of day and time of year

Overall, there was no difference between the proportion of KSI casualties resulting from collisions in the spring/summer months compared to the proportion occurring in the autumn/winter months. When considering different vulnerable road user groups, however, seasonal patterning was found to be present.

With regard to pedal cyclists the data analysis demonstrated a statistically significant increase in pedal cyclist KSIs in the spring/summer months compared to the autumn/winter months. This is a pattern that is also reported in National data and from within other countries with similar road systems in Europe (28). The reasons behind this seasonal increase in pedal cyclist casualties is not entirely understood. One plausible explanation is that in the Spring and Summer months there is an increase in the number of cyclists using the road system without a corresponding increase in situational awareness and demonstration of road safety behaviours by drivers. This explanation is supported by the observation that in the UK cyclists have approximately twice the risk of being killed per unit travelled than is the case in the Netherlands and Denmark despite cycling being far more common in these countries (29). It is thought that overall risk to cyclists is reduced because drivers are more aware of cyclists, and more likely to be cyclists themselves. This highlights the critical role of driver awareness and driver behaviour in reducing the risk of death and serious injury for more vulnerable road users.

A seasonal increase in motorcyclist KSIs was also observed over the spring/summer months compared to the winter/autumn months. Again, this is a pattern that is also reported within National statistics and is thought to be in part due to an increase in motorcyclists using the road system in the spring/summer months without a corresponding increase in situational awareness and demonstration of road safety behaviours by drivers (30).

Recommendation 9: Develop a better understanding of ways to improve driver awareness and behaviour relating to cyclists and motorcyclists.

It is also plausible that the relative inexperience of cyclists and motorcyclists who are more likely to travel by bike in the spring/summer months contributes to the creation of excess risk and increases the chances of collisions occurring. The road safety charity Brake highlights the role of targeted skills training for cyclists to improve confidence and provide education on how to avoid danger when cycling (31). Within Gloucestershire Bikeability provides pedal cycle training sessions to children and adults ranging from basic bike handling to navigating complex road layouts in heavy traffic. Advanced skills training for motorcyclists is also recommended to improve riding technique, hazard perception bike control. Gloucestershire Police's BikeSafe workshops are offered as part of the advanced motorcycle skills training available within the County.

Recommendation 10: Continue to support the provision of targeted skills training and education for cyclists. Consider increasing the visibility of training programmes such as Bikeability (for cyclists) and BikeSafe (for motorcyclists) to coincide with likely seasonal increases in the number of pedal cyclists and motorcyclists using the road system.

Conversely, a statistically significant increase in pedestrian KSI casualties was observed in the autumn/winter months compared to the spring/summer months. This observation potentially reflects the additional risks to pedestrians created from poorer visibility as a result of lower light levels and adverse weather conditions (32).

6.6 Key findings relating to district and road speed limit

The data analysis undertaken investigating district and road speed limit demonstrated different patterns relating to road speed and rural-urban classification for different districts across the County. Within Gloucestershire and Cheltenham a high proportion of KSI casualties occurred in urban locations on 30mph routes, whereas across other districts a higher proportion of KSI casualties occurred in rural locations on roads with a designated speed limit of 50 or 60mph. It is well documented that rural and urban road networks have markedly different safety challenges and risks (33). Strategic options targeting specific features of rural roads may be unlikely to substantively improve safety within urban networks and vice versa. The findings presented above suggest that bespoke consideration of the rurality or urbanity within the road system is warranted when identifying strategic options for action.

Recommendation 11: Use a tailored approach to identify strategic options for action that accounts for the specific features and safety challenges of rural and urban road networks within different districts of the County.

The rurality of Gloucestershire as a county also warrants special consideration with regards to strengthening post-collision response. The post-collision chain of response presented in Figure 21 details the necessary and interlinked components of post-collision care needed to prevent death and serious injury from occurring as a result of road traffic collisions (20). The Rural Paradox describes how individuals most likely to benefit from timely, high-quality trauma care are also the least likely to receive it, due to rurality adversely affecting all parts of the post-collision chain of response (20).

Figure 21. Post-collision chain of response

Post-collision response is an area of evolving research and practice, with a number of research projects currently being undertaken within the South West region. This includes Avon and Somerset Police trialling the introduction of over 500 Emergency Bleed Kits through their Community Bleed Kit Partnership initiative (34). If found to be effective, similar large-scale interventions may be appropriate to introduce within Gloucestershire as part of improving post-crash response. The Centre for Post-Collision Research, Innovation, and Translation (IMPACT) has also identified bystander intervention training to upskill first responders to undertake effective critical actions following a collision (35), alongside multi-agency extrication training have both been identified as potential way to reduce risk of morbidity or mortality, and close the rural paradox gap (36).

Recommendation 12: Explore mechanisms for strengthening post-crash response across the County, with a particular focus on rural road systems.

6.7 Key findings relating to injury-fatality matrix

An injury-fatality matrix was constructed to explore the relationship between the vehicle type causing injury or death against the type of road user who is harmed. Cars and Larger vehicle types

such as LGVs/HGVs in particular were observed to pose a high risk of harm to other more vulnerable users of the road system. While it is not possible to robustly ascertain the reason for a vehicle's journey from within the STATS19 dataset, it is a plausible assumption that many larger vehicles such as vans, LGVs and HGVs are likely to be being driven for commercial purposes. Information published by the Department of Transport with support from ROSPA and HSE has consistently indicated that between one quarter and one third of all collisions in the UK involve someone driving for work (37). The role of safety culture and the implementation of safe systems behaviours by companies using the road system is therefore an important consideration when considering mechanisms to improve road safety.

The Fleet Operator Recognition Scheme (FORS) is a voluntary accreditation scheme for fleet operators which aims to raise the level of quality within fleet operations, and to demonstrate which operators are achieving exemplary levels of best practice in safety, efficiency, and environmental protection. FORS accreditation is considered to be one of the gold-standard mechanisms though which commercial businesses can demonstrate safe operating practice and culture (38). The Health and Safety executive have also published extensive guidance for employers on driving and riding safely for work (39). This guidance includes the consideration of the health and safety of gig-economy workers and those who drive grey-fleet vehicles (personal vehicles used for business purposes). The gig-economy in particular is an area of emerging concern as drivers/riders may have little or no training or safety equipment, and be more likely to take greater risks on the road in pursuit of insecure work opportunities.

Recommendation 13: Engage with businesses using the road system commercially to identify examples of best practice and explore ways of working towards embedding optimal safety culture and practice. Consider how to engage with grey-fleet drivers and gig-economy workers to ensure they are adequately represented.

6.8 Key findings related to contributory factor analysis

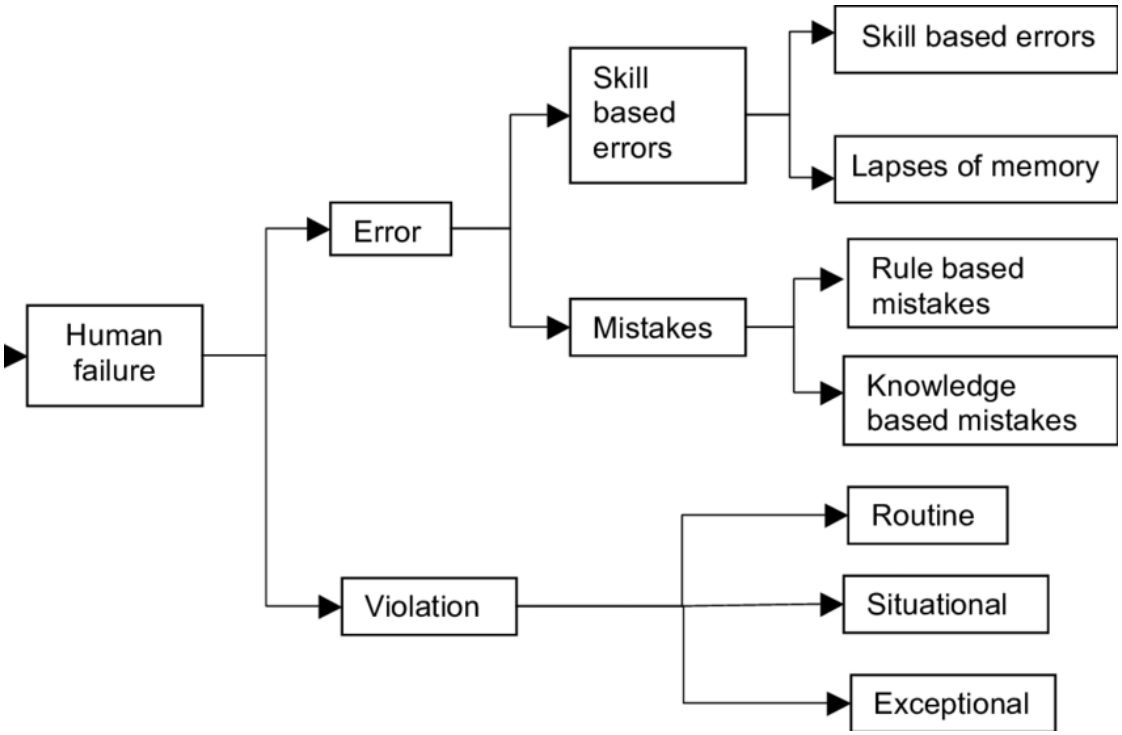
When police officers attend the scene of a collision, they are able to select up to 6 factors they believe contributed to the collision. These can be assigned to vehicles, casualties or uninjured pedestrians involved. While it is accepted that in-depth post-collision investigation may change the consensus on contributory factors, or reveal new factors, an analysis by the Department of

Transport showed that for most collisions the contributory factors identified at the scene were upheld following post-collision investigation (40). This makes contributory factor codes a valuable adjunct to understanding the aetiology of road traffic collisions.

Analysis of contributory factors showed that 25% of collisions resulting in KSI casualties had one or more codes relating to speeding, alcohol and drugs or driver distraction including from mobile devices. These factors form part of the 'fatal four' which alongside seatbelt wearing are offences that are prioritised within the National Police Chiefs Council (NPCC) Road Policing Strategy to reduce the number of people killed or seriously injured on the roads. The prevalence of fatal four contributory factor codes within collisions resulting in KSI casualties in the county show that continued action to reduce these offences remains a priority.

Analysis of contributory factors recorded against collisions resulting is KSI casualties additionally showed that a driver error and driver behaviour contributory factor codes were highly likely to be assigned to collision resulting in KSI casualties. Indeed 58% of KSI collisions were assigned a driver error contributory factor code, and 31.6% of KSI collisions were assigned a driver behaviour code. Accounting for the role of human factors within a safe system is fundamental to its success. Within occupational health and safety, the Types of Human Failure model is commonly used to describe how the two main components of human failure (error and violation) can result in accidents occurring as shown in Figure 22 (41).

Figure 22. Types of human failure model taken from Amusan et al.



It is acknowledged that this model is also highly applicable to road safety, and can be used to better understand how human actions within the road system impact on safety and risk. Behavioural insights and behavioural change models are tools that are commonly used across public services to generate low-cost interventions to improve health and wellbeing outcomes. The use of these established behavioural science tools may be highly relevant to designing road safety interventions, particularly those that rely on changing the attitudes and behaviours of individuals.

Recommendation 14: Continue to prioritise a reduction in fatal four offences alongside the identification of targeted interventions to address driver error and driver behaviour. Consider the use of a theoretical model of human failure alongside behavioural science tools to guide options for strategic action and their prioritisation.

6.9 Key findings related to motorcyclists

There were a total of 482 motorcyclist KSIs across the time period examined, meaning motorcyclists comprised 1 in 5 KSI casualties between 2017 and 2023, despite only being approximately 1-2% of

total road traffic. This highlights the vulnerability of motorcyclists in Gloucestershire, and the recommendation relating to the prioritising a reduction of KSIs among vulnerable road user groups applies here (Recommendation 1: Prioritise for strategic action a reduction in the rate of KSIs among those road user groups identified by this needs assessment as facing a disproportionate burden of serious injury and death within the road system).

Overall, 51% of motorcyclist KSIs occurred on 20, 30 or 40mph roads, and 49% occurred on roads where the speed limit was 50pmh or above. This again highlights that any strategy to improve road safety for motorcyclists on high-speed rural routes will not necessarily impacts rates of KSIs occurring on slower or more urban roads. The recommendation relating to the consideration of rurality and urbanity across the road system is also applicable here. (Recommendation 11: Use a bespoke approach when identifying strategic options for action that accounts for the rurality or urbanity of road networks within different districts of the county).

When exploring collision type motorcyclist KSIs, it was observed that over three quarters of KSIs occurred as a result of a motorcycle colliding with one or more other vehicles. The position of motorcyclists within the hierarchy of road user vulnerability and responsibility illustrates that the safety of motorcyclists is often dependent on the actions and behaviours of car drivers and drivers of larger vehicles such as vans, LGVs and HGVs. This is perhaps particularly important considering that 63% of motorcyclist KSIs were found to happen at a junction or roundabout, which are parts of the road system known to present considerable hazard to motorcyclists. It is also notable that 23% of motorcyclist KSIs were associated with a loss of control, and that the highest proportion of motorcyclist KSIs occurred in the Cotswold district on higher-speed rural roads.

Project PRIME is an award-winning Scottish motorcycle safety project that is based on the principle of 'nudge theory' using low-cost changes to road infrastructure to improve motorcycle rider safety behaviours (42). The evaluation of this project showed statistically significant positive behavioural changes in speed, lateral lane position and braking at sites where PRIME road markings had been introduced. The use of recommended PRIME traffic signs and marking was found to be particularly effective at influencing rider behaviour on higher speed rural routes.

Recommendation 15: Review the outcome data and installation toolkit relating to Project PRIME in Scotland, and consider if the recommended approach is transferrable to the road system in Gloucestershire.

6.10 Key findings related to younger drivers and riders

Younger people age 17-25 years who were drivers or riders were found to face disproportionate burden of death or serious injury when using the road system compared to road system users of all other ages. When categorised by severity of casualty, those aged 17 to 25 years old remained at highest risk of both being killed or seriously injured as a result of road traffic collisions. This highlights the vulnerability of younger drivers and riders in Gloucestershire, and the recommendation relating to the prioritising a reduction of KSIs among vulnerable road user groups also applies here (Recommendation 1: Prioritise for strategic action a reduction in the rate of KSIs among those road user groups identified by this needs assessment as facing a disproportionate burden of serious injury and death within the road system).

The risk to younger people associated with motorcycle and moped use was particularly stark with 46% of younger person KSIs involving this mode of transport. This finding is consistent with National statistics which show that young male motorcyclists are the most over-represented male age group as KSI casualties (30). There are a number of key skills influence the safety of motorcycle riding including the hazard perception, speed and condition awareness, and the ability to maintain control over the bike. Participation in advanced motorcycle training is recommended by RoSPA as one mechanism through which riders can be supported to develop these key safety skills (43).

Recommendation 16: Review the offer of advanced motorcycle training available in the county to assess if the needs of younger motorcyclist and moped riders are adequately met. Consider the role of additional barriers such as cost in encouraging younger motorcyclist and moped riders to participate in advance skills training.

There was also some evidence of patterning with regards to the time of day that younger people were likely to be involved in a collision resulting in death of serious injury. Overall, the highest proportion of KSIs involving younger people occurred between 3pm and midnight, and 42.8% of younger person KSI occurred between 6pm on Friday and 6am on Monday. This suggests there may be a clustering of risk for younger people associated with evening/nighttime and weekend driving and riding. There are several documented factors that influence the likelihood of younger people being involved in road traffic collisions when compared to other age groups in the population (25, 44, 45). These include distraction from mobile phones and other young people travelling in the same

vehicle, poorer hazard perception and propensity to speed, use of drink and drugs, and greater vulnerability to tiredness when driving at night. Inclination toward risk taking, particularly among young male drivers and riders, has also been identified as a contributory factor (44, 45). There is no reason to believe that these factors which are reported within national statistics, and wider the literature are not applicable to the local picture in Gloucestershire.

Recommendation 17: Ensure that factors that are relevant to generating excess risk among younger drivers and riders are explicitly addressed through targeted interventions for this population group. This should include the consideration of the role of sex relating to road safety behaviours and risk taking.

6.11 Key findings relating to pedal cyclists

Across all districts, the highest proportion of KSIs for pedal cyclist occurred on roads with a legal speed limit of either 30mph (59.7%) or 40mph (17.8%). Data analysis also suggests that just over two-thirds of cyclist KSI are occurring on roads classified as being urban, and that cyclists KSIs are almost exclusively resulting from collisions with other vehicles. In addition, a high proportion of cyclist KSIs were observed to occur at either a junction or a roundabout (68%) or in conjunction with an overtaking manoeuvre (27%). These findings demonstrate how pedal cyclist are likely become particularly vulnerable in parts of the road system where they are forced to travel in close proximity to other vehicles. Features of urban road networks such as high traffic volumes, non-segregated and inconsistent cycling infrastructure, and hazards such as parked cars may also contribute to elevated risk of collisions occurring. The recommendation relating to the prioritising a reduction of KSIs among vulnerable road user groups also applies here (Recommendation 1: Prioritise for strategic action a reduction in the rate of KSIs among those road user groups identified by this needs assessment as facing a disproportionate burden of serious injury and death within the road system).

The road safety charity Brake identifies cycle safe infrastructure and road speed as two of the most important ways to improve road safety for cyclists (46). The International Road Assessment Programme (iRAP) is a charitable organisation working towards the elimination of high risk roads. It has produced a number of infrastructure safety management tools, including CycleRAP which is a method of evaluating road and bicycling infrastructure for safety aiming to identify high risk locations without the need for collection of additional crash data (47).

Recommendation 18: Consider the use of tools such as CycleRAP to augment the current rolling programme of cycle route assessments with a specific focus on analysis of urban routes, junctions and roundabouts.

Recommendation 19: The Gloucestershire County Council current road safety policy considers that 20mph should be the accepted speed for drivers in places where vulnerable road users and vehicles mix. Consider the need for additional speed limit reviews across the road network as informed by the rolling programme of cycle route assessments with a specific focus on reducing the vulnerability of cyclists

Cycling is known to offer numerous health benefits, as well as being a key mode of active and sustainable travel. Additional and focussed efforts remain needed to ensure cycling within the county is as safe as it can be. Public perception that it is too dangerous to cycle on the roads is often cited as a critical barrier to more people using this form of transport (48, 49, 50). Improving road safety for cyclists is therefore likely to be an important mechanism through which increased levels of active and sustainable travel in the county are achieved.

6.12 Key findings relating to pedestrians

Approximately three quarters of pedestrian KSIs occurred on roads that were classified as urban, and 70.5% of pedestrian KSIs occurred on roads with a legal speed limit of 30mph. This strong patterning is likely a reflection of both high population and vehicle density within urban areas, combined with a higher likelihood of walkable journeys being within urban centres. The recommendation relating to the prioritising a reduction of KSIs among vulnerable road user groups also applies here (Recommendation 1: Prioritise for strategic action a reduction in the rate of KSIs among those road user groups identified by this needs assessment as facing a disproportionate burden of serious injury and death within the road system).

The standard speed limit in urban areas in England is 30mph, which is generally considered to represent a balance between mobility and safety. There is in now strong evidence that the risk of sustaining a fatal injury as a result of a road traffic collision is substantially reduced if a vehicle is travelling at 20mph compared to 30mph. The schematic diagram presented in Figure 23 illustrates the relationship between vehicle impact speed and the risk of fatal injury to adult pedestrians in a frontal impact, and the overall risk of fatality or serious injury at different speeds (51), and Figure 24 shows the likelihood of fatality or severe injury at different speeds (52).

Figure 23. Schematic diagram illustrating the relationship between vehicle impact speed and risk of fatal injury to adult pedestrians in a frontal impact

Figure 24. Schematic diagram illustrating the likelihood of fatality or severe injury at different speeds

A key principle of the safe system is that the road system is organised is such a way as to ensure that human errors do not need to have serious consequences. The implementation of 20mph speed limits within parts of the road system where pedestrians are likely to be in close proximity to vehicles is an important component of achieving this (53, 54). There is also evidence that reducing speed limits to 20mph increases public perceptions of safety, making it more likely that people will choose to undertake a journey by foot (55, 56). This has the potential to aid a greater number of the

population to access the health benefits of walking, alongside supporting the sustainable and active travel agenda.

The data analysis undertaken also demonstrated a clustering of pedestrian KSIs, with the highest proportions occurring between midday and 9pm. This potentially correlates with the times when the road system is likely to be at its busiest, highlighting the importance of traffic volume in the creation of excess risk for pedestrians. There are several initiatives that have been implemented both locally, and in other areas of the country that aim to either reduce overall traffic volume or to create areas of the road network that are traffic-free for part of the day. These include School Streets schemes, Play Street schemes and Low Traffic Neighbourhoods. Evaluation of these initiatives highlight the crucial role of co-creation (a collaborative process where stakeholders work together to create new initiatives) and community support in facilitating successful implementation (57, 58, 59, 60, 61).

Recommendation 20: The Gloucestershire County Council current road safety policy considers that 20mph should be the accepted speed for drivers in places where vulnerable road users and vehicles mix. Consider the need for additional speed limit reviews across the road network, and in collaboration with local communities, explore options for supplemental initiatives aimed at reducing traffic volume and car dependency.

Analysis of pedestrian casualties shows that over half of pedestrian KSIs were categorised as having the pedestrian crossing 'elsewhere' or within 50m of a crossing facility. Generally, this type of informal road crossing is considered to be more dangerous that the use of a formal crossing point. Research into pedestrian crossing preferences indicates that pedestrian behaviour related to crossing is shaped by a number of factors such as safety, convenience, crossing time, accessibility, and personal security. The type of crossing facility available is also likely to be an influential factor, with women and older people likely to be more adverse to using footbridges and underpasses as an example. Considerations about the availability of pavement space while waiting to cross may also influence the decision to walk to a designated crossing point, particularly for those with mobility aids and those travelling with young children in pushchairs. It is plausible that reducing pedestrian propensity to undertake informal road crossing through the provision of appropriately spaced and designed crossing points will improve the safety of pedestrians within the road system.

Recommendation 21: Undertake a review of the frequency of crossing facilities and the type of crossing facilities available within the County. In particular, consider barriers and facilitators that may either inhibit or promote the use of certain types of crossing facility from the perspectives of a diverse group of pedestrians.

The data analysis undertaken demonstrated an increased rate of KSI for pedestrians aged 70+ years compared to adult pedestrians aged 41-69 years. The hierarchy of road user vulnerability illustrates that individuals with disabilities are the most vulnerable road user group. Older pedestrians may be more likely to be considered to be part of this group due to factors such as physical frailty, neurocognitive disorders, and visual or hearing impairments. This is particularly pertinent considering that the number of adults aged 65 and over living in Gloucestershire is projected to increase by an average of 2,800 people per year between 2018 and 2043 (62).

Improving the safety of older pedestrians is dependent on the layout and functionality of the road system accounting for the specific needs and vulnerabilities of this group. Standards relating to inclusive mobility are outlined within the Department for Transport's guide to best practice on access to pedestrian and transport infrastructure (17). This document particularly emphasises the importance of active community engagement to ensure that the needs of disabled road users are fully understood and met. Overall, we all benefit from good design of the pedestrian and public transport system, and that any changes to the road system that improves safety for disabled road users is likely to also improve safety for other vulnerable road user groups.

Recommendation 22: Consider undertaking a mobility audit using inclusive mobility standards in areas of the county with the highest proportions of pedestrian casualties to identify areas of the road system that are particularly dangerous for disabled road users to navigate safely.

7. References

1. Department for Transport data on road network activity in the South West accessible from: Map Road traffic statistics - Road traffic statistics
2. Department for Transport annual report on reported road casualties in Great Britain published in 2024 accessible from: Reported road casualties Great Britain, annual report: 2024 - GOV.UK
3. International Transport forum at the OECD annual road safety report accessible at: Road Safety Annual Report 2022 | OECD
4. Parliamentary Advisory Council for Transport Safety GB road safety performance index accessible at: Microsoft Word - GB Road Safety Performance Index Report v2.2.docx
5. Department for Transport road safety statement published in 2019 accessible at: Road safety statement 2019: a lifetime of road safety - GOV.UK
6. BRAKE statement on Vision Zero and road safety management accessible at: Vision Zero: road safety management | Brake
7. Parliamentary Advisory Council for Transport Safety statement on safe system priorities accessible at: Safe System - PACTS
8. Vision Zero Network statement on traffic safety published in 2016 accessible at: How does Vision Zero differ from the traditional approach to traffic safety? | Vision Zero Network
9. Health and Safety Executive toolkit on understanding your HSE culture accessible at: Understanding your HSE culture | Hearts and Minds
10. Gloucestershire county council road safety policy accessible at: road-safety-policy.pdf
11. Inform Gloucestershire census data compiled by Gloucestershire county council data and analytics team accessible at: Census 2021 | Inform Gloucestershire
12. Inform Gloucestershire deprivation data compiled by Gloucestershire County Council data and analytics team accessible at: Deprivation | Inform Gloucestershire
13. Department for Transport STATS19 forms and guidance accessible at: STATS19 forms and guidance - GOV.UK
14. Department for Transport annual report on reported road casualties in Great Britain older drivers factsheet published in 2023 accessible at: Reported road casualties in Great Britain: older driver factsheet, 2023 - GOV.UK
15. Road safety observatory review on older drivers accessible at: Older Driver Review for the Road Safety Observatory
16. Older Drivers Forum information on age-related health conditions and fitness to drive accessible at: Home | Older Drivers
17. Department for Transport inclusive mobility guidance accessible at: Inclusive mobility: making transport accessible for passengers and pedestrians - GOV.UK
18. Mark Gunst, Vafa Ghaemmaghami, Amy Gruszecki, Jill Urban, Heidi Frankel & Shahid Shafi (2010) Changing Epidemiology of Trauma Deaths Leads to a Bimodal Distribution, Baylor University Medical Center Proceedings, 23:4, 349-354 accessible at: Changing Epidemiology of Trauma Deaths Leads to a Bimodal Distribution
19. Cuthbertson J, Drummond G. Prehospital Care Post-Road-Crash: A Systematic Review of the Literature. *Prehospital and Disaster Medicine*. 2025;40(2):94-100 accessible at: Prehospital Care Post-Road-Crash: A Systematic Review of the Literature | Prehospital and Disaster Medicine | Cambridge Core
20. Nutbeam T, Opinion: Why the safe system must work harder for rural communities, Road Safety GB, 2025 accessible at Opinion: Why the Safe System must work harder for rural communities

21. Department for Transport annual report on road casualties in Great Britain deprivation factsheet published in 2023 accessible at: Reported road casualties Great Britain: Casualties and deprivation 2024 (England) - GOV.UK
22. Nicola Christie, Sarah Jones, Sarah E. O'Toole, Systemic inequalities in road safety outcomes across high income countries and lessons from intervention approaches, Journal of Transport & Health, Volume 41, 2025 accessible at: **Systemic inequalities in road safety outcomes across high income countries and lessons from intervention approaches**
23. Sarah E. O'Toole, Nicola Christie, Deprivation and road traffic injury comparisons for 4–10 and 11–15 year-olds, Journal of Transport & Health, Volume 11, 2018 accessible at **Deprivation and road traffic injury comparisons for 4–10 and 11–15 year-olds - ScienceDirect**
24. Road Safety Foundation report on safe systems fatal review panels accessible at: **Fatal Review Panels • Learning from Crashes**
25. Department for Transport annual report on road casualties in Great Britain younger driver factsheet published in 2023 accessible at: **Reported road casualties in Great Britain: younger driver factsheet, 2022 - GOV.UK**
26. McCarty D, Kim HW. Risky behaviors and road safety: An exploration of age and sex influences on road accident rates. PLoS One. 2024 Jan 22;19(1):e0296663 accessible at: **Risky behaviors and road safety: An exploration of age and sex influences on road accident rates - PMC**
27. Jonathan J. Rolison, Shirley Regev, Salissou Moutari, Aidan Feeney, What are the factors that contribute to road accidents? An assessment of law enforcement views, ordinary drivers' opinions, and road accident records, Accident Analysis & Prevention, Volume 115, 2018 accessible at: **What are the factors that contribute to road accidents? An assessment of law enforcement views, ordinary drivers' opinions, and road accident records - ScienceDirect**
28. Department for Transport annual report on road casualties in Great Britain pedal cyclist factsheet published in 2024 accessible at: Reported road casualties in Great Britain: pedal cycle factsheet, 2024 - GOV.UK
29. European Commission road safety report accessible at: Cyclists - Mobility & Transport - Road Safety - European Commission
30. Department for Transport annual report on road casualties in Great Britain motorcyclist factsheet published in 2023 accessible at: Reported road casualties Great Britain: motorcyclist factsheet 2023 - GOV.UK
31. BRAKE statement on pedal cyclist and motorcyclist training available at: Pedestrian and cycle training | Brake
32. Department for Transport annual report on road casualties in Great Britain pedestrian casualty factsheet published in 2022 accessible at: Reported road casualties in Great Britain: pedestrian factsheet, 2022 - GOV.UK
33. European Road Safety Observatory statistics and analysis archive on urban and rural networks accessible at: Urban and rural networks - Mobility & Transport - Road Safety
34. Avon and Somerset Police published information about emergency bleed kit initiative accessible at: **Emergency bleed kits | Avon and Somerset Police**
35. Centre for Post-Collision Research, Innovation and Translation published information about bystander training accessible at: BYSTANDER - IMPACT
36. Centre for Post-Collision Research, Innovation and Translation published information about multiagency extraction training accessible at: EXIT - IMPACT

37. Department for Transport annual report on reported road casualties in Great Britain estimation of collisions involving driving for work accessible at: Reported road casualties Great Britain: estimates involving driving for work - GOV.UK
38. Fleet Operator Recognition Scheme published information accessible at: FORS Homepage - FORS - Fleet Operator Recognition Scheme
39. Health and Safety Executive guidance of driving and riding safely for work accessible at: Employers - driving and riding safely for work - Overview - HSE
40. Department for Transport report on contributory factors in road traffic collisions accessible at: Contributory factors in fatal collisions: comparing STATS19 with post-investigation recording, 2021 data - GOV.UK
41. Health and Safety Executive report on reducing error and influencing behaviour accessible at: Reducing error and influencing behaviour - HSE
42. Transport for Scotland Project PRIME toolkit accessible at: Project PRIME - Installation Toolkit | Transport Scotland
43. RoSPA statement on advance skills training for mortorcyclists accessible at: RoSPA-Motorcycle safety and training
44. Bates LJ, Davey J, Watson B, King MJ, Armstrong K. Factors Contributing to Crashes among Young Drivers. Sultan Qaboos Univ Med J. 2014 accessible at: Factors Contributing to Crashes among Young Drivers - PMC
45. BRAKE statement on younger drivers accessible at: Young drivers | Brake
46. BRAKE statement of training for pedal cyclists accessible at: Cycling | Brake
47. International Road Assessment Programme CycleRAP guidance and toolkit accessible at: CycleRAP - iRAP
48. RoSPA factsheet on perceptions of cycling safety in the UK accessible at: Safety in Numbers Factsheet
49. Department for Transport research report on increasing cycling uptake accessible at: A moment of change: increasing cycling uptake
50. David Friel, Sina Wachholz, Theresa Werner, Liesa Zimmermann, Oliver Schwedes, Rainer Stark, Cyclists' perceived safety on intersections and roundabouts – A qualitative bicycle simulator study, Journal of Safety Research, Volume 87, 2023 accessible at Cyclists' perceived safety on intersections and roundabouts – A qualitative bicycle simulator study - ScienceDirect
51. Department for Transport road safety web publication number 16 accessible at: Relationship between Speed and Risk of Fatal Injury: Pedestrians and Car Occupants
52. Tefft, B.C. (2011). *Impact Speed and a Pedestrian's Risk of Severe Injury or Death*. Washington, D.C.: AAA Foundation for Traffic Safety accessible at: Impact Speed and a Pedestrian's Risk of Severe Injury or Death - AAA Foundation for Traffic Safety
53. Carel-Peter L. van Erpecum, Anna Bornioli, Claire Cleland, Sarah Jones, Adrian Davis, Nicolette R. den Braver, Paul Pilkington,20mph speed limits and zones for better public health: Meta-narrative evidence synthesis, Journal of Transport & Health, Volume 39, 2024 accessible at: 20mph.pdf
54. Department for Transport 20mph research study report accessible at: 20mph research study - process and impact evaluation: headline report
55. Parliamentary Advisory Council for Transport Safety report on impact of 20mph zones for public health outcomes accessible at: New Report: The Impact of 20mph Speed Limits - PACTS

56. Paul Pilkington, Anna Bornioli, Issy Bray, and Emma Bird, The Bristol Twenty Miles Per Hour Limit Evaluation (BRITE) Study Analysis of the 20mph Rollout Project, 2018, accessible at: 323893116.pdf
57. Department for Transport low traffic neighbourhood research report accessible at: Low Traffic Neighbourhoods research report
58. National Centre for Social Research low traffic neighbour hood research report accessible at: Low Traffic Neighbourhoods Research Report
59. Centre for London report on low traffic neighbourhoods accessible at: CFL-StreetShift-LTNs-Final.pdf
60. UK Parliamentary Briefing report on pubic health impacts of 20mph speed limits and zones accessible at: POST-PB-0065.pdf
61. Living Streets Scotland review of practice and implementation of 20mph zones accessible at: review-of-current-practice.pdf
62. Inform Gloucestershire population projections compiled by Gloucestershire county council data and analytics team accessible at: overview-population-projections-for-gloucestershire-2018-2043.pdf