national highways

# Improving motorcycle safety

## A review of interventions and guidance for development and evaluation

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# EXECUTIVE SUMMARY

This work explored the role of post-licence motorcycle interventions for improving the safety of motorcyclists in Great Britain. National Highways has a long-term vision that no one should be harmed on their network and motorcyclists have been identified as a vulnerable road user (VRU) group due to their disproportionate involvement in injury collisions. The report details the findings from a literature review of existing interventions and international evidence, crash analysis and profiling, stakeholder workshop, logic model development and evaluation guidance.

The literature review serves as a foundation for understanding the current landscape of post-licence rider interventions in Great Britain. It provides insights into the types of programmes available, their design, approach, and effectiveness for enhancing rider safety. An in-depth review of these and international studies highlights the need for improved evaluation and reporting, better intervention design, an appreciation of the diverse nature of motorcyclists, and clearer correlation between interventions and common crash types.

To address this, a crash type analysis of STATS19 data identified seven segments of injury collisions involving motorcycles that highlights a complex interplay between bike size, urbanity and junctions:

1. Urban junction collisions involving those on small motorcycles.
2. Urban collisions involving those on small motorcycles away from junctions.
3. Rural collisions involving those on small motorcycles.
4. Urban junction collisions involving those on large motorcycles.
5. Single vehicle rural collisions involving large motorcycles away from junctions.
6. Rural collisions involving large motorcycles away from junctions (but involving other vehicles).
7. Rural junction collisions involving large motorcycles and other vehicles.

Profiling those injured in these crashes supports the identification of rider groups based on bike size, urbanity and a selection of demographic characteristics. The demographic characteristics vary significantly, clearly highlighting that a one-size-fits-all approach to intervention design will not work. Despite the variation, demographic groups that make up the majority of casualties were identified and can support future targeted intervention design, communication and recruitment.

Logic models for three of the segments representing the greatest number of casualties and most severe crash types are presented. These detail a framework showing the journey from intervention aims and objectives to measured outcomes via design, planning and mechanisms of effect, utilising well established behavioural theory. To further support future intervention development, a guide to process and outcome evaluation is provided with worked examples of question types and scales to use to measure outcomes related to attitudinal, behavioural and self-commitment responses.

Designing road infrastructure to protect motorcyclists is extremely challenging, given the nature of the vehicle and the protection it offers to riders. Riders, therefore, have a heavy burden of responsibility to manage their own exposure to risk. While a holistic approach is preferable, in the short-term, interventions need to support riders by equipping them with the knowledge, skills and self-awareness necessary for safe riding. This report underscores the need for tailored interventions, rigorous evaluation, and transparent reporting. Demographic profiling related to common crash types now provides a unique opportunity to tailor intervention design and communication to targeted audiences. While there is some evidence of best practice from international literature, this work suggests that either the adaptation of existing resources, or new resources, need to start with a detailed mapping exercise to bring it in line with best practice in other areas of public health.

# CONTENTS

## LIST OF FIGURES



## LIST OF TABLES

# 1.0 INTRODUCTION

Motorcyclists are the most vulnerable transport user group with the highest crash and injury rate of all road users (DfT, 2023a). In 2022, the fatality rate per billion passenger miles for motorcyclists was 114 across Great Britain. In comparison, for car occupants it was 2, and for pedestrians and cyclists it was 27 and 23 respectively. Prior to the COVID-19 pandemic, motorcyclist fatalities in Great Britain from 2011 to 2019 fluctuated between 319 and 365 each year, with no clear trend (DfT, 2020); 350 were killed in 2022 (DfT, 2023b)

National Highways has a long-term vision that no one should be harmed on their network and motorcyclists have been identified as a vulnerable road user (VRU) group due to their disproportionate involvement in collisions. In 2022, 296 motorcyclists were reported to have been killed or seriously injured (KSI) on the strategic road network (SRN), 15.2% of all KSIs on the network. Motorcycling features as a specific performance indicator (PI1.3 – the number of non-motorised and motorcycle users killed or injured on the SRN), hence there is a desire to establish the best available evidence for how to mitigate risk for motorcyclists.

A common intervention to improve safety for motorcyclists is rider training. Rider training is typically categorised as either pre- or post-licence training. Pre-licence training, such as Compulsory Basic Training (CBT), typically forms part of the licence acquisition process. This review is focused on post-licence rider interventions, such as 'advanced' rider training, education, communications and hazard perception. Post-licence interventions are typically voluntary and supplementary to any training required for licence acquisition.

## 1.1 THIS REPORT

This report details the findings from a number of activities that sought to explore, understand and inform the development of a framework for how interventions can reduce the number of motorcyclists killed and seriously injured.

Section 2.0 summarises a review that was conducted to identify the interventions that are currently available in Great Britain, and the evidence to support their design, implementation and effectiveness. To support this, a review of international literature was also undertaken to establish the broader evidence and identify examples of best practice.

Section 3.0 presents an analysis of crashes involving motorcyclists performed to establish the main factors that increase their risk on the SRN, and on the wider network. The evidence from the review and crash typology was used as the basis for discussion in a project workshop with key National Highways stakeholders to agree the direction and development of logic maps for motorcycle safety interventions.

Section 4.0 outlines the logic maps developed based on crash typologies in urban and rural areas that have the greatest severity outcomes. These maps detail the inputs, design, theoretical mechanisms of effect, behavioural impact and outcomes related to the specific crash type that any intervention targeting these riders would need to consider.

The final activity reported in Section 5.0 developed a guide and approach to the evaluation of such interventions, with relevant examples of measures also presented. This outlines what would be necessary to review and report on the impact, efficacy and effectiveness of such interventions.

The report concludes by summarising the key outputs of each task and presents recommendations for next steps.

# 2.0 LITERATURE REVIEW

A systematic approach was taken to explore the post-licence rider interventions currently available in Great Britain and to review the evidence available from published international literature. Rider interventions in Great Britain were assessed for their design, approach and evidence of meeting their goals and safety objectives. The review of international literature summarises the evidence for the effectiveness of post-licence rider interventions and discusses evidence of best practice. The review concludes with consideration of what National Highways may like to contemplate when considering their future support for post-licence rider interventions. The full method for the literature search with quality and inclusion criteria can be seen in Appendix A.

Rider training is the most common type of post-licence intervention currently delivered, although education, communications (e.g. promoting helmet wearing) and other approaches, like hazard perception, are also provided. A rider training intervention can itself include elements of skill-based training, education and hazard perception. To avoid confusion, the term “intervention” is used when discussing approaches to improve rider safety post-licence generally. The term “training” is used to refer to interventions designed specifically as training products.

## 2.1 OVERVIEW OF POST-LICENCE MOTORCYCLE TRAINING AND EDUCATION IN GREAT BRITAIN

A diverse array of post-licence interventions are offered to enhance rider safety and skills in Great Britain. In the section that follows, an overview of twenty interventions, encompassing a broad spectrum of training, education and communication approaches, are outlined and reviewed. These programmes range from practical on-road training and first-aid scene management to digitally accessible educational resources. Pre-CBT (Compulsory Basic Training) courses have been excluded from this analysis.

Table 1 contains a summary of the post-licence motorcycle interventions that have been identified as part of the review. Detailed descriptions of each intervention and a review of any existing evaluation evidence, where available, are provided in Appendix B. The evaluations included were those available at the time of writing and links are provided to publicly available reports. Following Table 1, the courses have been plotted onto the Goals for Rider Education framework (see section 3.3), to provide an overview of their scope and educational objectives.

*Table 2.1: Summary of post-licensure motorcycle training in Great Britain*

| No | Intervention | Provider | Delivery area(s) | Brief intervention description | Type of training | Cost per rider | Length (Time) | Evaluated | Link(s) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Advanced Motorcycle Training | RoSPA | National | On-road training | Knowledge<br>Attitude<br>Physical skills<br>Cognitive skills | Not known | 4-days | No | Link |
| 2 | Advanced Rider | IAM RoadSmart | National | On-road training | Knowledge<br>Physical skills | £175 | 6-8 sessions with observer | Yes | Link |
| 3 | BikerDown | Fire and Rescue Services | National – 47 teams delivering in UK | First aid and scene management, with a focus of the science of being seen | Knowledge<br>Attitude<br>Physical skills<br>Cognitive skills | £0 | 3-4 hours | No | Link |
| 4 | BikeSafe | Police | National – 38 Police Force areas | On-road rider assessment which signposts to post-test training | Knowledge<br>Attitude<br>Physical skills<br>Cognitive skills | £250+ | 5-8 hours | No | Link |
| 5 | BikeSense | Staffordshire County Council and Staffordshire Safer Roads Partnership | Staffordshire | On-road training | Physical skills<br>Cognitive skills | £100 | 1 day | No | Link |
| 6 | Bikertek | National Highways | National | Education via pop-up events display | Attitude<br>Knowledge | £0 | n.a. | Yes[1] | Link |
| 7 | BMF Blue Riband Rider Award | BMF | National - 25 approved training centres | On-road training | Knowledge<br>Physical Skills | £80 - £250+ | 1.5 days+ | No | Link |

[1] No link is available to an online evaluation but reference to a supplied PowerPoint presentation is provided in the Annex.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8 | BMW Rider Training | BMW | Exeter, Royston & Darlington | On-road training | Knowledge<br>Physical skills | £375 - £895 | 1-3 days | No | Link |
| **No** | **Intervention** | **Provider** | **Delivery area(s)** | **Brief intervention description** | **Type of training** | **Cost per rider** | **Length (Time)** | **Evaluated** | **Link(s)** |
| 9 | Diamond Advanced and Elite Motorcycle Test | Diamond | National | On-road assessment and limited training | Physical skills | £90 - £152 | 60-90 mins | No | Link |
| 10 | Enhanced Rider Scheme | DVSA | National | On-road training | Knowledge<br>Attitude<br>Physical skills<br>Cognitive skills | n.a. | 1-2hrs | No | Link |
| 11 | FireBike Better Biking Course | Essex Fire and Rescue Service | Essex | On-road assessment and training | Physical skills | £0 | 0.5 days | No | Link |
| 12 | Honda Refresher Course | Honda | National | On and off-road training | Physical skills | Not known | Not known | No | Link |
| 13 | Hugger's 1:1 Skills Session | Norfolk County Council | Norfolk | On-road training | Physical skills | £50 | 2 hrs | No | Link |
| 14 | Know the Dangers | Shiny Side Up | Derbyshire, Leicestershire and Nottinghamshire | Online educational resources | Physical skills<br>Knowledge | £0 | 3.5mins | Yes | Link |
| 15 | Live Fast Die Old | Road Safety Scotland | Scotland | Online campaign with expert tips | Attitude<br>Knowledge | £0 | n.a. | Yes | Link |
| 16 | Motorcycle Cornering Advice | RoSPA | National | Online educational resources | Physical skills | £3 | 6mins | No | Link |
| 17 | National Rider Risk Awareness Course | NDORS | National | Diversion from prosecution | Knowledge<br>Attitude<br>Cognitive skills | Various (dependent on police force) | 3 hrs | No | Link |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 18 | Raise Your Ride | Avon and Somerset Police and Somerset Road Safety | Somerset | Workshop and 1:1 training | Awareness Knowledge | £50 - £165 | 0.5-1 day | No | Link |
| **No** | **Intervention** | **Provider** | **Delivery area(s)** | **Brief intervention description** | **Type of training** | **Cost per rider** | **Length (Time)** | **Evaluated** | **Link(s)** |
| 19 | Safe Rider | Norfolk Constabulary and Norfolk County Council | Norfolk | On and off-road training | Knowledge Physical skills | £50 | 7.5 hrs | No | Link |
| 20 | Street Spirit Campaign | Safer Essex Roads Partnership | Essex | Online young rider campaign | Knowledge Attitude | £0 | 30-60 mins | No | Link |

Nb. The Kawaski Rider Training Scheme (KRTS)[2] provides 'back to biking' and advanced courses which can be adapted to suit specific rider needs. Training courses are available from approved training providers across Great Britain, but insufficient information is available from online sources to establish the content and focus of these courses. MCIA Ride[3] is an accreditation programme run by MCIA which provides quality assurance for motorcycle training schools and instructors. It is a scheme that is endorsed by the DVSA. The training providers which run post-test training courses under this scheme were not available from the MCIA site, and have not been included in this review. Several pre-CBT training programmes were also found as part of the search conducted for post-licence motorcycle training. Whilst these are outside the scope of this study, notable courses include the DVSA RideFree[4] programme which provides an online training programme to lay the foundation for participants taking their CBT course. TfL also fund a Beyond CBT: Skills for delivery riders course for those that have completed Compulsory Basic Training[5]. It should also be noted that there are several broader motorcycle initiatives taking place throughout the UK (e.g. 2Wheels Great Manchester[6], 2Wheels London[7] and the Young Rider Forum[8]) which aggregate information and advice for this user group, but have not been included in this review due to the largely 'sign-posting' role played. In addition, a hazard perception for motorcyclists project that has recently won funding from the Road Safety Trust[9] which will be relevant to National Highways considerations regarding motorcycle interventions once complete in 2025.

[2] https://www.learntoridewithkawasaki.co.uk/locations/

[3] https://mciacms.dn-01.visarchosting.co.uk/en/mcia-ride/about-mcia-ride

[4] https://www.safedrivingforlife.info/ridefree/

[5] https://tfl.gov.uk/travel-information/safety/road-safety-advice/motorcycling-in-london

[6] https://2wheelsgm.com/

[7] https://2wheelslondon.com/

[8] https://shinysideup.co.uk/nyrf/

[9] https://www.roadsafetytrust.org.uk/small-grants-awarded/national-young-rider-forum

## 2.2 INTERVENTION CORRESPONDENCE WITH GOALS FOR RIDER EDUCATION

The origin of the Goals for Rider Education is the Goals for Driver Education (GDE) framework, a pivotal framework in driver education research. The GDE framework was developed in the late 1990s as part of the European Union's GADGET (GDE Assessment Driver Education) project[10]. Its primary aim was to establish a more comprehensive approach to driver education, focusing on various levels of driving competencies beyond mere vehicle operation.

Since its inception, the GDE matrix has been extensively utilised and recognised in driver education and traffic safety research (e.g. Rodwell et al., 2018). The GDE matrix has also played a crucial role in shaping policies and educational methodologies in various countries (e.g. Molina et al., 2014), aligning driver training more closely with the complex demands of real-world driving and the development of responsible driving attitudes. Senserrick et al. (2017) adapted the GDE matrix for specific use with motorcycle education and training. The four hierarchical levels for the Goals for Rider Education framework range from basic vehicle control to personal characteristics, ambitions and competencies:

- ***Operational Level - Basic Vehicle Control:*** This foundational level concentrates on essential motorcycle control techniques, including steering accuracy, effective braking, and gear transitions.
- ***Tactical Level – Mastery of Traffic Situations:*** At this stage, riders develop advanced skills necessary for dealing with complex traffic situations. This includes engaging with other motorists, comprehending and abiding by traffic laws, and making informed decisions in various traffic conditions.
- ***Strategic Level – Trip-related Context and Considerations:*** This level expands to encompass broader aspects such as route selection, awareness of potential risks, understanding how emotions and societal standards impact riding behaviour, and the implications of these factors on overall journey planning
- ***General Level - Personal Characteristics, Ambitions and Competencies:*** The most advanced tier focuses on introspective aspects such as self-awareness of personal attributes, ambitions, and competencies. It emphasises the understanding of how personal lifestyle, motivations, and societal influences shape decisions and behaviours.

In relation to these levels, the essential elements of motorcycle rider education include:

- ***Knowledge and Skills:*** Developing specific competencies related to each level, ranging from basic vehicle control to the comprehension of broader journey-related considerations and personal characteristics.
- ***Risk-Increasing Factors:*** Identifying and understanding various risks associated with each level, from basic operational risks to strategic and general level risks like social pressures and personal risk tendencies.
- ***Self-Evaluation:*** Encouraging riders to continually assess their own abilities, behaviours, and tendencies across different levels, ensuring a realistic understanding of their skills and areas for improvement. Table 2 outlines the adapted Goals for Rider Education framework in full.

[10] https://road-safety.transport.ec.europa.eu/european-road-safety-observatory/statistics-and-analysis-archive/young-people/content-training-best-practice_en

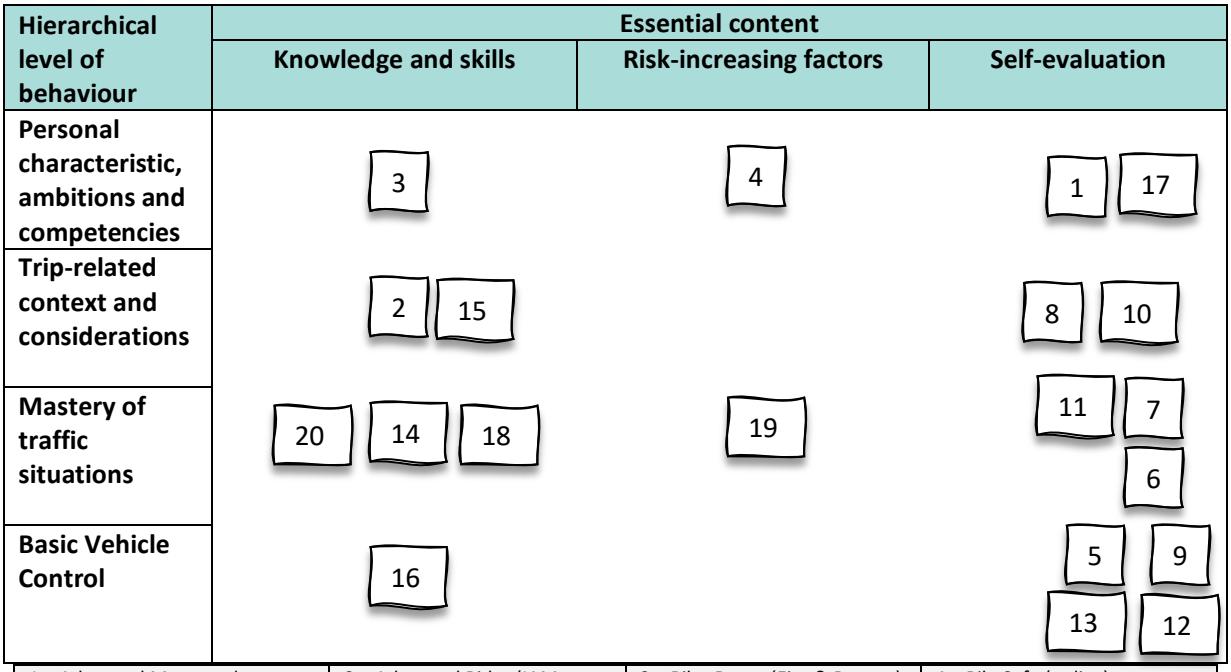
*Table 2.2: Overview of Goals for Rider Education framework*

| Hierarchical levels of behaviour | Essential Elements of Motorcycle Rider Education | | |
|---|---|---|---|
| | **Knowledge and skills** | **Risk-increasing factors** | **Self-evaluation** |
| iv. Personal characteristics, ambitions and competencies (General level) | Knowledge and control of general ambitions in life, values and norms and personal tendencies that affect driving behaviour<br>• Lifestyle<br>• Peer group norms<br>• Motives in life<br>• self-control and other characteristics<br>• personal values and norms<br>• etc. | Risky tendencies<br>• acceptance of risk<br>• self-value through riding<br>• sensation-seeking<br>• adapting to social pressure<br>• use of alcohol and drugs<br>• attitude towards society<br>• etc. | Self-awareness regarding;<br>• impulse control<br>• risky tendencies<br>• personal unsafe motives<br>• personal risky characteristics<br>• etc. |
| iii. Trip-related context and considerations (Strategic level) | Knowledge and skills regarding:<br>• choice of route<br>• estimated riding time<br>• effects of social pressure from pillions/co-riders<br>• estimating urgency of the trip<br>• etc. | Risks relating to:<br>• physiological condition of the rider<br>• road environment (urban/rural)<br>• social context and company of pillions/co-riders<br>• other motives (e.g. competition in traffic)<br>• etc. | Self-awareness regarding:<br>• personal skills with regard to planning<br>• typically risky motives when riding<br>• etc. |
| ii. Mastery of traffic situations (Tactical level) | Knowledge and skills regarding:<br>• traffic rules<br>• observation and use of signals<br>• anticipation<br>• speed adaption<br>• communication<br>• safety margins<br>• etc. | Risks caused by:<br>• poor decision- making<br>• risky riding style (e.g. aggressive)<br>• excessive speed<br>• vulnerable road users<br>• breaking traffic rules/unpredictable behaviour<br>• information overload<br>• difficult (road) conditions (e.g. darkness, bad weather).<br>• insufficient automatism of basic skills<br>• etc. | Self- awareness regarding:<br>• strengths and weaknesses regarding riding skills in traffic<br>• personal riding style<br>• personal safety margins<br>• strengths and weaknesses in dangerous situations<br>• realistic assessment of own skill<br>• etc. |
| i. Basic vehicle control (operational level) | Knowledge and skills regarding:<br>• control of direction and position of vehicle<br>• surface grip, tyre pressure<br>• dimensions of vehicle<br>• technical aspects of vehicle<br>• etc. | Risks related to:<br>• insufficient automation of basic skills<br>• difficult (road) conditions (e.g. darkness, bad weather)<br>• improper use of personal protective equipment sitting position<br>• etc. | Self-awareness concerning:<br>• strengths and weaknesses of basic vehicle control<br>• strengths and weaknesses manoeuvring in dangerous situations<br>• realistic assessment of own skill<br>• etc. |

*Source: Adapted from Goals for Rider Education framework (Senserrick et al., 2017)*

Figure 1 shows at what level each of the 20 interventions identified within this report are operating within the Goals for Rider Education framework. Where the course is placed has been determined as its highest level of operation. Overall, there is a good spread of courses and programmes, throughout the Goals for Rider Education levels, with over half (12) addressing the first two levels of the framework only. This is a summative assessment based on the available information, agreed between report authors. The assessment at this stage is not intended to be definitive but has been developed to support the logic model development completed as part of this commission.

*Figure 2.1: Goals for Rider Education levels addressed by identified post-licence motorcycle training interventions in Great Britain*




| | | | |
|---|---|---|---|
| 1 = Advanced Motorcycle Training (RoSPA) | 2 = Advanced Rider (IAM RoadSmart) | 3 = BikerDown (Fire & Rescue) | 4 = BikeSafe (police) |
| 5= BikeSense (Staffordshire) | 6 = Bikertek (National Highways) | 7 = BMF Blue Riband Rider Award (BMF) | 8 = BMW Rider (BMW) |
| 9 = Diamond Advanced & Elite Motorcycle Test (Diamond) | 10 = Enhanced Rider Scheme (DVSA) | 11 = FireBike Better Biking Course (Essex Fire & Rescue) | 12 = Honda Refresher Course (Honda) |
| 13 = Hugger's 1:1 Skills Session (Norfolk) | 14 = Know the Dangers (Shiny Side Up) | 15 = Live Fast Die Old (Road Safety Scotland) | 16 = Motorcycle Cornering Advice (RoSPA) |
| 17 = National Rider Risk Awareness Course (NDORS) | 18 = Raise Your Ride (Avon & Somerset) | 19 = Safe Rider (Norfolk) | 20 = Street Spirit Campaign (Essex) |

*Source: Authors' own*

## 2.3 EVIDENCE FROM INTERNATIONAL LITERATURE

This section reviews the evidence collated from the search for international published literature. The evidence base is limited, and therefore it is difficult to determine trends or reach firm conclusions. Nevertheless, a review of the literature provides relevant context for post-licence motorcycle interventions in Great Britain and supports assessment of opportunities for development.

The section begins with consideration of the overall evidence for the effectiveness of post-licence motorcycle interventions, followed by a summary of the evidence from notable trials and more specific approaches.

### 2.3.1 Evidence for effectiveness

Reviews on the evidence for effectiveness of motorcycle interventions typically look to Kardamanidis, Martiniuk, Ivers, Stevenson and Thistlewaite's (2010) Cochrane review which considered pre- and post-licence training. Cochrane reviews are systematic reviews that follow a common method to limit bias and error and are widely recognised as meeting the highest standards in evidence-based healthcare literature. Unfortunately, due to the poor quality of the studies in this domain, the authors were unable to reach any evidential conclusions. The review could therefore not determine if, or what type of motorcycle training, reduces the risk of crashes, injuries or offences.

The most recent systematic review was conducted by Araujo, Illanes, Chapman and Rodrigues (2017). Their broader aim was to review the evidence for the most effective interventions (not limited to training only) to prevent motorcycle-related injuries. Searching for studies published since 2000 from all major databases, the authors found only 20 that met the inclusion and quality criteria. The majority of papers, and the most effective intervention, was to promote helmet wearing (much of this from countries where helmet wearing rates are low). Other effective approaches for reducing injury rates include protective clothing and penalties for alcohol consumption and speeding. With regard to training, the evidence for pre-licence training suggested that it had a mild to moderate effect, although Karamanidis et al. (2010) previously suggested any effect for pre-licence training is likely due to motorcycle licensing acting to reduce exposure. However, there were no significant findings regarding non-compulsory post-licence training, which led the authors to summarise it as an "ineffective measure".

In summary, there is little overall evidence from systematic reviews for the effectiveness of post-licence motorcycle training due to a lack of published studies, and due to those that have been published being of poor quality. There is evidence of broader initiatives related to helmet wearing being effective, but this has limited relevance in Great Britain where wearing is compulsory and wearing rates are high. The remainder of this section looks at some of the individual studies published, mostly since these reviews, to determine what can be learned from the approaches taken.

### 2.3.2 Published evaluations since last systematic review

There are two trials not included in Araujo et al.'s review that stand out for addressing some of the methodological concerns raised by Karamanidis et al. (2010). In the first, Boele-Vos and de Craen (2015) conducted a randomised controlled evaluation of a one-day advanced rider training course. Two-hundred and two motorcyclists were randomly assigned to either the intervention or a control group. Due to the size of the sample, it was not possible to assess whether the intervention had any impact on crash outcomes. The research instead assessed the impact of the intervention on observed rider behaviour, self-reported rider behaviour and hazard perception.

The intervention was developed by the Royal Dutch Motorcyclist Association (KNMV) who designed the course to improve riders higher order skills (similar to levels 3 and 4 of the Goal for Rider Education framework). The training is both theoretical and practical and focuses on perception and recognition of hazards, and adaptation of riding behaviour to deal with risks. The content includes topics associated with conspicuity, speed, glance behaviour, risk perception and risk acceptance.

Results of post-intervention observations by riding instructors found that trained riders received a higher grade for 'safe' riding than the control group. The results indicated that trained riders had improved on adapting their speed or position on the road in response to potential hazards and to increase visibility. It should be noted that the training and post-intervention assessment were both performed by KNMV instructors, hence they may have picked-up on specific trained behaviours and rated them more strongly in the trained group. Nevertheless, the results suggest that the training

successfully transferred to observed post-intervention behaviour (e.g. speed choice, road positioning and response to potential hazards), although it is not clear what effect this might have on safety outcomes. The trained group also scored more highly on the independent hazard perception test compared to the control group. There was no indication that the training resulted in an increase in self-confidence.

The authors acknowledge that the results from this study somewhat surprisingly show such clear effects of the training. They point out that it is not clear what impact the recorded effects might have on safety outcomes but note that the research design addresses many of the shortcomings previously highlighted in systematic reviews. They posit that on-road instruction (rather than off-road) and in-class discussion of recordings of each individual rider were potentially the most effective components that supported self-reflection, insight and engagement while minimising any increase in confidence. This is important as previous training and education interventions have identified increases in confidence can result in participants taking greater risks (Elvik et al., 2009). The content of the course was considered to be varied and interactive with participants encouraged to analyse their own behaviour. Groups contained a maximum of nine riders and at least three KNMV certified instructors who regularly have the quality of their training assessed.

The second published trial was a large, randomised control trial of a post-licence rider coaching intervention (Ivers et al., 2016). The intervention was aimed at newly licensed riders in Victoria, Australia. The 2,399 riders who volunteered to take part were randomly allocated to either a control or intervention group. The intervention group received an on-road motorcycle rider coaching programme which involved pre-programme activities, 4 hours of riding, and facilitated discussion in small groups with a riding coach. Learner-centred approaches and principles of insight training (Gregersen, 1996) were central to the philosophy of the programme design.

The programme ran for over two years and riders were interviewed 3 and 12 months after completing the programme; control participants were contacted at the same timepoints. Participants were also linked with official databases containing police-recorded crash and offence data.

The analysis found no evidence of any effect of the on-road coaching programme on crashes. Riders in the intervention group reported fewer near crashes at three months, but the effect was not sustained at 12 months; nor replicated in sensitivity analyses. The intervention group reported more confidence in riding skills, more attribution of crash responsibilities to riders, more speeding behaviours and more riding hours in an average week than control riders, after accounting for the effects of age, gender, and riding exposure. There were no differences in police-recorded traffic offences, or in other self-report measures.

The 3-month near-crash effect may suggest that the intervention group developed better skills to anticipate road and traffic conditions, and to detect, recognise and react to hazards. However, the increase in confidence was also related to self-confidence in identifying hazards. The increased confidence may have been reasonable given a possible increase in skill, but this skill improvement did not ultimately lead to a reduction in crashes, or indicators of crash risk such as speeding. The intervention group reported statistically significantly more speeding behaviours compared to the control group, which while not seemingly increasing their crash risk, may be a concerning outcome related to the increase in confidence.

The lack of effectiveness from an intervention designed with best-practice principles and evaluated to a high-standard raises question marks over the expectation for post-licence training interventions to directly reduce rider crashes. When taken together, these two well-designed evaluations provide

mixed evidence and present a significant challenge to understand what approach, design or content may or may not be effective for post-licence motorcycle interventions. One major difference between the studies is the sample. Boele-Vos and de Craen's sample was recruited from attendees at a motorcycle fair (Boele, de Craen & Erens, 2013). The sample had a mean age of 43 years and 15 years' riding experience; this sample of 222 riders were therefore older, more experienced, and potentially enthusiastic, than the 2,399 newly licenced riders who took part in the trial delivered by Ivers et al. (2016). As both interventions appeared to follow similar best-practice design principles it is feasible that this was suitable for one audience (experienced riders) but not the other (inexperienced riders).

### *2.3.3 Hazard perception for motorcyclists*

In driving, hazard perception has long been considered an important skill for reducing collision involvement. Hazard perception is known to increase with on-road experience, and be trainable (Horswill & McKenna, 2004; McKenna, Horswill & Alexander, 2006; Grayson & Sexton, 2002). Despite this, very little work has been completed to understand the role of hazard perception for motorcyclists. This is surprising as hazard perception is potentially more important for motorcyclists than it is for drivers due to the physical vulnerability associated with riding. While there are a number of historical laboratory and simulator-based studies (e.g. Horswill & Helman, 2003; Rosenbloom, Perlman & Pereg, 2011; Underwood & Chapman, 1998), there is very little understanding of motorcycle-specific hazard perception skill and how this is associated with riding experience or crash risk.

To address this knowledge gap, Crundall, van Loon, Stedmon & Crundall (2013) sought to understand whether riding experience is related to motorcycle-perspective hazard perception skill. Crundall et al. (2013) tested 61 participants split into three groups of riders (novice, experienced and advanced riders) on a bespoke video-based hazard perception test. Novice riders were either approaching their motorcycle licence test or had passed within the last 12 months. Experience riders had a full licence and been riding for over 3 years, and advanced riders were experienced riders who had also undertaken post-licence motorcycle training.

Motorcycle perspective hazards were filmed from a moving motorcycle and were classified according to three of the top four reasons for motorcycle collisions (Clarke, Ward, Bartle & Truman, 2004): vehicles failing to give way to motorcycles at junctions, car drivers failing to spot motorcycles when engaged in motorcycle-specific behaviours (such as filtering), and rear shunts. The fourth most common motorcycle collision is loss of control on bends, a feature that was considered to relate more to hazard management than hazard perception.

Results found that while advanced riders performed better (i.e. reacted quicker at identifying hazards) than experienced riders, they were not significantly better than novice riders. There are several possible reasons for this finding. It is possible that the experienced riders were using a visual search strategy that is more attuned to progression on the road than hazard perception. It is suggested that riders might develop progression-focused strategies with experience, that advanced rider training reshapes. Advanced riders will also use progression-focused strategies, but may not do so at the expense of safety. A similarly structured motorcycle simulator study provides some support for this theory. It found experienced riders were more likely to choose the 'racing line' on bends compared to advanced riders, who choose a line to maximise visibility around the corner (Crundall, Stedmon, Crundall & Saikayasit, 2014). Novice riders took a line that was similar to the racing line, but it was suggested that they did not have the confidence of experienced riders to fully commit to it.

Crundall et al. (2013) suggest that both novice riders and advanced riders may have benefited from recent training. Experienced riders meanwhile may not have had access to any form of hazard training from either a car or motorcycle-perspective. When comparing to existing knowledge of car-driver hazard perception, it is worth considering that most motorcyclists will ride fewer miles than they drive in a car. As a result, riders may not have the opportunity to develop similar levels of motorcycle-perspective hazard perception skill through exposure and experience alone. This might suggest that there could be a role for post-licence hazard perception training, although given the results from Ivers et al. (2016), it is not clear in what format this would be. There is little other research to compare these findings with but the authors' concluded that advanced rider training may have supported hazard prediction and identification, and a more internalised Locus of Control (i.e. that management of road risks were within their control rather than dependent on others). Riders attributing control to themselves is something that is considered beneficial as it is considered more likely that they will take responsibility for managing their risk on the road, rather than believing that others' behaviour will dictate their safety.

In another hazard perception study, Helman, Palmer, Delmonte and Buttress (2012) trialled a hazard perception training package with novice and experienced riders. The controlled study with 88 participants in total involved riders in small groups (4-8 people) receiving facilitated group discussion and commentary in response to filmed clips from a rider's position. The hazard perception training was compared to a placebo training course focused on protective clothing. The results from a matched-pairs hazard perception test indicated that there were differences between novice and experienced riders speed choice overall (with novices choosing higher speeds) and that the hazard perception trained novice riders chose lower speeds to the scenes in the test than novices who received the protective gear training. However, there were no differences between the experienced rider groups. From this study it could be suggested that hazard perception training for novice riders would be beneficial, but this would need to be replicated to confirm any recommendation.

The evidence for hazard perception training with motorcyclists is limited and paints an unclear picture. Logically hazard perception is a key skill that is likely related to crash risk, but the relationship with experience is not as consistent as with findings from the driving literature. It seems intuitive that some form of hazard awareness training should be beneficial for post-licence riders, whether they are novices, returning riders or simply experienced riders, but the best approach to this has not been demonstrated[11].

[11] Note that there are two Road Safety Trust funded projects currently underway to explore the best perspective for a motorcycle hazard perception test (due for completion in 2025) and an exploration of the different mental models of on-road danger held by riders and drivers and how this impacts their ability to spot hazards on the road (due for completion in 2024). https://www.roadsafetytrust.org.uk/small-grants-awarded/national-young-rider-forum

## 2.4 DISCUSSION

There are many post-licence motorcycle interventions targeting riders in Great Britain, and they cover a fairly broad spread across the Goals for Rider Education framework. However, there is little evidence for the effectiveness of any of them to improve safety outcomes. Only four of the interventions identified have been evaluated, but few have been conducted to reliably confirm evidence for effectiveness at changing behaviour or improving safety outcomes. Despite the presence of some recent well-designed evaluation studies, the international literature does little to collectively support this and identify what works and what doesn't. To help inform next steps in this project, it is necessary to try and understand why post-licence motorcycle interventions, particularly training, lacks evidence. Four possible reasons are explored:

1. Poor evaluation and reporting.
2. Not all motorcyclists are the same.
3. Interventions are unrelated to crash outcomes.
4. Design of content and/or delivery is not effective.

### *2.4.1 Poor evaluation and reporting*

Kardamanidis et al. (2010) concluded,

> "Due to the poor quality of studies identified, we were unable to draw any conclusions about the effectiveness of rider training on crash, injury, or offence rates."

As a result, they were unable to identify or make recommendations for what a best rider training intervention should look like. The review by Araujo et al. (2017) was broader and concluded that there was evidence for the effectiveness of preventing injury and death to motorcyclists through helmet use, protective clothing, compulsory pre-licence training, and penalties for alcohol consumption and speeding. Nevertheless, the lack of well-designed, published evaluations of post-licence motorcycle training meant there was no evidence for what works, and what doesn't. The evidence from evaluations of post-licence motorcycle training in Great Britain does little to advance current knowledge.

Since these reviews, two randomised control trials of post-licence motorcycle training have been published. While they provide somewhat conflicting evidence, they hopefully show the way in which future evaluation can be conducted in this domain. Even where evaluations are being conducted, results might not always be published. Examples are known to the authors of historical evaluations remaining unpublished. Similarly, a blog by TRL noted that,

> "In 2019, TRL reviewed a set of four rider training courses (aimed at riders from novice through to experienced) and compared course content with main crash types. The (unpublished) report for the client noted inconsistencies in the ways in which the rider training courses introduced and covered these main crash types."
> https://www.trl.co.uk/news/predictable-nature-of-motorcycle-collisions

Without transparent publication of all evidence, whether good or bad, it is impossible to develop a weight of evidence and learn lessons.

### *2.4.2 Not all motorcyclists are the same*

You only have to consider the wide variety of powered two-wheeler vehicles available to realise that not all motorcyclists are the same. A number of studies have sought to explore different types of motorcyclists. Indeed, current provision of interventions already somewhat creates a segmentation

of motorcyclists considered most in need. For example, inexperienced riders, returning riders, female riders, commercial riders, advanced skill riders and aspirational racers (Blackman, Haworth, Biggs & Wishart, 2020). While this might be a logical categorisation, there is currently no understanding of the diversity within each of these groups.

In an exploration of post-licence motorcycle courses in New South Wales, Australia, the authors noted that participants had diverse characteristics, needs and motivations for undertaking rider training (Blackman, Haworth, Biggs & Wishart, 2020). Most riders in Australia do not undertake post-licence training (Haworth et al., 2012), but the perceived value of rider training in general has been shown to increase with age, with riders in their fifties tending to value it most highly (Sakashita, Stephen, Senserrick, Lo, & Ivers, 2014).

In the UK, Christmas, Young, Cookson and Cuerden (2009) sought to develop an understanding of motorcyclists' attitudes to safety and the reasons behind the decisions that impact on their safety. On the basis of qualitative and quantitative data collection from riders in Great Britain, Christmas et al., developed a segmentation of riders based on their motivations for riding. A summary of the segments can be seen in Table 3.

While no segmentation of riders is perfect, attempting to categorise riders based on their motivations as a rider could help identify what types of training could be relevant to different segments. No segmentation remains static and it is unclear how the motorcycle community may have changed since this research was conducted. For example, trends such as the gig economy will have impacted those riding for work who may not be well represented in the segmentation by Christmas et al. (2009).

*Table 2.3: Segmentation based on rider motivation from Christmas et al. (2009)*

| Segment | Proportion of riders | Description | Relationship with risk |
|---|---|---|---|
| **Performance disciples** | 8% | These are committed, all-year riders with a total focus on high performance riding – and a strong dislike for anything that gets in the way of it. | Precautionary fatalism: See risk as unavoidable negative of riding but tend not to think about it all the time – emphasis on personal skill and armour as responses to risk. |
| **Performance hobbyists** | 15% | These are solitary, summer-only riders, for whom riding is all about individual experiences and sensations – and who are not concerned about what other riders are doing. | Cautious attraction: See risk as part of what makes riding fun, but very circumspect about own abilities to deal with risks, leading to caution in behaviour. |
| **Riding disciples** | 16% | These are passionate riders for whom riding is a way of life, built on a strong relationship with the bike itself and membership of the wider fraternity of riders. | Active management of risks: Highly conscious of potential risk in riding, take active steps to manage it by responsible riding behaviour and use of gear. |
| **Riding hobbyists** | 15% | These are older, summer only riders who enjoy the social interaction with other riders almost as much as the riding itself – and who like to look the part. | Personal responsibility for avoiding risk: Highly conscious of risk, tendency to avoid potentially risky situations altogether, and to emphasise rider's responsibility for risks. |

| Segment | Proportion of riders | Description | Relationship with risk |
|---|---|---|---|
| **Car rejecters** | 10% | These are escapees (a higher proportion of women than in any other segment) from traffic jams, parking tickets, fuel costs and other problems of car use – who don't care for motorcycles but do care for low-cost mobility. | High awareness and high unhappiness: Very sensitive to the risks of riding and see this as a strong argument against riding. |
| **Car aspirants** | 11% | These are young people looking forward to getting their first car when age/ finances allow – but for the time being just happy to have got their own wheels. | Low awareness but high educability: Tend not to think about the risks of riding and as a result may not take steps to manage them; but signs that they will take steps when the risks are pointed out to them. |
| **Look-at-me enthusiasts** | 25% | These are young (or never-grew-up) riders with limited experience but limitless enthusiasm, for whom riding is all about self-expression and looking cool | Blasé confidence: Recognise risks of riding in general, but see themselves as relatively safe; plus strong tendency to see risk as part of what makes riding fun, and to engage in risky behaviours. |

Gig economy riders may be a group worthy of particular attention. While research is limited in this emerging domain, significant road safety risks have already been raised (Christie & Ward, 2023; Taylor et al., 2023). Gig workers frequently juggle multiple employment, in doing so undermining any controls over working hours (Christie & Ward, 2023). With various employment formats and a motivation on delivery rates, riders are known to be more likely to speed, run red lights and engage in risky behaviours fostered by a culture of urgency (Christie & Ward, 2023). Gig economy riders are also more likely to operate closer to populated centres where differences in motorcycle use has been identified previously (Jamson & Chorlton, 2009). For example, London motorcyclists are more likely to own bikes under 250cc and typically choose to ride a motorcycle to avoid congestion compared to a comparative UK sample's general "love of motorcycling". Nevertheless, no differences were found between London motorcyclists and the general comparison groups' propensity to undertake voluntary rider courses (Jamson & Chorlton, 2009).

### *2.4.3 Interventions are not related to crash outcomes*

As alluded to in the TRL blog quoted earlier, it is possible that the lack of effectiveness in post-licence motorcycle interventions is because content does not overlap significantly with typical crash outcomes. If the intervention is not aligned with crash outcomes, then it is logical that safety outcomes may not be realised. There is some evidence of interventions being designed to address specific known crash types, for example, Transport Scotland's Live Fast Die Young messaging focused on left-hand bends.

Historical in-depth motorcycle collision studies consistently conclude that crashes involving motorcycles have different characteristics to other road user groups (RoSPA, 2017). Nevertheless, the common crash types involving motorcyclists are fairly consistent and well established (Clarke et al., 2004, 2007; DfT, 2023; RoSPA, 2017). These include:

1. **Junctions**: The most typical collision involves a right of way violation whereby another vehicle turns into the path of an approaching motorcycle (commonly referred to as Look-But-Fail-To-See error).
2. **Loss of control**: Many of these will occur on rural roads and bends. On bends, there is evidence that collisions are more likely to happen on sharp bends than on gentle bends (Stedmon et al., 2023). In such circumstances, motorcyclists tend to 'run wide' across the centre of the

road making them vulnerable to oncoming traffic, hard vegetation or roadside furniture (Stedmon et al., 2023). Motorcyclists may also have to change line to negotiate hazards on the road surface (like oil gravel or mud) or unexpected traffic or objects on the road.

3. **Decision making**: This covers overtaking, speed choice, and impairment.
    a. **Overtaking**: Crashes while overtaking typically occur because either other road users are not aware of a motorcycle 'filtering' through static or low-speed traffic, or because of a misjudged overtake at higher speed.
    b. **Speed choice**: Clarke et al.'s (2004) in-depth crash study identified misjudging the speed to negotiate a bend as the most common cause of single vehicle motorcycle crashes. In-depth analysis of 93 crashes involving a fatal motorcyclist in London found 'exceeding the speed limit' to be among the most common police recorded contributory factors for the motorcyclist in single and two-vehicle collisions (Smith, Knowles & Cuerden, 2013).
    c. **Impairment**: While riders are less likely to fail breath tests than drivers, motorcyclists are 2.7 times more likely to be involved in a crash when under the influence of alcohol than car drivers (RoSPA, 2017). The role of drug riding in collision data is uncertain although Smith et al. (2013) reported that drugs were present in 6% of fatal motorcyclists in their sample. Rider fatigue is also a common concern and included in interventions such as National Highways' Bikertek resource.

The crash type analysis in Section 3 updates and supports the in-depth analysis undertaken by Clarke et al. and others, suggesting junction conflicts (where cars turn into the path of an oncoming motorcyclist); loss of control; and poor decision making all still feature in motorcycle collisions. Common crash types therefore involve both interaction with other road users (such as at junctions or when filtering) but can also be influenced by rider perception, anticipation and decision making. It is not clear how much current intervention provision has been overlaid with these crash causation factors with the aim of providing riders with strategies to reduce related risk. It is also not clear where the gap for each of these occurs: is it knowledge, attitudes, physical skills, or cognitive skills, for example?

### *2.4.4 Design of content and/or delivery is not effective*

With the lack of clear evidence for post-licence motorcycle intervention content, it may be necessary to consider lessons learned from driver training. Historically, advanced driver training focused on teaching complex lower-order skills, such as advanced vehicle control in emergency situations like skidding or braking. However, these were commonly found to lead drivers to overestimate their skills. A meta-analysis concluded that training aimed at control skills for managing rare, dangerous situations was counterproductive and detrimental to road safety (Elvik et al., 2009). A new generation of driver education was later promoted based on 'higher order skills' such as motives, self-awareness, self-regulation and anticipation (Bartl et al., 2002; Hatakka et al., 2002). Advanced higher-order training can still lead to overconfidence in skills in some cases (Sanders & Keskinen, 2004), but focusing content on higher-order skills is nevertheless considered to be best-practice in motorcycle intervention development (Senserrick et al., 2017).

Higher-order skills map well to the higher levels, and particularly the self-evaluation column, of the Goals for Rider Education framework (see Figure 1). They are also important elements of modern behaviour change theories (e.g. COM-B[12]) which focus on individuals perceiving that they have the capability, opportunity and motivation to perform the desired behaviour. This requires supporting people to have self-awareness and create detailed mental models for how to achieve an aim (e.g. safer riding). Equipping riders with safety-orientated subjective norms[13] and promoting perceived behavioural control[14] could be considered successful outcomes of a training intervention, for example. The relationship between these factors with safety outcomes may be complex and mediated by a variety of factors (none more so than the randomness of crashes), but they are measurable outcomes that could be more easily evaluated than crashes.

Some of the courses currently available appear to have elements that overlap well with higher levels of the Goals for Rider Education framework. For example, RoSPA's Advanced Motorcycle Training focuses on hazard management and risk reduction, including improving observations and awareness of potential road risks. Similarly, the National Rider Risk Awareness Course seeks to address high-risk riding and is exploring mental models of on-road danger and the relationship with hazard perception. This course is only available to those who have committed a traffic offence though. Few, however, appear to have a similar balance of on-road and classroom-based instruction with such a strong individual focus as the Dutch training evaluated by Boele-Vos & de Craen (2015). As one of the only interventions to have demonstrated effectiveness, it may provide the best guidance for future course design and delivery.

## 2.5 SUMMARY

In short, while there are numerous post-licence motorcycle interventions being offered in Great Britain, little has been evaluated and the evidence for what works and what does not is almost non-existent. The international literature is similarly weak, although some recent evaluations have been of high quality. Nevertheless, the historic lack of evaluation and reporting is challenging.

Motorcycle riders cover a broad spectrum of society and have varied needs, use cases and motivations. The training needs and motivation of a young gig economy worker is likely to be very different from an older rider who has purchased a new motorcycle after a few decades of not riding. Identifying the purpose and audience for any post-licence intervention is critical, and this is not always clear from those on offer.

[12] The COM-B model for behaviour change cites capability (C), opportunity (O), and motivation (M) as three key factors necessary to affect behaviour change (B). Capability refers to an individual's psychological and physical ability to participate in an activity. Opportunity refers to external factors that make a behaviour possible. Lastly, motivation refers to the conscious and unconscious cognitive processes that direct and inspire behaviour.

[13] A subjective norm is a perception that an individual has regarding whether people important to them would approve of a particular behaviour.

[14] Perceived behavioural control refers to an individual's belief about how easy or difficult it will be for them to perform a particular behaviour, taking into account the resources and obstacles they anticipate.

Motorcycle crash types appear to be fairly consistent, and training should focus on addressing these directly. Not all are in the sole control of the motorcyclist and a broader spectrum of Safe System approaches is necessary to address these (e.g. junction interactions with other vehicles). It is not clear how much current interventions are designed to target known crash types directly, or how much they have been designed to focus on what those designing it think should be taught. For example, elements of Police Roadcraft training may be relevant to all riders (such as increasing visibility with positioning and hazard anticipation), but not all riders need to be trained to ride like police officers (i.e. highly skilled to cope with high-speed pursuit riding).

Finally, modern approaches to training and behaviour change promote equipping riders with the skills to make good decisions. Some of the training appears to have elements of the higher levels of the Goals for Rider Education, but it is not clear what the right blend of content and delivery needs to be. Two well designed and evaluated trials reported different results with experienced versus inexperienced rider samples, meaning it may be necessary for each intervention to cater specifically to the intended audience and outcome. The design of these interventions, nevertheless, potentially identifies best practice principles for future design. For example, the intervention positively evaluated by Boele-Vos and de Craen (2015) had a strong focus on riders analysing and reflecting on their own recorded behaviour, with post-ride analysis supported by highly trained facilitators. That study was not evaluated against crash outcomes, which can be challenging for evaluations, and proxy variables such as confidence in riding skills, attribution of responsibility, speed choice and observed behaviour could be used. Further work could also explore the use of hazard perception training, particularly for novice riders as a lack of rider exposure may limit development of this skill.

# 3.0 CRASH TYPE ANALYSIS

## 3.1 SCOPE

Collision and casualty analysis was conducted to identify trends in incidents involving motorcyclists. Analysis was split between those riding motorcycles with an engine size up to 125cc and those with engines over 125cc.

The data source for this analysis was national STATS19[15] data (e.g. police reported collision data). The figures are based on reported numbers of casualties, and not those adjusted to account for changes in severity reporting.

For an incident to be included in STATS19, it must have:

- ✓ Involved at least one vehicle (including non-motorised vehicles)
- ✓ Resulted in an injury to at least one person
- ✓ Occurred on a public highway or footway (or involved a vehicle leaving a public highway) and
- ✓ Been reported to the police (at the scene or subsequently).

Therefore, an incident falls outside the scope of STATS19 if it:

- × Did not involve any vehicles
- × Resulted in no human casualties
- × Occurred outside the public highway (for example, in a car park or private road) and/or
- × Was not reported to the police within 30 days.

STATS19 data is collated in a form which collects information on the 'Crash', which covers details about the location (road type, speed limit, weather and lighting conditions, carriageway hazards); the 'Vehicle' (vehicle type, manoeuvres, driver or rider details, and impact types); and the 'Casualty' record (age, sex, severity of injury, pedestrian movement details); and 'Contributory Factors', which are factors assigned to participants (either the driver/rider or casualty) by the reporting officer at the time of the collision. The system used to undertake this analysis (MAST Online) links fields across the different parts of the STATS19 form to be able to explore the crash location, casualty details, and driver/vehicle data associated with each collision.

An injury collision recorded in STATS19 must involve at least one vehicle (which can include pedal cycles) and therefore a pedestrian fall would not be included. As an injury collision, it must also involve at least one casualty. Therefore, the number of injury collisions is always lower than the number of involved vehicles and the number of casualties: one collision has one or more vehicle and one or more casualty. Furthermore, one vehicle can have one or more casualties associated with it.

The following filters were applied for this crash analysis:

- Crash Location = England
- Crash Date = 2018-2022
- Crash involved Motorcycle User Casualty = Yes
- Crash involved Motorcycle: 'Motorbike over 125cc' or 'Motorbike up to 125cc'.

For this analysis, the focus was on collisions where either a motorcycle rider or pillion passenger was injured. In addition, it is possible that other participants, including pedestrians, were also hurt (and are explored in the casualty analysis).

[15] https://assets.publishing.service.gov.uk/media/5a7b306340f0b66a2fc05c34/dft-statement-stats-19.pdf

The following filters were applied for casualty analysis:

- Crash Location = England
- Crash Date = 2018-2022
- Casualty Type of Related Vehicle: 'Motorbike over 125cc' or 'Motorbike up to 125cc'.

A 'related vehicle' is the vehicle being driven or ridden if the casualty was a driver or rider; the vehicle that a casualty passenger was travelling in or on; or the vehicle that struck a pedestrian. In this analysis, therefore, the casualties could be the motorcycle rider, their pillion passenger, and/or any pedestrians hit by a motorcycle.

## 3.2 MAIN FINDINGS

The following summarises the collision and casualty analysis outlined in more detail in this report.

- There were 42,585 injury collisions where motorcyclists riding motorcycles up to 125cc were injured (60% of total).
- There were 28,992 injury collisions where motorcyclists riding motorcycles over 125cc were injured (40% of total).
- Whilst there are more injury collisions where those riding small motorcycles were injured (to any severity), a greater proportion of those involving large motorcycles result in death or serious injury.
- 25% of collisions involving motorcycles up to 125cc are killed or seriously injured (KSI) collisions.
- 44% of collisions involving motorcycles over 125cc are KSI collisions.

The analysis revealed that there were different circumstances which were more common in different types of collision involving motorcyclists. These include differences related to the locations in which collisions occur or the types of motorcyclists involved. As a result, **seven segments** of motorcyclists were identified, with three of these segments having sub-segments based on whether the motorcyclist lived in London or not. These seven segments are:

1. Urban junction collisions involving those on small motorcycles.
    a. Londoners
    b. Non-Londoners
2. Urban collisions involving those on small motorcycles away from junctions.
    a. Londoners
    b. Non-Londoners
3. Rural collisions involving those on small motorcycles.
4. Urban junction collisions involving those on large motorcycles.
    a. Londoners
    b. Non-Londoners
5. Single vehicle rural collisions involving large motorcycles away from junctions.
6. Rural collisions involving large motorcycles away from junctions (but involving other vehicles).
7. Rural junction collisions involving large motorcycles and other vehicles.

Table 4 shows the seven segments and the number of collisions, vehicles and casualties associated with each segment. Clicking on the segment title (in bold) takes the reader to more analysis on each segment.

*Table 3.1: Motorcycle segmentation*

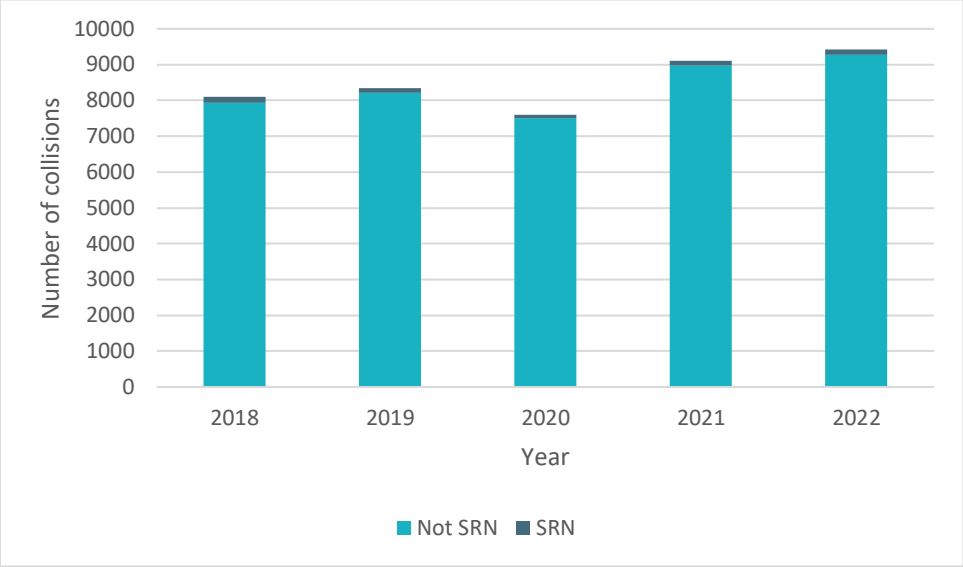
| Segment | Category | Number |
|---|---|---|
| 1: Urban junction collisions with small motorcycles | Collisions | 10,414 |
| | Contributory Vehicles (Motorcyclists) | 8,064 |
| | Casualties (A: Londoners) | 5,179 |
| | Casualties (B: Non-Londoners) | 4,639 |
| 2: Urban collisions with small motorcycles away from junctions | Collisions | 7,014 |
| | Contributory Vehicles (Motorcyclists) | 4,879 |
| | Casualties (A: Londoners) | 3,155 |
| | Casualties (B: Non-Londoners) | 3,480 |
| 3. Rural collisions involving small motorcycles | Collisions | 7,452 |
| | Contributory Vehicles (Motorcyclists) | 6,257 |
| | Casualties | 7,237 |
| 4. Urban junction collisions involving large motorcycles | Collisions | 4,682 |
| | Contributory Vehicles (Motorcyclists) | 4,075 |
| | Casualties (A: Londoners) | 1,847 |
| | Casualties (B: Non-Londoners) | 3,248 |
| 5. Single vehicle rural collisions involving large motorcycles away from junctions | Collisions | 2,576 |
| | Contributory Vehicles (Motorcyclists) | 2,190 |
| | Casualties | 2,347 |
| 6. Rural collisions involving large motorcycles away from junctions with other vehicles | Collisions | 4,128 |
| | Contributory Vehicles (Motorcyclists) | 3,971 |
| | Casualties | 4,048 |
| 7. Rural junction collisions with large motorcycles and other vehicles | Collisions | 3,411 |
| | Contributory Vehicles (Motorcyclists) | 3,060 |
| | Casualties | 3,267 |

More detailed information is provided in the tables associated with each segment provided in Appendix C.

### 3.2.1 Crashes involving riders on motorcycles up to 125cc

These collisions are those involving individuals who were injured whilst riding a smaller motorcycle. Over the five years of 2018 to 2022, there were 42,585 collisions involving riders who were injured whilst travelling on smaller motorcycles.

*Figure 3.1: Collisions involving motorcycles up to 125cc by year and SRN or local roads (2018-2022)*




A quarter of the collisions involving these smaller motorcycles resulted in death or serious injury.

Most of these collisions (98%) did not occur on the National Highways' Strategic Road Network (SRN) and 82% of the incidents occurred on urban roads (which reduced slightly to 72% when only those collisions resulting in death or serious injury were included). In total, 35,129 collisions occurred on urban roads and 7,452 occurred on rural roads.

Half of the collisions which occurred on urban roads were on A roads, as can be seen in Figure 3.2. The proportion was similar for rural roads (48%), although a higher percentage of these collisions occurred on rural B roads than urban B roads (17% to 11%) as shown in **Error! Reference source not found.**.3.

*Figure 3.2: Collisions involving motorcycles up to 125cc on urban roads by road class (2018-2022)*

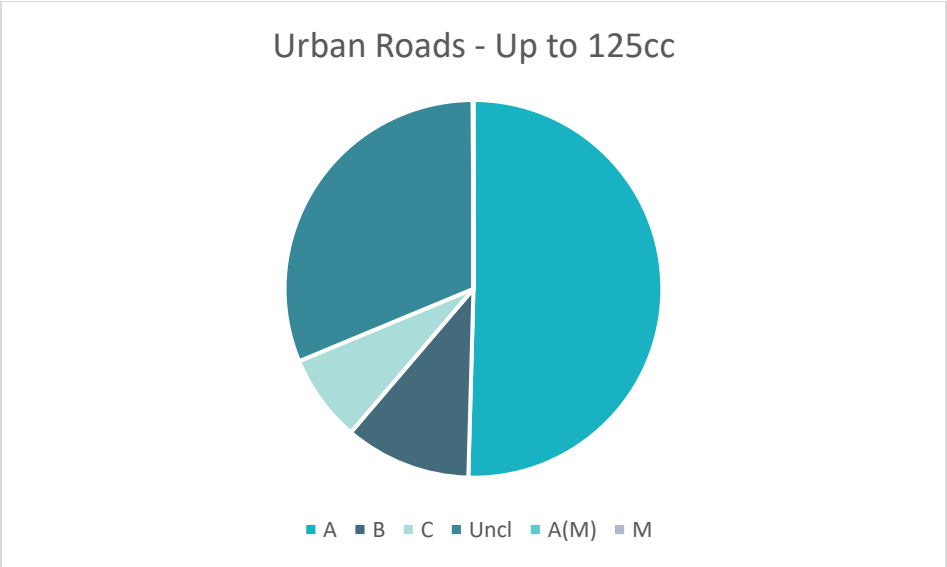
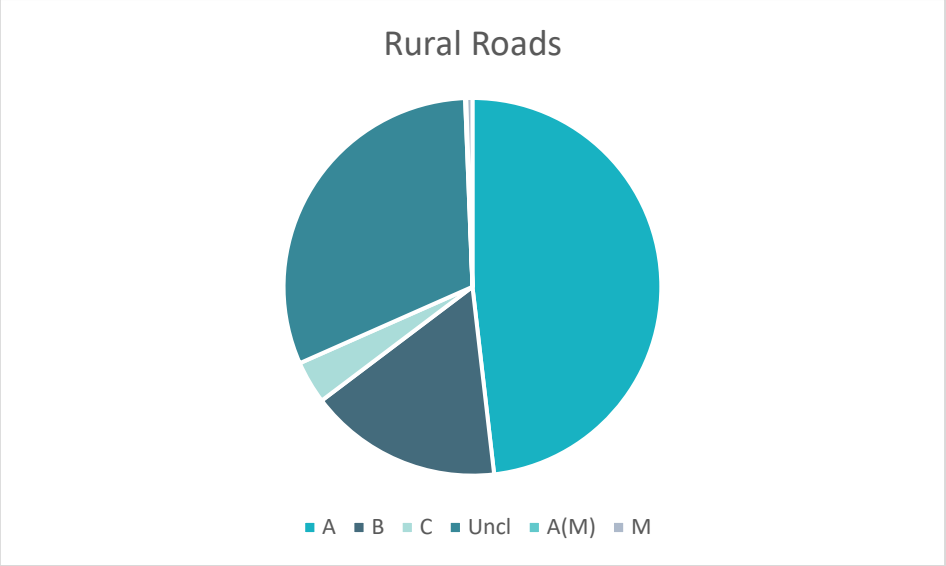
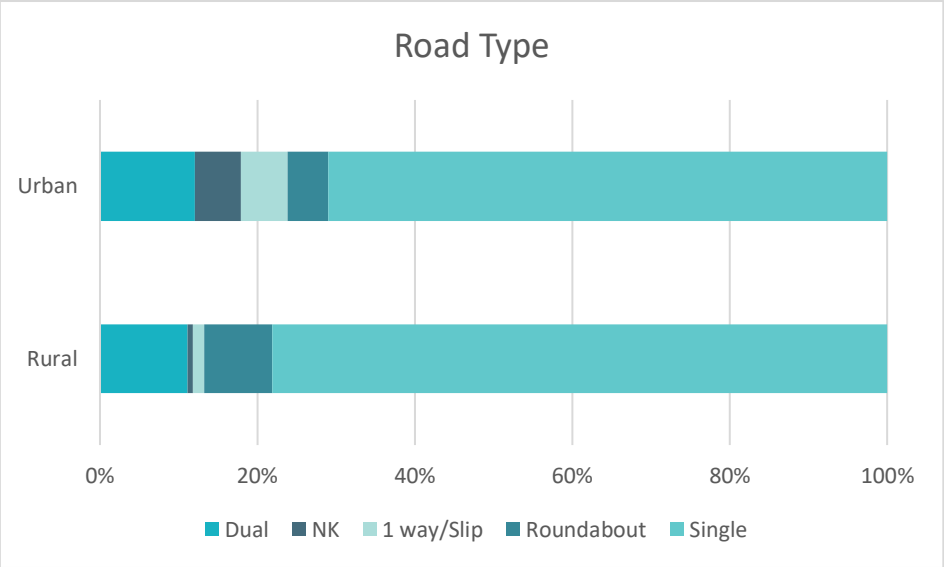


*Figure 3.3: Collisions involving motorcycles up to 125cc on rural roads by road class (2018-2022)*



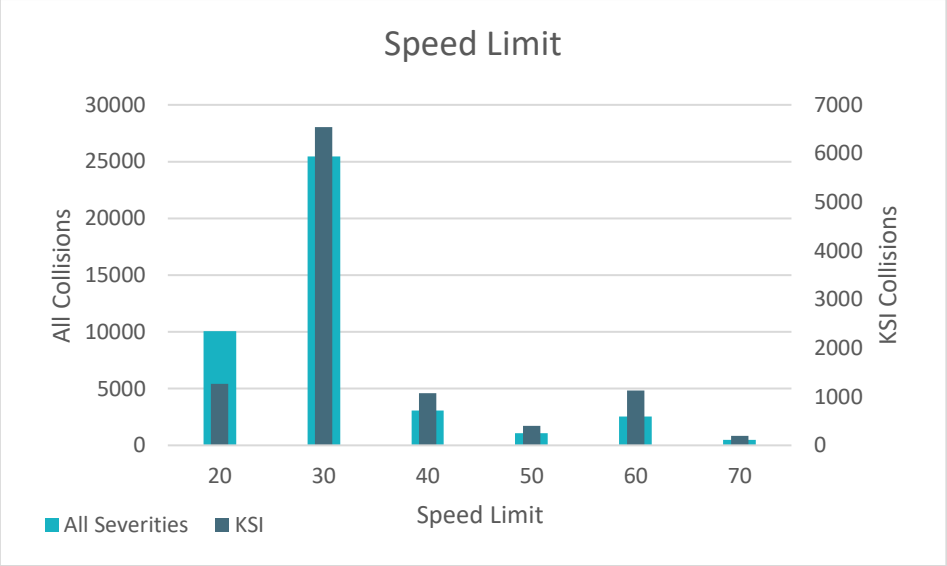

For both urban and rural collisions, small motorcycles tended to be travelling on single carriageway roads at the time of their incident.

*Figure 3.4: Collisions involving motorcycles up to 125cc by road type and rurality (2018-2022)*




Speed limit analysis is interesting when the severity of the collision is explored. The majority of the collisions which involved small motorcycles were in 30mph speed limits for all collisions and KSI collisions. Unsurprisingly, there was a higher proportion of collisions of all severities which occurred in 20mph speed limits, whilst more severe collisions which resulted in death or serious injury had higher proportions in faster limits.

*Figure 3.5: Collisions involving motorcycles up to 125cc by speed limit and severity (2018-2022)*




Exploring collision dynamics on single carriageway roads, where most of the collisions occur, there was no impact with another vehicle in 22% of the incidents involving motorcycles up to 125cc. This suggests that the motorcyclist left the carriageway and hit another object. In KSI collisions, 28% had no impact with another vehicle but 19% had a head on impact.

Looking at the junction detail, 71% of collisions occurred at some sort of junctions with 36% of the collisions occurred at T junctions. Overall, 29% occurred where there was no junction. The proportion where there was no junction was higher for KSI collision at 36%. The majority of these junction collisions were Give Way controlled.

### *3.2.2 Collision-involved motorcyclists on machines up to 125cc*

Postcode data[16], collected at the time of the collision, can provide an insight into where motorcyclists come from and can be linked to sociodemographic profiling systems to understand who they are.

This analysis explores all casualties where the 'related vehicle' was the motorcycle. This means the rider of the motorcycle, a pillion passenger on that motorcycle, or a pedestrian struck by the motorcycle. However, 93% of the casualties were the motorcycle rider themselves.

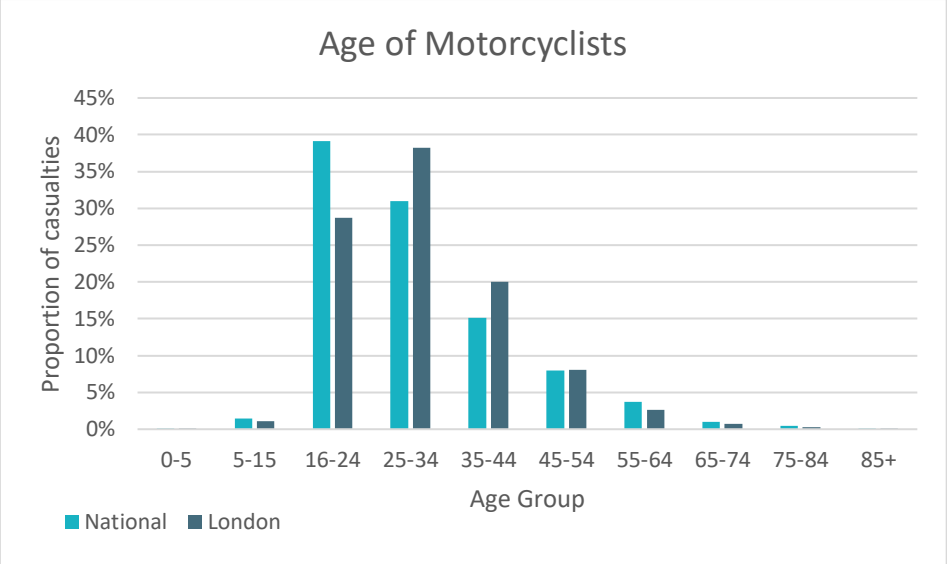
Cars were most frequently the other vehicle involved in the collision (34% for fatal casualties and 59% of serious casualties). For those killed in these collisions, 27% were in a collision which involved no other vehicles (17% of serious casualties). The motorcyclists tended to be travelling straight ahead (56%) or were overtaking (12%).

Almost half of the motorcycle casualties on machines with an engine up to 125cc lived in London.

The majority of riders were male (88%) and they tend to be young. Over a third (39%) were aged between 16 and 24 years old and a further 31% were aged between 25 and 34 years old. For KSI collisions, an even greater proportion (43%) were aged 16 to 24 years old. There was a slightly older age profile for those from London, although the majority are still under 35 years old.

[16] 6% of all KSI motorcycle casualties injured on English roads did not have postcode data recorded.

*Figure 3.6: Age of motorcycle casualties on up to 125cc in London and nationally (2018-2022)*




Acorn[17] is a consumer segmentation of UK residential neighbourhoods, published by CACI. It is a classification of different groups based on their sociodemographic characteristics, lifestyle choices, preferences, and behaviours, which provides a detailed understanding of the various types of people who make up a specified target audience or consumer base in a given catchment area. Figure 3.7 and Figure 3.8 shows the Acorn Groups where the greatest number of casualties live.

All of the Groups have an over-representation of people under the age of 50. However, there are many differences in their characteristics, with some struggling with their financial situation and others who are much more comfortable. Their educational backgrounds, family composition, residence type, and employment situation all differ. This reflects the wide range of people who will ride a small motorcycle and is also indicative of the wide range of motivations for using a motorcycle as a form of transport. For some, it will be a convenient commute; for others, it will be used for work purposes; and for some others, it will be the only form of transport they can afford. It is important to highlight the diversity amongst these casualties – the differences in reasons for using a motorcycle will also influence the types of intervention which will resonate and be effective .

[17] https://acorn.caci.co.uk/

*Figure 3.7: Acorn Profiles with the largest numbers of motorcycle casualties from London on up to 125cc machines (2018-2022)*

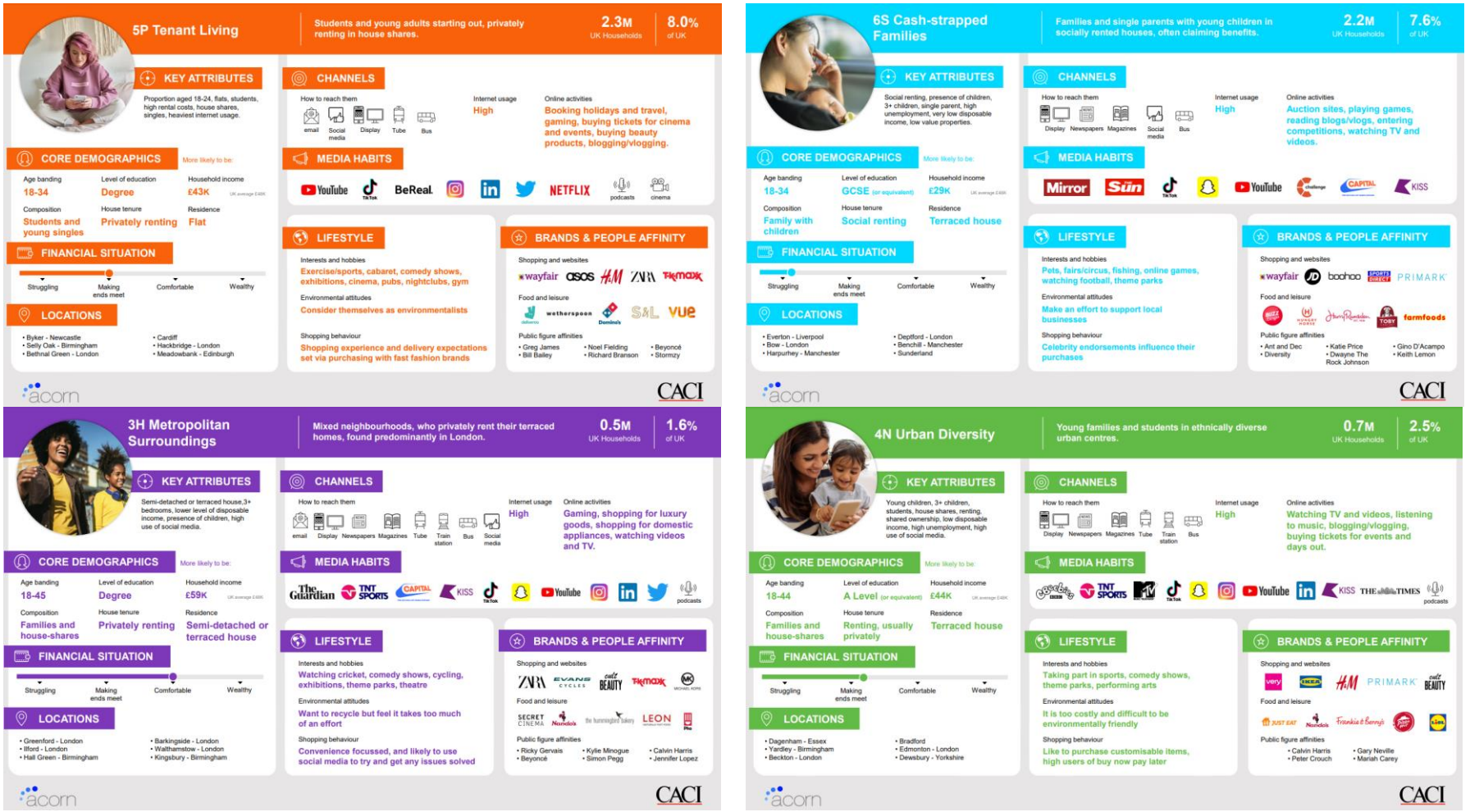
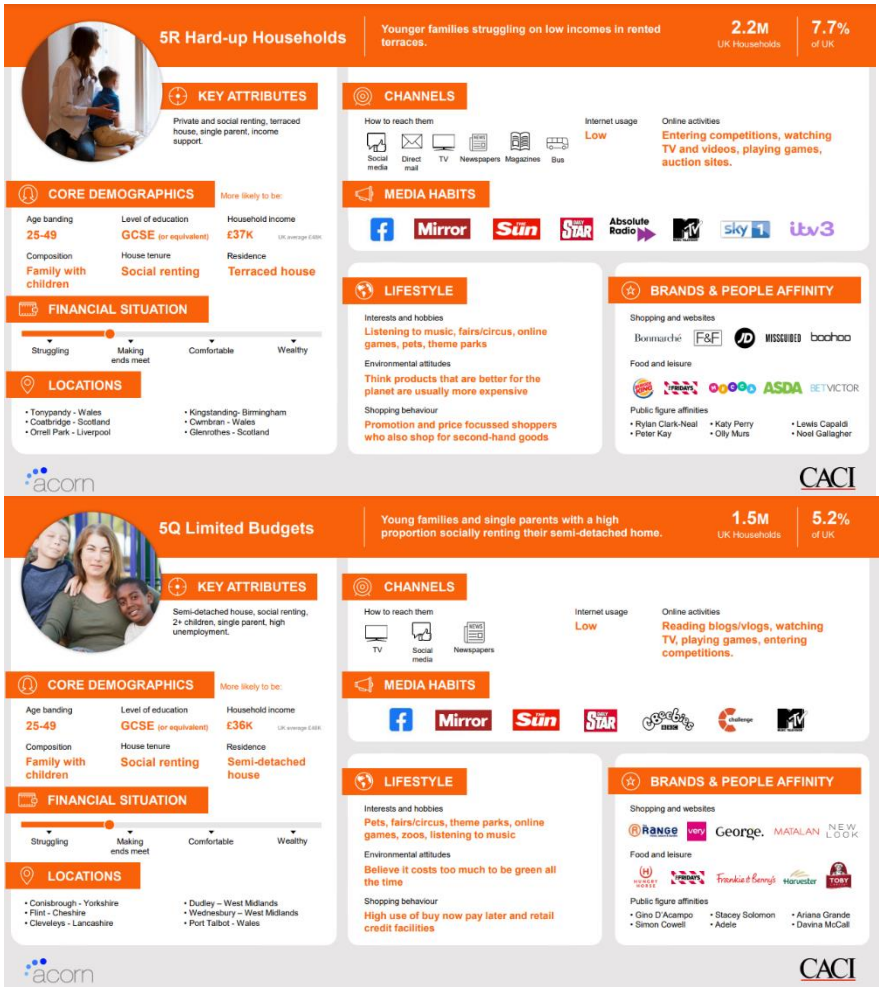


*Figure 3.8: Acorn Profiles with the largest numbers of motorcycle casualties from outside London on up to 125cc machines (2018-2022)*



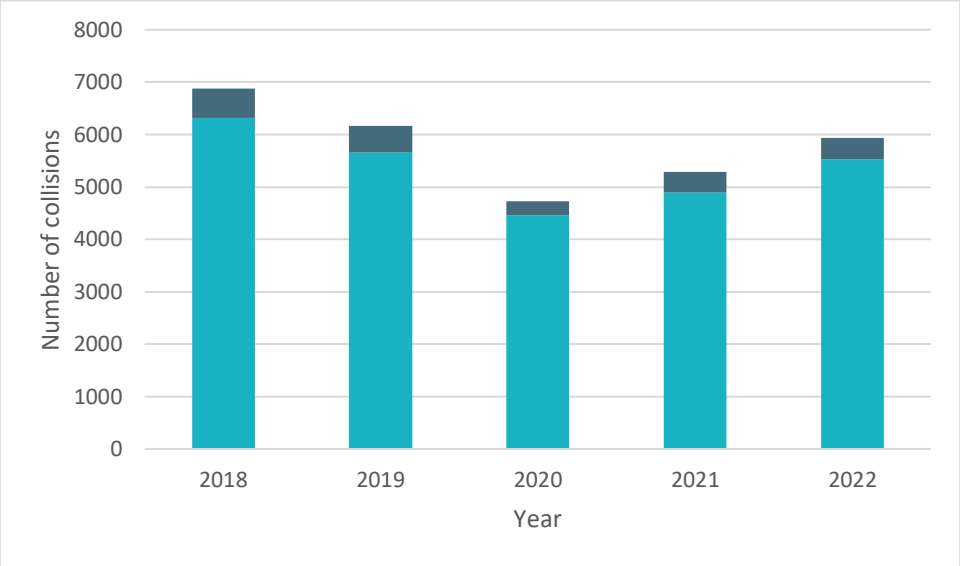
### 3.2.3 Crashes involving riders on motorcycles over 125cc

These collisions are those involving individuals who were injured whilst riding a larger motorcycle. Over the five years of 2018 to 2022, there were 28,992 collisions involving riders who were injured whilst travelling on larger motorcycles.

Just under half of the collisions involving these larger motorcycles resulted in death or serious injury.

Most of these collisions (93%) did not occur on the National Highways' Strategic Road Network (SRN) but were fairly evenly split between urban and rural roads (57% of all and 53% of KSI collisions were on urban roads). In total, 16,666 collisions occurred on urban roads and 12,371 occurred on rural roads.

*Figure 3.9: Collisions involving motorcycles over 125cc by year and SRN or local roads (2018-2022)*




Over half of the collisions which occurred on urban roads were on A roads, as can be seen in Figure 3.10. The proportion was similar for rural roads (56%), although a higher percentage of these collisions occurred on rural B roads than urban B roads (17% to 10%) as shown in Figure 3.11.

*Figure 3.10: Collisions involving motorcycles over 125cc on urban roads by road class (2018-2022)*

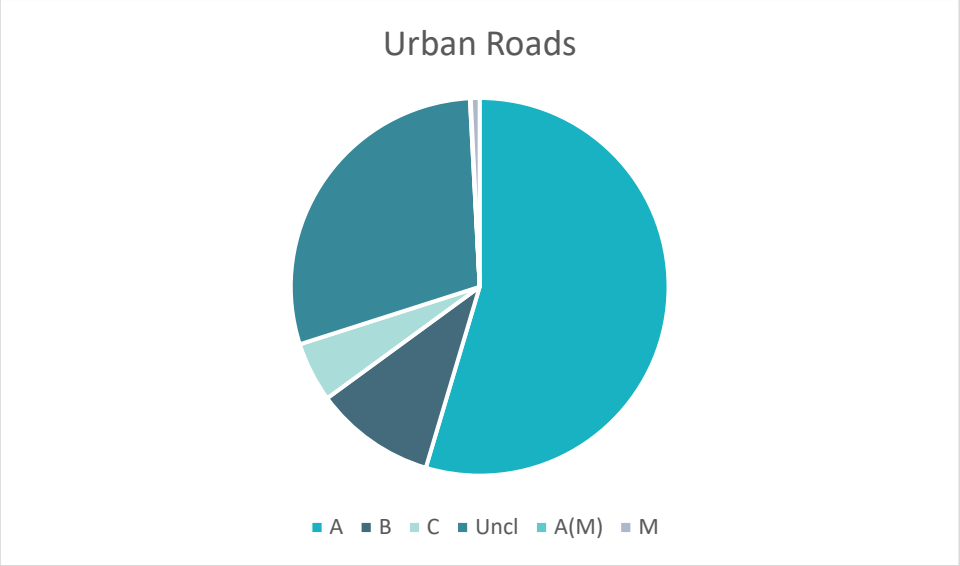
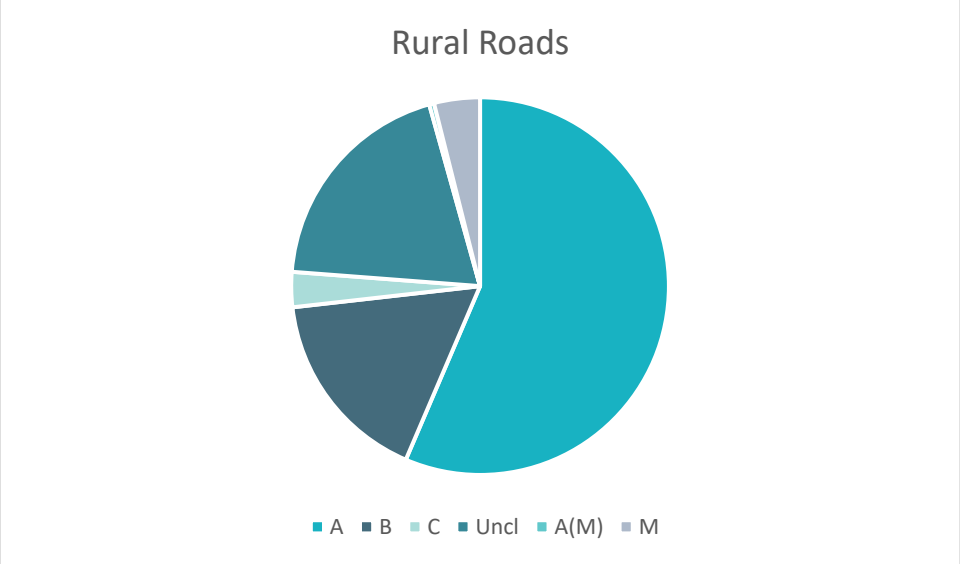
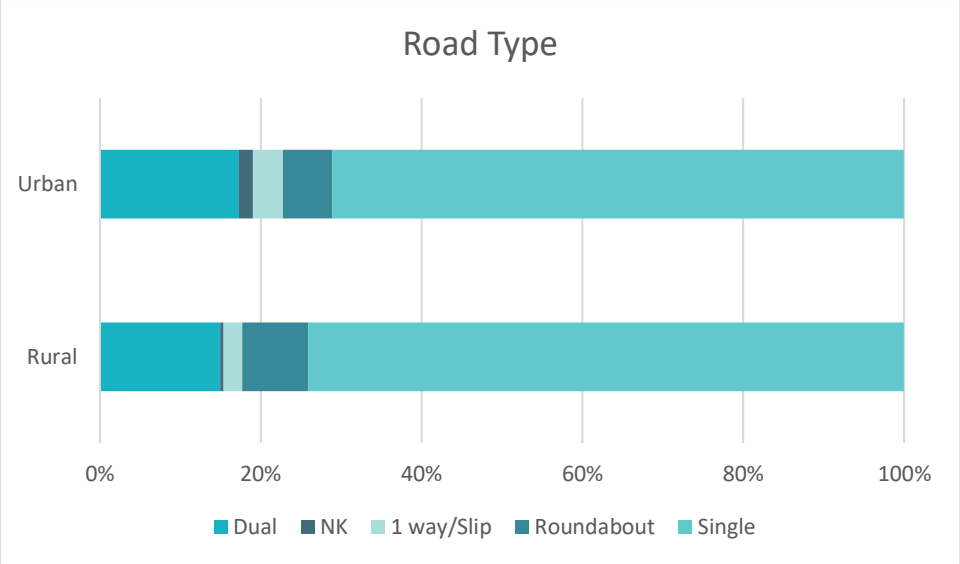



*Figure 3.11: Collisions involving motorcycles over 125cc on rural roads by road class (2018-2022)*



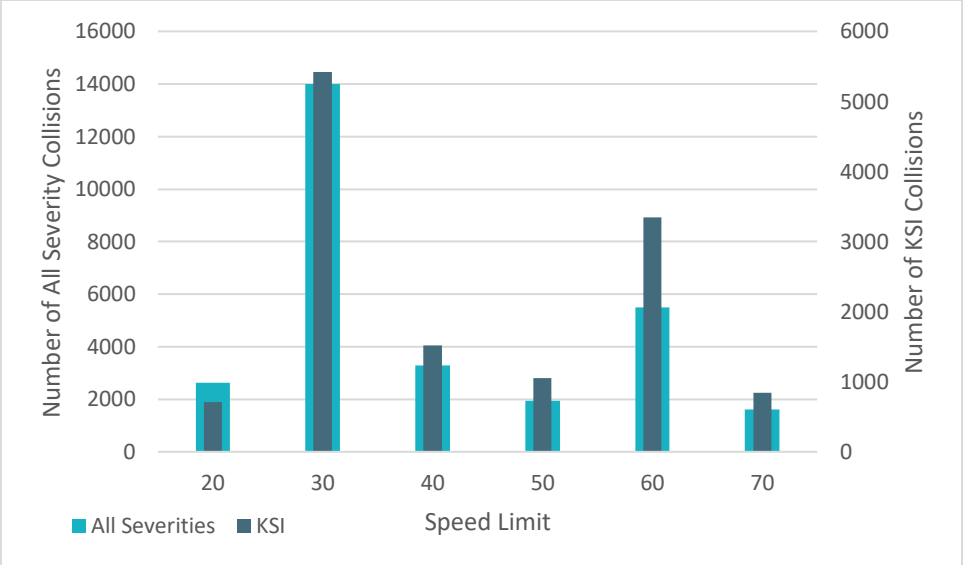

For both urban and rural collisions, larger motorcycles tended to be travelling on single carriageway roads at the time of their incident.

*Figure 3.12: Collisions involving motorcycles over 125cc by road type and rurality (2018-2022)*




As with small motorcycles, speed limit analysis is interesting when the severity of the collision is explored. The majority of the collisions which involved larger motorcycles were in 30mph speed limits for all collisions and KSI collisions. More larger vehicles were involved in collisions on 60mph roads, especially when the incident resulted in death or serious injury (accounting for 19% of all collisions to 26% of KSI collisions).

*Figure 3.13: Collisions involving motorcycles over 125cc by speed limit and severity (2018-2022)*




On single carriageways (where most of these collisions occur), there was no impact between vehicles in 27% of collisions; vehicle impact was unknown in 17% of collisions; 17% were head on; and vehicles were in 'other impact' in 17% of collisions (not head on, rear, or side). For KSI collisions involving larger motorcycles, 30% involved no impact with another vehicle; 20% were head on; 16% were other impact; and 15% were impact unknown.

Looking at the junction detail, 61% of the collisions occurred near a junction, with 31% at T junctions. Overall, 39% occurred where there was no junction. The proportion where there was no junction was higher for KSI collision at 45%. The majority of these junction collisions were Give Way controlled.

### 3.2.4 Collision-involved motorcyclists on machines Over 125cc

Postcode data, collected at the time of the collision, can provide an insight into where motorcyclists come from and can be linked to sociodemographic profiling systems to understand who they are.

This analysis explores all casualties where the 'related vehicle' was the motorcycle. This means the rider of the motorcycle, a pillion passenger on that motorcycle, or a pedestrian struck by the motorcycle. However, 90% of the casualties were the motorcycle rider themselves.

Cars were most frequently the other vehicle involved in the collision (38% for fatal casualties and 53% of serious casualties). For those killed in these collisions, 21% were in a collision which involved no other vehicles (22% of serious casualties). The motorcyclists tended to be travelling straight ahead (65%) or were overtaking (14%). A quarter of the motorcycle casualties on machines with an engine over 125cc lived in London and 20% come from the south east.

The majority of riders were male (90%) and are spread across age groups. A quarter (25%) were aged between 25 and 34 years old, with a further 19% aged between 45 and 54 years old, and 18% were 35 to 44 years old. There is a similar pattern for those involved in KSI collisions. Unlike the smaller motorcyclists, those on machines over 125cc tended to be younger when they came from London (32% aged between 16 and 25 years old).

*Figure 3.14: Age of motorcycle casualties on over 125cc in London and nationally (2018-2022)*

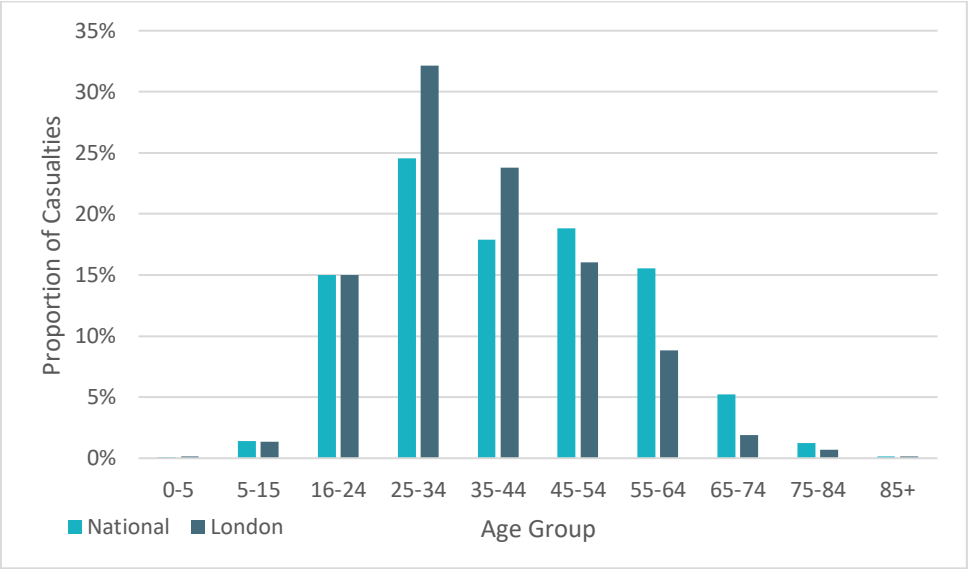



Figure 3.15 and Figure 3.16 shows the Acorn Groups where the greatest number of casualties live. The Acorn Groups are very varied in terms of age, reflecting the casualty analysis. As with the casualties on smaller motorcycles, there are many differences in their characteristics, with some struggling with their financial situation and others who are much more comfortable. Their educational backgrounds, family composition, residence type, and employment situation all differ. This reflects the wide range of people who will ride a large motorcycle and is also indicative of the wide range of motivations for using a motorcycle as a form of transport. For some, it will be a convenient commute; for others, it will be used for work purposes; and for some others, it will be the only form of transport they can afford. Leisure riding is much more of a consideration for those riding larger motorcycles. It is important to highlight the diversity amongst these casualties – the differences in reasons for using a motorcycle will also influence the types of intervention which will resonate and be effective for them.

*Figure 3.15: Acorn Profiles with the largest numbers of motorcycle casualties from London on over 125cc machines (2018-2022)*

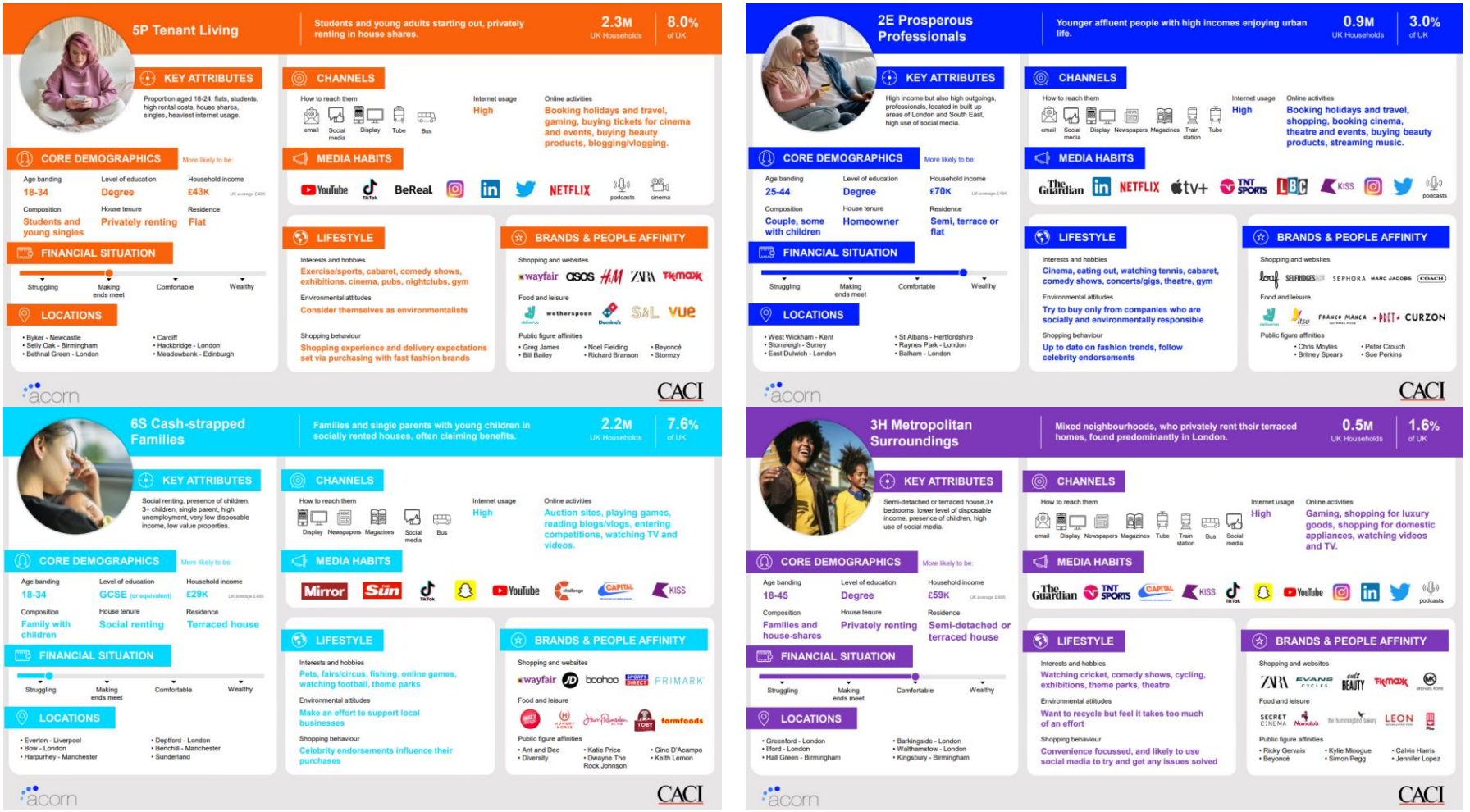
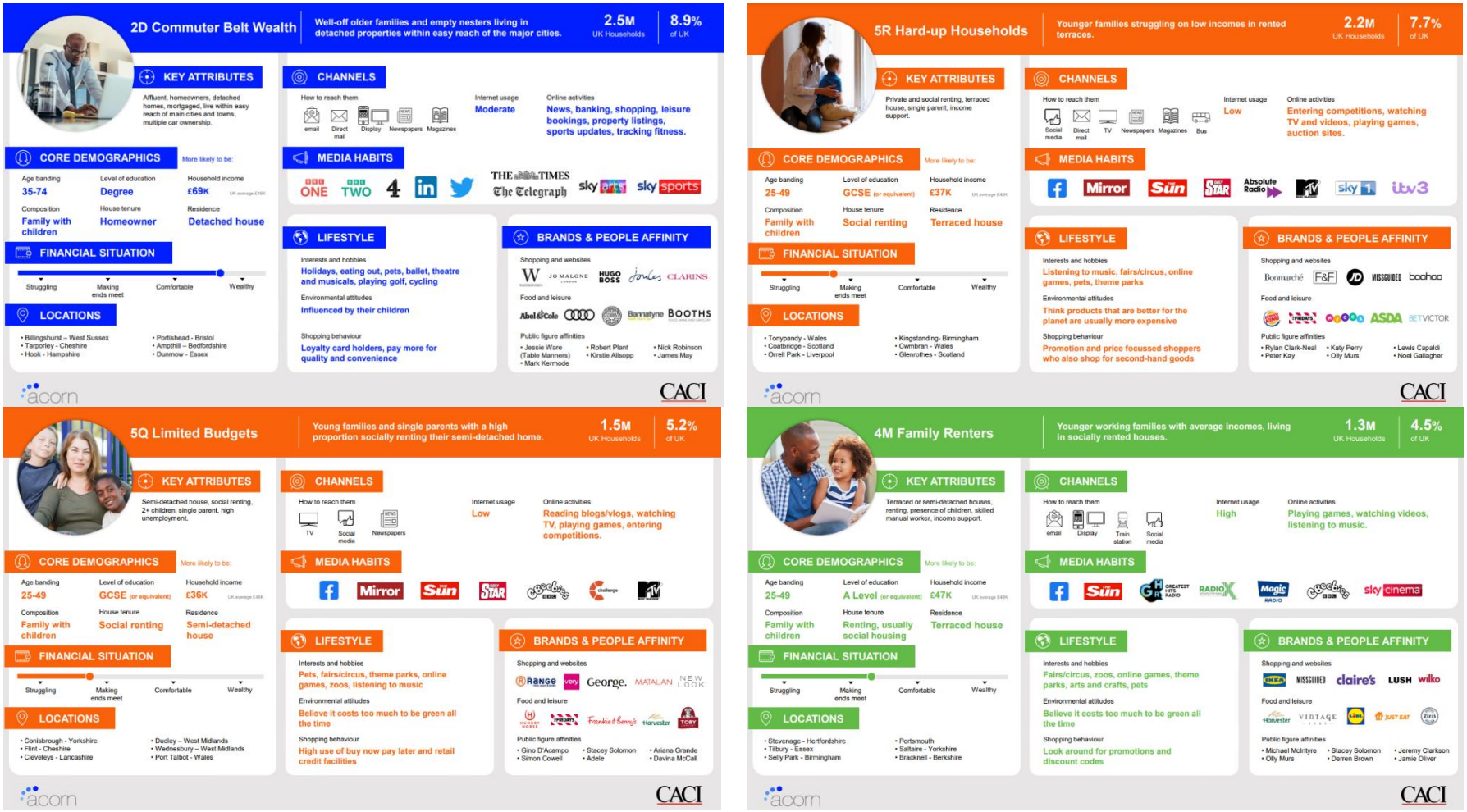


*Figure 3.16: Acorn Profiles with the largest numbers of motorcycle casualties from outside London on over 125cc machines (2018-2022)*



# 4.0 LOGIC MODEL CREATION

Insights from the literature review and collision analysis were explored in the expert workshop to inform the development of a conceptual model for rider interventions. In the absence of a clear evidenced approach to developing rider interventions, the creation of logic models provides a useful way to create an informed and structured plan. Logic models clearly lay out how inputs, activities, outputs, and outcomes are interconnected.

It was agreed that a 'one-size-fits-all' approach is not appropriate due to the significant variance in motorcycle users. There are various ways that riders could be grouped and targeted, for example, by bike type or size, user type, age group, or motivation for riding. As the overarching purpose of designing and conducting rider interventions is to improve safety outcomes by reducing those killed and seriously injured, the logic models have been designed to address the most prominent collision types as outlined in Section 3. This provides a platform to structure intervention design around the contextual factors prominent in the crash types and to target the populations most commonly involved.

This section describes a suggested theoretical approach used to underpin the development of the logic models, which can support intervention design. It then applies this to two examples covering three of the collision segments from Section 3. An overview of the insights of these segments is followed by two logic models that outline approaches to intervention design for the identified target audience.

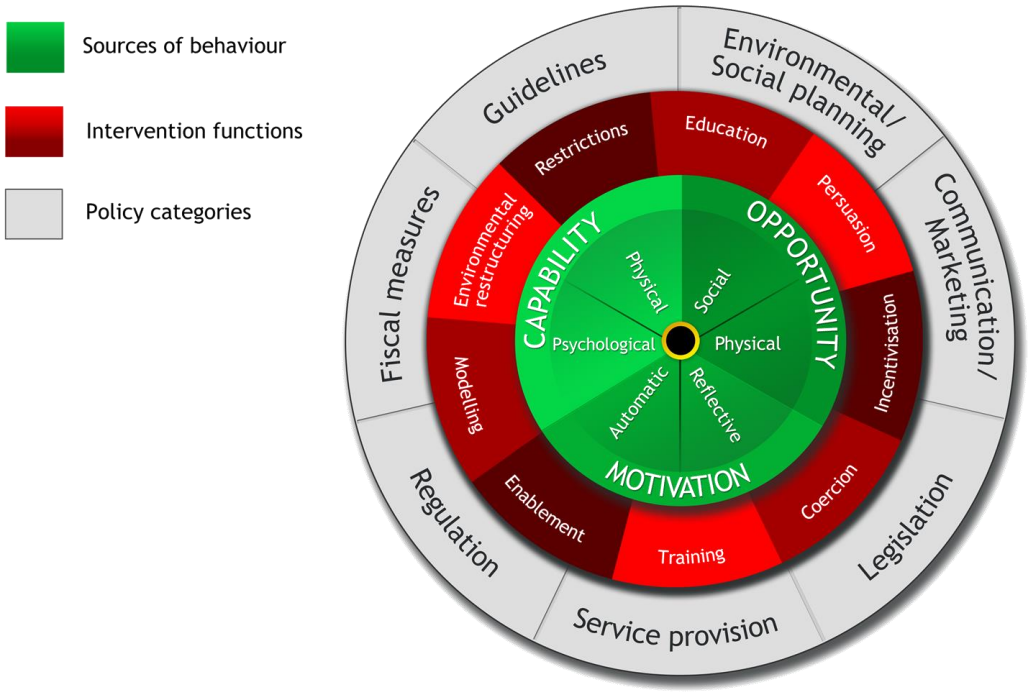
## 4.1 THEORETICAL APPROACH TO INTERVENTION DESIGN

COM-B is a comprehensive framework for understanding and designing behaviour change interventions. Standing for Capability, Opportunity, Motivation, and Behaviour, this model posits that behaviour change results from an interplay of these three essential components: an individual's capability (both psychological and physical) to engage in the desired behaviour, the opportunity provided by the environment (both social and physical) to enact the behaviour, and the motivation (reflective and automatic processes) that directs behaviour. By assessing these elements, the COM-B model helps to identify the specific barriers to, and facilitators of, behaviour change, guiding the development of targeted interventions. This approach is widely utilised across various fields, including health, safety, and environmental behaviours, to design interventions that are nuanced and tailored to address the specific needs and contexts of the target population. By focusing on these core aspects, COM-B enables a systematic and theory-driven approach to intervention design, aiming to effectively influence behaviour in a desired direction.

The COM-B model is not only a foundational model for understanding behaviour change but also serves as the heart of the Behaviour Change Wheel (BCW), a framework designed to support the development of effective interventions (see Figure 4.1). The BCW surrounds the COM-B model with a 'wheel' of intervention functions and policy categories, providing a structured method to identify the most appropriate mechanisms and strategies for facilitating behaviour change. These intervention functions—such as education, persuasion, incentivisation, coercion, training, restriction, environmental restructuring, modelling, and enablement—are chosen based on the specific barriers and facilitators identified within the COM-B analysis. Moreover, the BCW outlines a range of policy categories—such as communication/marketing, guidelines, fiscal measures, regulation, legislation, environmental/social planning, and service provision—that can support the implementation of these functions.

By systematically linking the understanding of behaviour from the COM-B model to actionable strategies and policies through the BCW, practitioners can design comprehensive interventions that are both evidence-based and context-specific. This approach ensures that interventions are not only tailored to address the specific components of capability, opportunity, and motivation but are also supported by an appropriate mix of policy and intervention functions to maximise the likelihood of achieving desired behaviour change outcomes.

*Figure 4.1: COM-B and the Behaviour Change Wheel*




Source: Mitchie et al. (2011, 2014)

## 4.2 SEGMENT 1: URBAN JUNCTION COLLISIONS WITH SMALL MOTORCYCLES

This segment includes 10,414 collisions, the highest total among the segments identified in this analysis. The collisions occur in urban settings when riding motorcycles with engines under 125cc. The majority of collisions occur at or around junctions and involve interaction with another vehicle, typically a car. Collisions typically occur on 20 or 30 mph roads, rarely part of the SRN, with the majority occurring during daylight on dry roads, although crashes peak between 3-6pm and 6-9pm. Collisions are rarely fatal with just over 21% resulting in serious injury; the vast majority result in slight injuries (78%).

Analysis indicates that riders were travelling straight ahead (or manoeuvre was unknown), implying that the involved car was entering or exiting the junction. Failure to look properly and failure to judge other person's path or speed are the top contributory factors.

These collisions can be split between London and other urban centres in Great Britain. The demographic of riders in London indicates young (16-34 years-old) males with household incomes ranging from £20,000 to £40,000 are involved in the majority of collisions. However, there is representation from higher earning households (£60,000 to £80,000) that includes older riders (35-49 years-old).

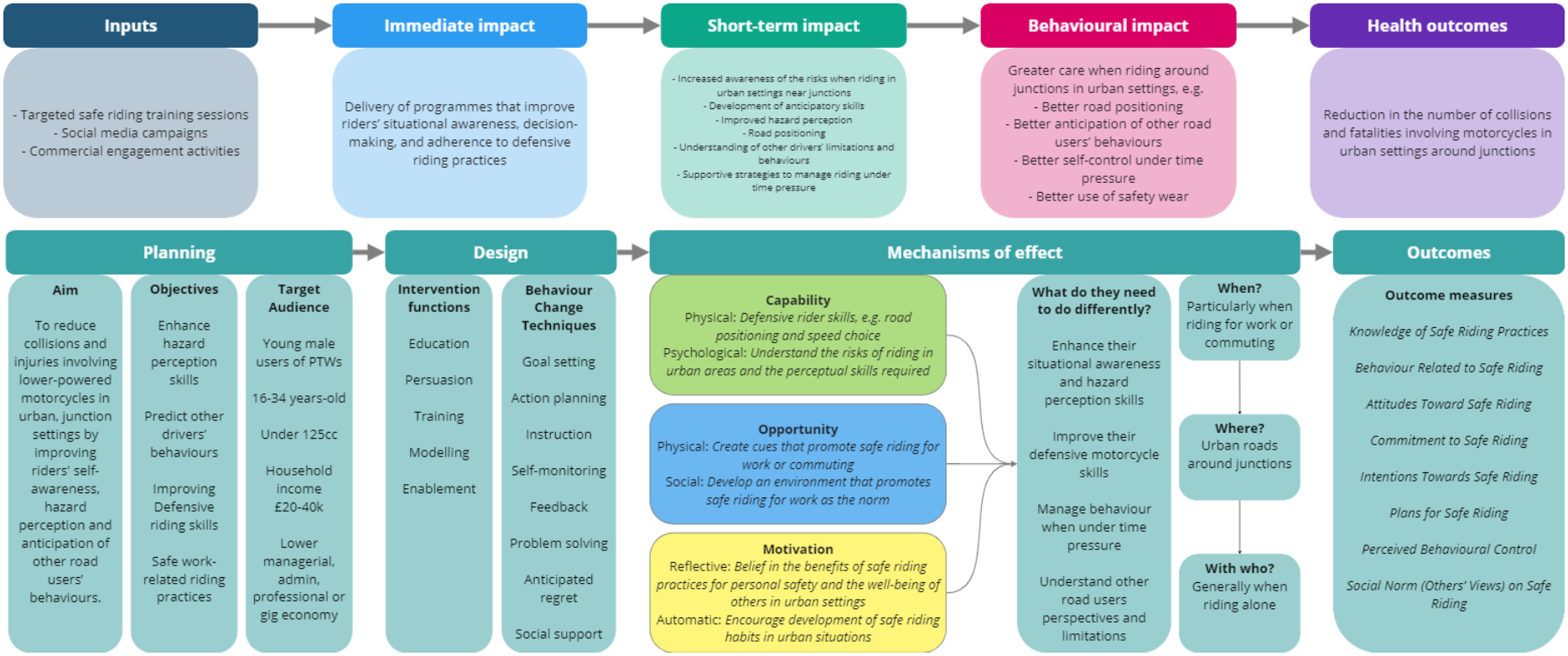
At least a third of these riders are known to have been riding for work at the time of the collision and 15% were commuting (54% unknown might suggest under-reporting of work-related journey purpose).

Riders outside of London have a similar profile although the majority are younger with no education and a household income between £20,000 to £40,000. Unlike Londoners, these riders are more likely to own another vehicle but have low mileage. They are also less likely to have been riding for work (13%) although a similar proportion or journeys were related to commuting (17%) and were classified as unknown (54%).

Taken together, the combination of contributory factors and situational variables suggests hazard perception and anticipation, as well as riding under time pressure to be potential concerns. Fatigue may also play a part although this is difficult to determine. There may be elements of self-awareness and a complex interplay of behavioural, skill-based, and attitudinal factors to consider for this segment. The interaction with other motorists cannot be ignored and riders are unlikely to be solely responsible in these collisions. The reduction in risk from a rider-only intervention may therefore be limited by this interaction.

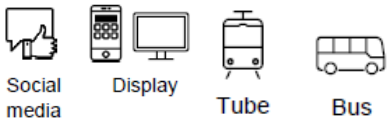
Using this insight, Figure 4.2 illustrates a logic model for intervention development designed to address the knowledge, attitudes and behaviours related to this collision outcome. Full details can be seen in Appendix C.

*Figure 4.2: Logic model illustration for Segment 1 - Urban junction collisions with small motorcycles*




Common media outlets:

Common communication channels:



## 4.3 SEGMENTS 5 & 6: RURAL COLLISIONS INVOLVING LARGE MOTORCYCLES (SINGLE VEHICLE AND WITH OTHER ROAD USERS)

Collisions in both of these segments occur on rural roads away from junctions. Segment 5 includes 2,576 collisions and has the highest severity outcome of all the segments identified in the casualty analysis (62% KSI). These single vehicle collisions typically occur on 60 mph roads in rural settings when riding motorcycles with engines over 125cc. Of these 13% occurred on the Strategic Road Network, mostly on A roads (two-thirds of those which occurred on the SRN).

Segment 6 encompasses 4,128 collisions in rural settings, involving motorcycles with engine sizes over 125cc. This segment has the highest proportion of fatalities.

The majority of collisions occur during daylight on dry roads, peaking between noon-3pm and 3-6pm, generally at weekends, particularly Sundays. This suggests the riding is likely to be for leisure although 10% is recorded as commuting with 87 recorded as 'unknown' or 'other'.

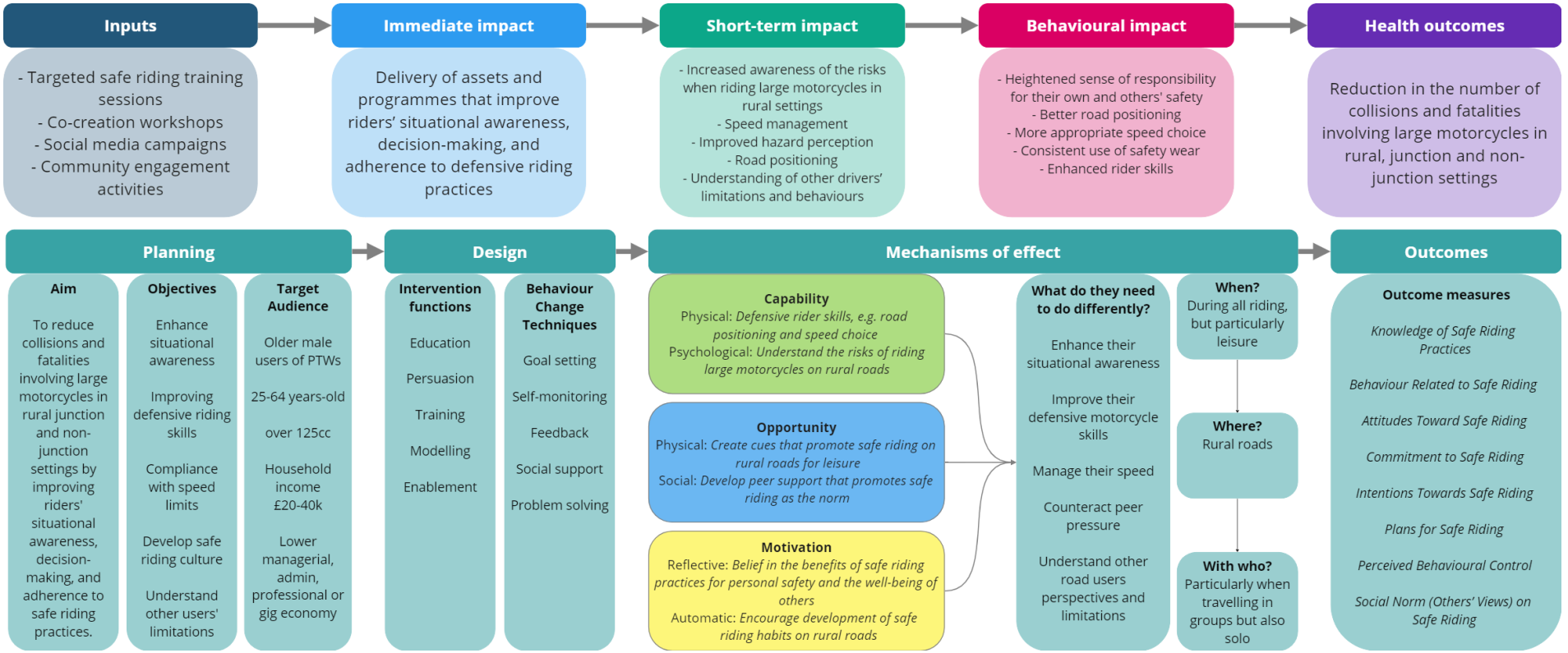
For segment 5, analysis indicates that riders were travelling straight ahead or at a left- or right-hand bend, with a minority of overtaking manoeuvres also recorded. 'Loss of control' is recorded as the most common contributory factor. 'Carless, reckless or in a hurry' and 'poor turn or manoeuvre' compete the top three, which is suggestive of poor decision making on behalf of the rider. However, 'deposit on the road' and 'slippery road surface' is also recorded in around 10% of these collisions, as is speed related factors ('travelling too fast for conditions' and 'exceeding speed limit').

For segment 6, the combination of contributory factors such as perception issues (failure to look properly or judge other vehicles' speed and path), skills issues (loss of control, poor manoeuvring), and non-compliance issues (speeding, aggressive riding) indicates a complex interplay of behavioural, skill-based, and attitudinal elements that contribute to collisions in this segment.

The segments are demographically similar suggesting that these segments can be targeted as a single group. Their only differentiating factor is whether they lost control on their own or when interacting with another road user.

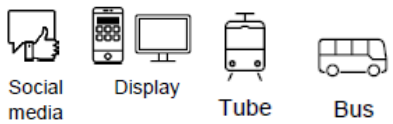
Using this insight, Figure 4.3 illustrates a logic model for intervention development designed to address the knowledge, attitudes and behaviours related to this collision outcome. Full details can be seen in Appendix C.

*Figure 4.3: Logic model illustration for Segments 5 & 6 - Single vehicle rural collisions involving large motorcycles (at and away from junctions)*




Common media outlets:

Common communication channels:



# 5.0 EVALUTION OF RIDER INTERVENTIONS

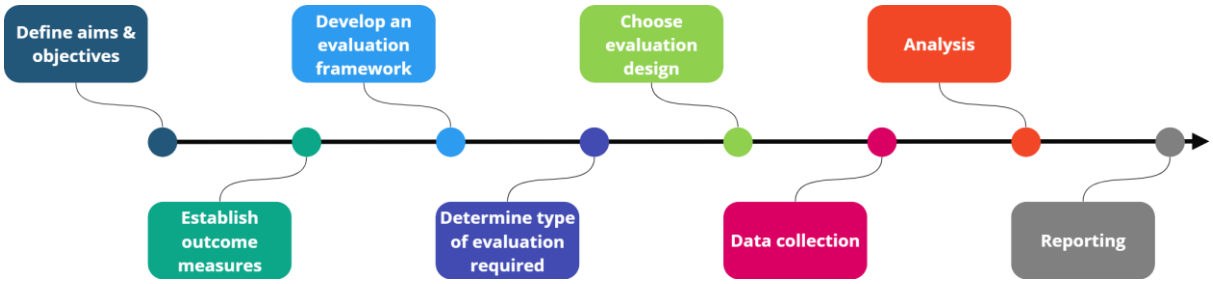
The review of evidence in Section 2.0 concluded that the lack of evaluation of rider interventions has limited our understanding of how to improve the safety of motorcyclists. Without good quality, published evaluations, it cannot be established whether an intervention is having an impact and is worthy of continued funding and investment. It is also necessary to establish that the intervention is not doing harm and increasing risk. While this may seem counterintuitive, it has been repeatedly demonstrated in public health that it is feasible to introduce harm, even from well-intentioned interventions (e.g. McIsaac et al., 2017; Powroznik, 2017; Riley et al., 2017).

There are several published papers with detailed guidance for practitioners seeking to design and conduct interventions and evaluation, for example The Green Book (2022) guidance on appraisal and evaluation, DfT (2004) guidance for evaluating road safety education, and Fylan's (2017) guidance for the road safety community published by the RAC Foundation. This chapter summarises guidance from these and other resources for developing and designing appropriate evaluation for rider interventions. An overview of an 8-step approach to evaluating rider interventions is followed by discussion and examples of the types of measures that would be appropriate for the rider intervention logic maps from Section 4.0.

## 5.1 SUMMARY OF GUIDANCE FOR CONDUCTING AN EVALUATION

Designing, conducting and reporting evaluation of an intervention is a process. This process is presented slightly differently in published guidance depending on the specific purpose of the publication. The primary steps that are typically included have been summarised into an 8-step process relevant to rider interventions. These are shown in Figure 5.1 and described below.

*Figure 5.1: Overview of 8-step evaluation process*




### 1. Define aims and objectives

The first step in all guidance is to clearly articulate the goals of the intervention. This is typically done by defining the aims and objectives. The aim is the vision for the intervention. This might be a broad vision like reducing motorcycle collisions on the SRN. The aim explains 'why' the intervention is being conducted. The objectives describe 'what' the intervention will achieve to move in the direction of the aim. Objectives are short-term measurable stepping stones that can be used to demonstrate whether the intervention is likely to support its aim. Once the aims and objectives are clearly defined, the next step is to think about what measures would identify whether the objectives are being met.

### 2. Establish outcome measures

The aim might be reducing motorcycle collisions, injuries, and fatalities, but these may not be realistic metrics that could be used for an evaluation. It might be more appropriate to identify specific outcomes of the intervention that can be measured against the objectives, such as changes in behaviour (e.g. lane positioning), or in rider knowledge (e.g. helmet rating schemes) and skills (e.g. hazard perception).

Selecting the right measures and metrics for evaluating motorcycle safety interventions is a process that will directly influence the validity and reliability of the evaluation outcomes. There are several relevant criteria for choosing measures and metrics to ensure the effectiveness of the evaluation framework:

- *Relevance:* It is important that measures used directly align with the objectives of the intervention and the aspects of behaviour or outcomes it aims to influence. They should reflect the core elements outlined in the logic models, ensuring that the evaluation focuses on the intervention's intended impacts.
- *Sensitivity:* The chosen metrics should be capable of detecting even small changes in outcomes or behaviours as a result of the intervention. This sensitivity is vital for assessing the effectiveness of interventions that may produce subtle yet significant shifts in rider behaviour or attitudes over time.
- *Specificity:* Metrics need to specifically measure the outcomes they are intended to evaluate, to minimise the risk of capturing unrelated changes. High specificity ensures that observed changes can be confidently attributed to the intervention, rather than external factors.
- *Feasibility:* The practicality of implementing the measures is also a key consideration. This includes the availability of resources, time, and the necessary tools or technologies to accurately collect and analyse the data. Feasible measures ensure that the evaluation can be conducted efficiently and effectively, within the constraints of a project evaluation.

To fully understand the impact of motorcycle safety interventions, it is crucial to select measures that capture both the immediate outcomes and the longer-term behavioural changes. Immediate outcomes, such as improvements in recall, attitudes, and intentions towards safe riding practices, are often the first indicators of an intervention's effectiveness. These early measures can provide quick feedback on whether the intervention is moving in the right direction, like influencing riders' awareness and mindset towards safety.

However, the goal of these interventions is to foster longer-term behavioural changes that lead to a sustained improvement in road safety. This includes observable shifts in riding behaviour, such as enhanced road positioning, increased use of safety equipment, and adherence to speed limits, which directly contribute to reducing collisions and fatalities. Capturing these longer-term changes requires a commitment to ongoing evaluation and the use of metrics that can track progress over time.

By integrating both types of measures, evaluations can provide a comprehensive picture of an intervention's impact. Together, they form a holistic understanding of how interventions are working, guiding future efforts to enhance motorcycle safety.

### 3. Develop an evaluation framework

Developing a framework, such as a logic map, creates a structured process that links the objectives of the intervention with the desired outcome measures, bridging the gap to articulate how the intervention will achieve its objectives.

The example logic models developed and reported on in Section 4, outline a pathway from intervention activities to immediate and short-term impacts, to behavioural changes and, ultimately, health outcomes. Logic models serve as important guides for identifying the critical aspects of interventions for measurement to assess their effectiveness.

The interventions' outlined in the logic models focus on enhancing riders' situational awareness, decision-making, and adherence to defensive riding practices, whether in congested urban environments near junctions or in more expansive rural settings, which highlights the need for a multidimensional evaluation approach. The selection of measures and metrics is not just a procedural step but a strategic one, ensuring that the evaluation captures the essence of what the intervention aims to achieve.

### 4. Determine the type of evaluation required

There are two main types of evaluation that are commonly discussed. Creating questions about what the purpose of the evaluation is can help guide whether one, or both, is most appropriate. For example, if the question is "Do participants in the intervention understand the materials and identify with the key messages?" then a formative, or process, evaluation would be suitable. Process evaluations examine the interventions from an implementation perspective, offering insights into how the interventions are delivered in comparison 48laned execution. This involves exploring the experiences of riders, the fidelity[18] of the intervention delivery, and the contextual factors influencing its success. Such evaluations are critical for understanding the 'how' and 'why' behind the outcomes, ensuring that the interventions are not only effective but also feasible and adaptable to different contexts.

If the question is "Do participants reduce their speed on rural roads?" then a summative, outcome or impact, evaluation would be suitable. Such evaluations are used to measure the effectiveness of the intervention against the outcome measures defined earlier, and therefore, what effect it has had in achieving its intended outcomes.

Conducting both process and outcome evaluations provides a dual lens through which to view the interventions' effectiveness and implementation. In the case of the motorcycle interventions proposed, evaluations should seek to assess immediate impacts like enhanced situational awareness and decision-making, as well as long-term changes in behaviour and reductions in collisions and fatalities.

Combining outcome and process evaluations underpins a more nuanced and comprehensive understanding of intervention effects by not only measuring the tangible results of interventions but also shedding light on the mechanisms through which these outcomes are achieved.

[18] the degree to which the delivery of an intervention adheres to the originally designed or planned programme

### 5. Choose evaluation design

Fylan (2017) summarises the three most common types of evaluation in road safety:

*i. Randomised controlled trial (RCT)*: An RCT is considered to be one of the best methods for evaluating an intervention. It involves recruiting participants and then randomly allocating them into groups: one (or more) that receive the intervention (the intervention group or groups) and one that does not (a control group). Randomly allocating participants addresses selection bias and with a large enough sample means that any differences measured between the groups following the intervention is most likely a result of the intervention. Statistical tests can be performed to establish how similar the groups are on important socio-demographic factors (e.g. age, gender, experience) that might affect the results.

*ii. Comparison groups:* Sometimes it is not possible to randomly allocate people, for example if they have signed up for a course that they expect to receive. In this situation, identifying a comparison group, such as a group of similar age riders that do not sign up for the intervention, can be the next best thing. There are likely to be differences between the groups (e.g. those who volunteer for such courses and those who don't) but it provides a way to understand whether any change measured between the groups before and after the intervention is related to the intervention.

*iii. Before and after*: The weakest form of evaluation is a before and after design. While this measures whether there is change in the intervention group before and after delivery of the intervention, there is no way of knowing whether this change is a result of the intervention, or whether it might have happened anyway (i.e. as a result of something external, such as influence from social media).

### 6. Data collection

Choosing the appropriate approach and methods for data collection will depend on the objectives and available resources. A combination of qualitative and quantitative methods is beneficial where interventions are being evaluated for the first time so that statistical analysis can be complemented by descriptive feedback from participants. Methods used for rider interventions discussed in the literature review included surveys, interviews, observations, focus groups, and collision data. Motorcycle data (e.g. speed, acceleration and braking forces) is something that could be explored in this domain but there is little evidence of its use for evaluating interventions to date.

### 7. Conduct analysis

To understand if an intervention has been effective, it needs to be established whether there have been any changes to the outcome measures (e.g. knowledge, attitudes, behaviours, collision data) over and above what would have been expected in the absence of the intervention. Analysing the data collected forms an important part of establishing effectiveness, whether that be for a process or impact evaluation. The analysis needs to be appropriate for the design, measures being used, and the sample size. Analysis of quantitative data can involve summary analysis (e.g. percentage change) and more complex statistical analysis (e.g. correlational analysis or Analysis of Variance) to determine whether the change is meaningful or may have happened by chance. The data from qualitative research provides a depth of insight and complements quantitative analysis. Analysing qualitative data is more nuanced than statistical analysis but can help to understand why a change in an objective measure did, or did not, happen as expected. One approach is to conduct content analysis which is used to determine common themes or concepts emerging from interview or focus group data.

### 8. Report findings

Reporting the outcomes of the evaluation, whether they support the effectiveness of an intervention or not, is essential for the development of rider safety interventions. It helps to build an evidence base that can be used to inform future decisions and course development.

Reporting should be made easily accessible to relevant stakeholders, such as being hosted online. A dissemination plan should be created to outline how target audiences will be made aware of the research. It is common for projects to produce news releases, write news articles, create a podcast or host a dissemination event to share findings. Publication in an academic journal could be considered to demonstrate that the design, data collection, analysis and reporting of results meets peer-reviewed standards.

## 5.2 EVALUATION MEASURES

Several outcome evaluation measures were recommended as part of the logic models developed in Section 4. These included the provision of knowledge, influencing components of the Theory of Planned Behaviour, changing behaviour and establishing commitment to safe riding practices. In this section, these measures are discussed in turn, with suggested measures recommended. Typical questions and measures for conducting a process evaluation are also presented to support planning.

### *5.2.1 Knowledge*

Assessing the impact of interventions on knowledge is a common approach, although it is important to recognise the inherent limitations of relying solely on knowledge enhancement for inducing behaviour change. Michie and Johnston (2012) have highlighted in their review on advancing behaviour change science that the direct impact of knowledge and attitudes on eventual behaviours can be significantly diminished by various external influences. Consequently, while measuring improvements in knowledge post-intervention is valid, it is important to recognise the limitations of this approach. Intervention designers are often keen to improve participants' knowledge and awareness. Whilst it is common for these terms to be used interchangeably, they encapsulate different aspects of cognitive processing. Knowledge refers to the accumulation of specific facts, principles, and information that individuals understand and have learned through experience or education. It is concrete and can be directly applied to decision-making or behaviour. Awareness, on the other hand, is more about the conscious realisation of a situation, condition, or set of facts. It implies a general understanding or recognition that may not include the depth or detail that knowledge entails. Awareness can act as a precursor to gaining knowledge as it is the initial step towards understanding a broader issue or concept, but it is important not to confuse these two separate concepts.

In Section 4, the following measurement item was recommended for administration, before and after an intervention, to assess whether it is effective:

- *Recipients' Knowledge of Safe Riding Practices:* Assess understanding regarding the benefits of situational awareness, hazard perception, and defensive riding skills.

To assess knowledge changes before and after an intervention, the following questions could be used:

- Describe your level of familiarity with defensive riding techniques (Very unfamiliar, Unfamiliar, Neutral, Familiar, Very Familiar)
- What should you do to ride defensively (Open response – would expect responses such as situational awareness, visibility, space management, speed control, braking techniques,

evasive manoeuvring, road positioning, riding in adverse conditions, mental preparation, regular maintenance)

### 5.2.2 Measures from the Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB), developed by Ajzen in 1991, extends from the Theory of Reasoned Action and is a model commonly applied to assist with understanding and predicting individual behaviour. At its core, TPB suggests that a person's behaviour is directly influenced by their intention to perform that behaviour, which itself is shaped by their attitudes towards the behaviour, subjective norms (beliefs about how others view the behaviour), and perceived behavioural control (someone's perception of the ease or difficulty of performing the behaviour). The framework posits that these factors, along with actual behavioural control, are influenced by background elements such as individual, social, and informational contexts. Although not initially devised as an intervention design tool, TPB has been widely applied and recommended for this purpose, especially in health promotion and road safety research. It supports the creation and evaluation of interventions by offering a structured approach to understanding the determinants of specific behaviours.

In Section 4, the following TPB components were proposed for measurement, before and after an intervention, to assess whether it is effective:

- *Attitudes Toward Safe Riding:* Evaluate perceptions of the importance of safe riding practices, particularly under time pressure or risk scenarios.
- *Social Norm (Others' Views) on Safe Riding:* Measure changes in social norms within the motorcycle community regarding the promotion, support, and practice of safe riding.
- *Perceived Behavioural Control:* Assess riders' confidence in maintaining safe riding practices amidst challenges.
- *Intentions Towards Safe Riding:* Measure changes in riders' intentions to practice safe riding behaviours in scenarios previously conducive to risky behaviours (e.g. not slowing down around junctions, running amber lights).

To accurately assess the components of the Theory of Planned Behaviour (TPB) and their influence on behaviour change, standardised measures have been developed and refined over time (See Conner & Sparks, 2005). These measures offer a methodological framework for researchers to systematically evaluate: the impact of interventions on individual attitudes; the perceived social pressure to engage or not engage in a behaviour; the perceived ease or difficulty of performing the behaviour; and the strength of one's intention to perform the behaviour. Such systematic assessment ensures the reliability of findings and facilitates comparison across different studies, enhancing the understanding of how interventions can effectively influence behaviour through the lens of TPB components. Using these standardised measures, the following survey questions could be used to assess the impact an intervention had on motorcyclists' attitudes and intentions to slow down when passing rural junctions.

*Table 5.1: Example TPB questions for assessing impact of an intervention on motorcyclists propensity to slow down when passing rural junctions*

| Measure | No. items | Question(s) | Scale | Response |
|---|---|---|---|---|
| Intention | 2 | How likely would you be to slow down when passing a rural junction?<br><br>How willing would you be to slow down when passing a rural junction? | 1:7 | [Unlikely – Likely]<br><br>[Not at all willing – Willing] |
| Attitude | 4 | Slowing down when passing a rural junction is… | 1:7 | [Harmful – Beneficial]<br>[Negative – Positive]<br>[Foolish – Wise]<br>[Unpleasant – Pleasant] |
| Subjective norm | 2 | People who are important to me [think that I should/should not] slow down when passing a rural junction<br><br>People who are important to me [think that I should/should not] slow down when passing a rural junction | 1:7 | [Think I should not – Think I should]<br><br>[Would disapprove – Would approve] |
| Perceived behavioural control | 4 | How much control would you have over whether or not you would slow down when passing a rural junction?<br><br>I would have complete control over whether or not I would slow down when passing a rural junction<br><br>If I wanted to, slowing down when passing a rural junction would be…<br><br>If I wanted to, I could easily slow down when passing a rural junction | 1:7 | [Complete control – No control]<br><br>[Agree – disagree]<br><br>[Easy – Difficult]<br><br>[Likely – Unlikely] |

Each TPB construct (i.e. attitudes, subjective norms, perceived behavioural control and intentions) can be assessed through several different measures. Statistical techniques are used to assess whether the responses to these questions are consistent with each other (i.e. internal coherence). If they are, it is possible to combine several survey questions into a single, composite measure. The advantage of employing a composite measure is its enhanced reliability and validity compared to using a single survey item. This approach reduces the impact of anomalies or biases inherent in individual questions, providing a more stable and accurate reflection of the constructs being measured.

Whilst the measures proposed by Conner & Sparks (2005) are commonly used, different survey measures have also been used in other studies (see case study example). If validated survey metrics are not used, it is important to trial a newly devised survey instrument (i.e. testing with around 100 participants from the target audience) to assess both target audience understanding and that the measures are consistently and reliably measuring the outcome components of interest.

**CASE STUDY EXAMPLE: Understanding the factors influencing safe and unsafe motorcycle rider intentions (Tunnicliff et al., 2012)**

This study surveyed 229 Queensland riders, exploring psychosocial factors affecting their intentions toward safe and risky behaviours through an extended Theory of Planned Behaviour (TPB). The study measured three 'safer' and three 'riskier' riding behaviours. The three behaviours representing safer riding were whether respondents would:

1) Handle my motorcycle skilfully;
2) Always be 100% aware of the traffic and surrounding road environment; and
3) Refuse to ride if I am tired, affected by drugs or alcohol, or my judgement is impaired in anyway.

The three riskier riding behaviours that were assessed were whether respondents would:

1) Bend road rules to get through traffic;
2) Push my limits; and
3) Perform stunts and/or ride at extreme speeds.

Participants were asked to think about their on-road riding over the next 12 months, with all responses recorded on a 7-point Likert scale (1 = Strongly agree, 7 = Strongly disagree). The specific survey questions used for TPB components were:

- *Intention* – It is likely that I will <do the behaviour> (e.g. it is likely that I will bend road rules to get through traffic)
- *Attitude* - <doing the behaviour> is important to me (e.g. Handling my motorcycle skilfully is important to me)
- *Subjective norm* – The people I ride with would want me to <do the behaviour> (e.g. Most people who are important to me would want me to push my limits)
- *Specific subjective norm* – The people I ride with would want me to <do the behaviour> (e.g. The people I ride with would want me to perform stunts and/or ride at extreme speeds)
- *Group norm* – The people I ride with would <do the behaviour> (e.g. The people I ride with would refuse to ride if they are tired, affected by drugs or alcohol, or their judgement is impaired in anyway)
- *Perceived behavioural control* – Whether or not I <do the behaviour> is completely within my control (e.g. Whether or not I am always 100% aware of the traffic and surrounding road environment is completely within my control)

### 5.2.3 Behaviour

When considering the measurement of behaviour before and after an intervention, it is essential to focus on gathering objective data that accurately reflects changes in specific behaviours. Objective data enables a clear, unbiased assessment of whether the intervention has led to the desired behavioural changes. In the realm of safe riding, monitoring tangible changes in actual riding behaviours would be ideal. This includes evaluating road positioning in urban environments to enhance visibility and safety, as well as adherence to speed limits and the consistent use of safety equipment. Such precise measurements allow intervention adjustments to be made based on solid evidence rather than subjective perceptions.

In Section 4, the following measurement item was recommended for administration, before and after an intervention, to assess whether it is effective:

- *Behaviour Related to Safe Riding:* Monitor changes in actual riding behaviours, such as road positioning in urban environments and adherence to speed limits and use of safety equipment.

This could be measured by using GPS data or video analysis to objectively assess changes in road positioning, such as maintaining safe distances from other vehicles, using lanes that maximise visibility to other drivers, and appropriate positioning at junctions. Adherence to speed limits could be assessed through implementing speed monitoring devices on motorcycles to record changes in speed compliance before and after the intervention, with data highlighting shifts in riders' commitment to following speed limits in different settings. The use of safety equipment could be assessed through conducting observational studies or surveys to quantify changes in the use of helmets, gloves, jackets, and other protective gear to understand to what extent the adoption of safety gear has become a routine part of riding.

### 5.2.4 Commitment and planning

Understanding and fostering commitment to safe riding practices is important for promoting long-term behavioural change among motorcycle riders. This commitment involves riders' dedication to consistently adhere to safe riding behaviours, even when faced with challenges such as work-related pressures or the need to alter ingrained habits. Evaluating this commitment requires a comprehensive assessment of both the psychological resolve of individuals to maintain safety as a priority and the practical strategies they employ to navigate various pressures. Similarly, the formulation and execution of plans for safe riding play a pivotal role in sustaining these behaviours over time. Plans serve as a roadmap for riders, detailing how they intend to implement and stick to safe riding practices amidst the complexities of everyday life. By assessing both the levels of commitment to safe riding and the effectiveness of planned strategies, it is possible to gain insights into the factors that support or hinder the adoption of safety measures.

In Section 4, the following measurement item was recommended for administration, before and after an intervention, to assess whether it is effective:

- *Commitment to Safe Riding:* Assess commitment levels to consistently adhere to safe riding practices, even when faced with work pressures or the need to change longstanding habits.
- *Plans for Safe Riding:* Evaluate the development and implementation of strategies to maintain safe riding behaviours under various pressures.

This could be measured through administering the following survey questions.

- To what extent do you agree/disagree with the following statement: I prioritise my safety over getting to destinations quickly (Strongly agree, Agree, Neither Agree nor Disagree, Disagree, Strongly Disagree)
- To what extent do you agree/disagree with the following statement: I am willing to change long-standing riding habits to improve my safety (Strongly agree, Agree, Neither Agree nor Disagree, Disagree, Strongly Disagree)
- How confident are you in your ability to maintain the following safe riding behaviours under pressure? (separate questions for: Adhering to speed limits, Using turn signals for every turn or lane change, Wearing all necessary safety gear, Maintaining a safe distance from vehicles ahead, Executing evasive manoeuvres to avoid hazards) (Very Confident, Quite confident, Neither confident nor unconfident, Quite unconfident, Very unconfident)
- After the intervention, did you create any new plans for safe riding? (Yes, I developed entirely new plans, Yes, I significantly modified my existing plans, Yes, I made some minor modifications to my existing plans, No, I did not make any significant changes, but reviewed my existing plans, No, I did not make any changes to my plans).

### *5.2.5 Process evaluation questions*

Process evaluations play an important role in the comprehensive assessment of interventions by focusing on the 'how' and 'why' aspects of programme implementation. They tell you how well a programme has been implemented and identify opportunities for improvement. Process evaluations provide valuable insights into the perspectives of both recipients and deliverers of interventions, offering a deeper understanding of the components that contribute to an intervention's effectiveness. According to Saunders et al. (2005), process evaluations are instrumental in monitoring and documenting programme implementation, by assisting in deciphering the relationship between specific programme elements and their outcomes.

While recognising the value of process evaluations, it is also acknowledged that relying solely on these evaluations without considering observed behavioural changes can limit the comprehensive understanding of an intervention's impact (e.g. Lennon et al., 2016). Often, process evaluations are deemed beyond the scope of studies primarily focused on outcome evaluations, despite the need to conduct both types of studies, especially prior to large-scale intervention rollouts. This underscores the importance of integrating process evaluations within the broader context of intervention research to ensure a better understanding of intervention effectiveness and to inform the design of future interventions.

Saunders et al. (2005) suggest that process evaluations assessing the implementation of interventions should seek to understand the elements outlined in Table 5.2.

*Table 5.2: Process evaluation assessment plan*

| Component | Process evaluation question | Tools/Procedures |
|---|---|---|
| Fidelity | To what extent was the intervention implemented consistently and as planned? | - Website analytics<br>- Random sample observation of intervention<br>- Deliverer questionnaire, interview and/or focus group<br>- Emails<br>- Reflections |
| Dose delivered | To what extent were the units within the intervention implemented? | - Participant questionnaires<br>- Deliverer questionnaire<br>- Log of attendances<br>- Intervention observation |
| Dose received | Did participants enjoy and engage with the intervention?<br>Were deliverers satisfied with the intervention?<br>Were managers of the intervention satisfied with the intervention? | - Participant questionnaire<br>- Deliverer questionnaire<br>- Intervention observation<br>- Reflections |
| Reach | What % of participants within the intervention area was the programme delivered to? | - Intervention logs |
| Recruitment | What procedures were followed to recruit participants to the intervention? | - Marketing strategy details |
| Context | What were the barriers and facilitators to implementing the intervention? | - Participant questionnaire<br>- Deliverer questionnaire<br>- Intervention observation<br>- Reflections |

*Source: Adapted from Saunders et al (2005)*

Some typical process evaluation questions might take the following form:

- To what extent do you agree or disagree that the intervention was…
    - Matrix options: Credible, Useful, Interesting, Important, Informative, Enjoyable, Boring, Surprising, Shocking, Worrying, Frightening
    - Response options: Strongly agree, Agree, Neither agree nor disagree, Disagree, Strongly disagree [5-point scale]
- To what extent do you agree or disagree that the intervention you have taken part in…
    - Matrix options: Has provided you with new insights, Has been beneficial to you personally, Has covered ideas that you see yourself doing, Has highlighted changes that you need to make, Will make a difference to your decisions and behaviours as a rider
    - Response options: Strongly agree, Agree, Neither agree nor disagree, Disagree, Strongly disagree [5-point scale]

## 5.3 SUMMARY

The review of evidence reported in Section 2.0, highlighted a significant gap in the evaluation of rider interventions, pointing out the crucial need for high-quality, published evaluations to ascertain the effectiveness and justify the continued investment in safety interventions for motorcyclists.

This chapter recommends establishing clear aims and objectives for interventions from the outset. Selecting relevant and sensitive outcome measures is crucial, which can be quantified through objective data. An evaluation framework, grounded in a theory of behaviour change, like the Theory of Planned Behaviour, has also been introduced as a helpful approach for providing a structured method for evaluations.

Different types of evaluation design (e.g. randomised controlled trials, comparison groups, and before-and-after studies) are suited to different research questions and contexts. Process and outcome evaluations provide a dual perspective on both the effectiveness and the implementation of the interventions, and are important studies to conduct as part of any intervention evaluation. The need for a comprehensive data collection approach that combines qualitative and quantitative methods, to enable a holistic understanding of the intervention's impact is also important. The necessity of choosing indicators that accurately reflect the intervention's impact on riders is a key consideration, with the selection process for these measures requiring careful consideration of their relevance, sensitivity, specificity, and feasibility to ensure the evaluation's overall validity and reliability.

Finally, this chapter discusses specific outcome and process evaluation measures which could be used to measure the effectiveness of interventions outlined in the logic models in Section 4. The evaluation approach outlined not only measures the tangible outcomes of safety interventions but also explores the underlying mechanisms contributing to these outcomes, providing a nuanced understanding which can be used to guide future efforts to enhance motorcycle safety.

# 6.0 SUMMARY AND CONCLUSIONS

Motorcyclists are a vulnerable road user (VRU) group due to their disproportionate involvement in collisions resulting in death and serious injury. This project sought to improve knowledge of motorcycle collisions and interventions and develop a framework that can guide future intervention development and collaboration. To do this, a number of activities were completed: a literature review of existing interventions and international evidence, crash analysis and profiling, stakeholder workshop, logic model development and evaluation guidance. This section summarises the key findings from each of these activities to draw conclusions and advise on next steps.

The literature review identified a lack of evidence for existing rider interventions to improve motorcycle safety. This is likely the result of four interrelated reasons:

1. Poor evaluation and reporting.
2. Not all motorcyclists are the same.
3. Interventions are unrelated to crash outcomes.
4. Design of content and/or delivery is not effective.

Rider training is the most common post-licence intervention, but education, communications campaigns, and hazard perception programs are also prevalent. Very little has been evaluated, almost none rigorously (e.g. up to best practice standards in public health). Few have clearly defined aims and objectives beyond seeking to improve rider safety generally and there is little evidence of mapping this broad safety aim to intervention outcomes (e.g. through logic maps or similar). This does not dismiss current interventions, but simply highlights that they do not clearly articulate the theoretical process through which the design of the intervention maps onto objectives and outcomes, and how it is associated with common collision types for motorcyclists. Some communication campaigns are targeted at specific crash types, but these cannot be expected to have a meaningful impact on rider behaviour and safety beyond awareness raising.

A review of international literature established that Great Britain is not alone. There are very few well-designed interventions or evaluations published worldwide. Nevertheless, two well designed and evaluated trials were identified. These trials from the Netherlands and Australia reported different results with experienced versus inexperienced rider samples respectively. This highlights that it is critical for interventions to be designed around the intended audience. Demographic profiling is important for interventions to increase the chance of delivering effective communication and training. The design of these international interventions potentially identifies best practice principles. For example, one of the interventions had a strong focus on riders analysing and self-reflecting on their own recorded behaviour, with post-ride analysis supported by highly trained facilitators. This was found to support self-reflection, insight and engagement. That study was not evaluated against crash outcomes, which can be challenging for evaluations, and proxy variables such as confidence in riding skills, attribution of responsibility, speed choice and observed behaviour were used and are good examples for future evaluations.

Further work could explore the use of hazard perception training, particularly for novice riders. Whilst the evidence is limited for this group specifically, the literature review supports it as a potential approach, especially as there is a strong relationship between hazard perception and safety for novice drivers which could be replicable with motorcyclists. There is a suggestion that as motorcyclists do not typically travel the same mileage as car drivers, a lack of rider exposure may limit development of this skill. Ongoing studies with the Road Safety Trust should be monitored as there is potential for this to form an important part of a wider intervention.

The crash type analysis serves as an important starting point for intervention development. The analysis enables intervention strategy and design to be developed around safety-related outcomes while supporting the need to tailor interventions to target specific rider demographics. The analysis indicated seven segments:

1. Urban junction collisions involving those on small motorcycles.
2. Urban collisions involving those on small motorcycles away from junctions.
3. Rural collisions involving those on small motorcycles.
4. Urban junction collisions involving those on large motorcycles.
5. Single vehicle rural collisions involving large motorcycles away from junctions.
6. Rural collisions involving large motorcycles away from junctions (but involving other vehicles).
7. Rural junction collisions involving large motorcycles and other vehicles.

Within segments 1, 2 and 4 there are differences between those living in London and those living outside of London. The analysis indicates that while smaller motorcycles (up to 125cc) make up the majority of injury collisions, larger engine motorcycles are involved in a greater proportion of collisions involving death and serious injury. In short, the interaction between engine size, urbanity and junctions provides the basis for future intervention development. The majority of injury collisions occur away from the SRN (98% for up to 125cc and 93% for over 125cc occur on other roads).

While these factors help to clarify the typical circumstances relating to injury collisions involving a motorcycle, they do not tell us about the target group other than by the size of the bike. The demographic profiling of those riding smaller motorcycles finds a majority of male riders aged between 16 and 34 years. However, many other factors vary significantly such as financial status, education, family composition and employment status.

Riders of larger motorcycles are also majority male but tend to be older, with a much broader age range. Again, there is variation in demographic characteristics, although leisure riding is much more common than for smaller motorcycles, where work and commuting dominate primary use. While demographic characteristics vary, profiles of the most represented groups can be identified and provide guidance for how target audiences can be identified, communicated with and recruited.

The crash analysis, profiling, and guidance on effective design from the review were all used to inform a stakeholder workshop that aided the development of logic models. These models set out examples of conceptual maps for rider interventions targeting three of the seven segments: those from both urban and rural settings with the greatest number and severity of collisions. The logic maps utilise the COM-B model to underpin a theoretical approach. COM-B (Capability, Opportunity, Motivation, and Behaviour) is a well-developed theory in public health that supports the design and implementation of interventions to change behaviour. The logic maps detail the planning, design, mechanisms of effect and the outcomes that can be measured. For example, an objective might be to improve situational awareness skills for urban riders of lower-powered motorcycles. The intervention might target young males with lower household incomes and seek to raise their capability (improve perception skills), motivation (belief in the benefits of safe riding behaviours) as well as developing cues, such as when commuting (opportunity) to recall trained defensive riding behaviours. To measure effectiveness, an intervention might look to identify changes in attitudes to safe riding, behaviour such as lane positioning or speed choice, and self-awareness of their limitations.

Having identified that evaluated interventions are scarce, the report provides a guide for how motorcycle interventions should be evaluated. Examples of measures for identifying changes in knowledge, behaviour, commitment and planning and related to the theory of planned behaviour are all suggested.

Motorcycles are involved in a disproportionately high number of collisions resulting in deaths and serious injuries. They possess incompatible attributes of high performance and lack of protection. It is precisely these attributes that motivates some riders, while for others it is the accessibility as an affordable and efficient form or transport, providing unique advantages to other modes. Any approach to truly improve the safety of motorcyclists needs to be holistic. It is extremely challenging to design a transport system to account for the risks associated with operating motorised vehicles with almost no physical protection. While system attributes may improve with time, the short-term approach relies heavily on supporting the rider to be equipped with the knowledge, skills and self-awareness necessary to manage their personal exposure to risk when riding.

This project has identified that the motivation for riding can differ between demographic profiles that relate to seven types of common crash types. The desire to support riders and manage the excessively high injury rate among motorcyclists has led to a number of interventions being developed and currently available. Unfortunately, there is little evidence to support which of the various designs of intervention are effective in reducing serious crash involvement. While there is some evidence of best practice from international literature, this work suggests that either the adaptation of existing resources, or new resources, need to start with a detailed mapping exercise to clearly identify the relationship between aims, objectives, mechanisms of effect and outcomes. No one-size-fits-all approach will work for what is an extremely varied motorcycling community. Demographic profiling related to common crash types now provides a unique opportunity to tailor intervention design and communication to targeted audiences. The recommendations in this report also outline several intervention evaluation opportunities and approaches which can be applied to build a more robust and much needed understanding of intervention effectiveness.

# REFERENCES


Araujo, M., Illanes, E., Chapman, E., & Rodrigues, E. (2017). Effectiveness of interventions to prevent motorcycle injuries: systematic review of the literature. *International journal of injury control and safety promotion, 24(3)*, 406-422. https://doi.org/10.1080/17457300.2016.1224901

Ajzen, I., (1991). The Theory of Planned Behaviour. *Organizational Behavior and Human Decision Processes, 50*, 179–211. https://doi.org/10.1080/10410236.2018.1493416

Bartl, G., Baughan, C., Fougère, J.P., Gregersen, N.P. (2002). *The EU Advanced Project: Description and analysis of post-licence driver and rider training: Final Report*: CIECA. https://www.cieca.eu/sites/default/files/documents/projects_and_studies/1ADVANCEDFinalReportEn.pdf

Blackman, R., Haworth, N., Biggs, H., & Wishart, D. (2020). Review of Post-Licence Motorcycle Rider Training in New South Wales. *Journal of Road Safety, 31(4),* 26-35. https://doi.org/10.33492/JRS-D-19-00069

Boele, M.J., de Craen, S., & Erens, A. (2013) *The effects of a one-day advanced rider training for motorcyclists*. R-2013-3. SWOV, Leidschendam. https://swov.nl/system/files/publication-downloads/R-2013-03.pdf

Boele-Vos, M. J., & de Craen, S. (2015). A randomized controlled evaluation study of the effects of a one-day advanced rider training course. *Accident Analysis & Prevention, 79*, 152-159. https://doi.org/10.1016/j.aap.2015.03.021

Christie, N., & Ward, H. (2023). Delivering hot food on motorcycles: A mixed method study of the impact of business model on rider behaviour and safety. *Safety Science, 158*, 105991. https://doi.org/10.1016/j.ssci.2022.105991

Christmas, S., Young, D., Cookson, R., & Cuerden, R. (2009). *Passion, Performance, Practicality: Motorcyclists' Motivations and Attitudes to Safety*. TRL report PPR442, Crowthorne: Transport Research Laboratory

Clarke, D.D., Ward, P., Bartle, C., Truman, W. (2004). *In-depth Study of Motorcycle Accidents*. Road Safety Research Report No. 54. London: Department for Transport. ISSN 1468-9138.

Clarke, D.D., Ward, P.J., Bartle, C., & Truman, W.A. (2007) The role of motorcyclist and other driver behaviour in two types of serious accident in the UK. *Accident Analysis and Prevention, 39, 5*, 974-981. https://doi.org/10.1016/j.aap.2007.01.002

Conner, M., & Sparks, P. (2005). *Theory of Planned Behaviour and Health Behaviour*. In M. Conner & P. Norman (Eds.), Predicting Health Behaviour (2nd Edition, pp. 170–222). Berkshire, England: Open University Press.

Crundall, D., Van Loon, E., Stedmon, A. W., & Crundall, E. (2013). Motorcycling experience and hazard perception. *Accident Analysis & Prevention, 50*, 456-464. https://doi.org/10.1016/j.aap.2012.05.021

Crundall, D., Stedmon, A. W., Crundall, E., & Saikayasit, R. (2014). The role of experience and advanced training on performance in a motorcycle simulator. *Accident Analysis & Prevention, 73,* 81-90. https://doi.org/10.1016/j.aap.2014.08.009

DfT (2023a). *Reported Road Casualties Great Britain Annual Report 2022.* London: Department for Transport. https://www.gov.uk/government/statistics/reported-road-casualties-great-britain-annual-report-2022/reported-road-casualties-great-britain-annual-report-2022

DfT (2023b). *Reported road casualties Great Britain: Motorcyclist factsheet 2022*. London: Department for Transport. https://www.gov.uk/government/statistics/reported-road-casualties-great-britain-motorcyclist-factsheet-2022/reported-road-casualties-great-britain-motorcyclist-factsheet-2022

DfT (2020). *Reported Road Casualties Great Britain Annual Report 2019*. London: Department for Transport.

DfT (2004). *Guidelines for Evaluating Road Safety Education Interventions*. London: Department for Transport https://www.roadsafetyevaluation.com/docs/dft-guide.pdf

Elvik, R., Høye, A., Vaa, T., & Sørensen, M. (2009). *The handbook of road safety measures*. Emerald Group Publishing Limited.

Fylan, F. (2017). *Using Behaviour Change Techniques: Guidance for the road safety community*. London: RAC Foundation https://www.racfoundation.org/wp-content/uploads/2017/11/Using_behaviour_change_techniques_Guidance_for_the_road_safety_community.pdf

Grayson, G. B., & Sexton, B. F. (2002). *The development of hazard perception testing.* Crowthorne: Transport Research Laboratory.

Gregersen, N. P. (1996). Young drivers' overestimation of their own skill – an experiment on the relation between training strategy and skill. *Accident Analysis and Prevention, 28*, 243-250. https://doi.org/10.1016/0001-4575(95)00066-6

Hattaka, M., Keskinen, E., Gregersen, N.P., Glad, A., & Hernetkoski, K. (2002). From control of the vehicles to personal self-control; broadening the perspectives to driver education. *Transportation Research Part F: Traffic Psychology and Behaviour, 5*, p.201-215. https://doi.org/10.1016/S1369-8478(02)00018-9

Haworth, N.L., Rowden, P.J., Wishart, D.E., Buckley, L., Greig, K. & Watson, B.C. (2012). *Motorcycle Rider Safety Project Summary Report*; Queensland Department of Transport and Main Roads: Brisbane, Australia.

Helman, S., Palmer, M., Delmonte, E., & Buttress, S. (2012). *Development of a video measure of hazard perception skill and a group discussion based hazard perception training package for motorcyclists (PPR615)*. Crowthorne: Transport Research Laboratory.

Horswill, M. S., & Helman, S. (2003). A behavioral comparison between motorcyclists and a matched group of non-motorcycling car drivers: factors influencing accident risk. *Accident Analysis & Prevention, 35(4)*, 589-597. https://doi.org/10.1016/S0001-4575(02)00039-8

Horswill, M. S., & McKenna, F. P. (2004). *Drivers' hazard perception ability: situation awareness on the road*. In S. Banbury and S. Tremblay (eds.). A Cognitive Approach to Situation Awareness: Theory and Application. Aldershot; Ashgate Publishing, 155-175.

Ivers, R. Q., Sakashita, C., Senserrick, T., Elkington, J., Lo, S., Boufous, S., & De Rome, L. (2016). Does an on-road motorcycle coaching program reduce crashes in novice riders? A randomised control trial. *Accident Analysis & Prevention, 86*, 40-46. https://doi.org/10.1016/j.aap.2015.10.015

Jamson, S., & Chorlton, K. (2009). The changing nature of motorcycling: Patterns of use and rider characteristics. *Transportation Research Part F: Traffic Psychology and Behaviour, 12(4),* 335-346. https://doi.org/10.1016/j.trf.2009.04.002

Kardamanidis, K., Martiniuk, A., Ivers, R.Q., Stevenson, M.R., & Thistlethwaite, K. (2010). Motorcycle rider training for the prevention of road traffic crashes. *Cochrane Database of Systematic Reviews 2010, Issue 10*. Art. No.: CD005240. DOI: 10.1002/14651858.CD005240.pub2

Lennon, A., Bates, L., Evenhuis, A., Somoray, K., & Trust, N.-A. R. S. (2016). How effective is the ACT Road Ready pre-licencing driver education program at changing novice driver risk related attitudes and reducing the offence and crash involvement of novice drivers in the ACT? http://www.roadsafetytrust.org.au/c/rtt?a=da&did=1004593%0Ahttps://trid.trb.org/view/1467898

McIsaac, J. L. D., Read, K., Williams, P. L., Raine, K. D., Veugelers, P. J., & Kirk, S. F. (2017). Reproducing or reducing inequity? Considerations for school food programs. *Canadian Journal of Dietetic Practice and Research, 79(1)*, 18-22. https://doi.org/10.3148/cjdpr-2017-029

McKenna, F.P., Horswill, M.S., & Alexander, J.L. (2006). Does anticipation training affect drivers' risk taking? *Journal of Experimental Psychology: Applied 12*, 1–10. https://psycnet.apa.org/doi/10.1037/1076-898X.12.1.1

Michie, S., van Stralen, M.M. & West, R. (2011). The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci., 6:42*. https://doi.org/10.1186/1748-5908-6-42

Michie, S., Atkins, L. & West, R. (2014). *The behaviour change wheel: A guide to designing interventions*. London: Silverback

Michie, S., & Johnston, M. (2012). Theories and techniques of behaviour change: Developing a cumulative science of behaviour change. *Health Psychology Review, 6(1),* 1–6. https://doi.org/10.1080/17437199.2012.654964

Molina, J.G., García-Ros, R., & Keskinen, E. (2014). Implementation of the driver training curriculum in Spain: An analysis based on the Goals for Driver Education (GDE) framework. *Transportation Research Part F: Traffic Psychology and Behaviour, 26*, p.28-37. https://doi.org/10.1016/j.trf.2014.06.005

National Highways (2022) BikerTek Post Campaign Research. November 2022.

Powroznik, K. M. (2017). Healthism and weight-based discrimination: The unintended consequences of health promotion in the workplace. *Work and Occupations, 44(2),* 139-170. https://doi.org/10.1177/0730888416682576

Riley, K. E., Ulrich, M. R., Hamann, H. A., & Ostroff, J. S. (2017). Decreasing smoking but increasing stigma? Anti-tobacco campaigns, public health, and cancer care. *AMA Journal of Ethics, 19(5),* 475. https://doi.org/10.1001%2Fjournalofethics.2017.19.5.msoc1-1705

Rodwell, D., Hawkins, A., Haworth, N., Larue, G.S., Bates, L., & Filtness, A. (2018). A mixed-methods study of driver education informed by the Goals for Driver Education: Do young drivers and educators agree on what was taught? *Safety Science, 108.* P.140-148. https://doi.org/10.1016/j.ssci.2018.04.017

Rosenbloom, T., Perlman, A., & Pereg, A. (2011). Hazard perception of motorcyclists and car drivers. *Accident Analysis & Prevention, 43(3),* 601-604. https://doi.org/10.1016/j.aap.2010.08.005

RoSPA (2017). RoSPA Road Safety Research: Common motorcycle crash causes. https://www.rospa.com/rospaweb/docs/advice-services/road-safety/motorcyclists/common-motorcycle-crash-causes.pdf

Sakashita, C., Jan, S., Senserrick, T., Lo, S., & Ivers, R. (2014). Perceived value of a motorcycle training program: the influence of crash history and experience of the training. *Traffic injury prevention, 15(4),* 407-413. https://doi.org/10.1080/15389588.2013.828346

Sanders & Keskinen (2004)

Saunders, R. P., Evans, M. H., & Joshi, P. (2005). Developing a Process-Evaluation Plan for Assessing Health Promotion Program Implementation: A How-To Guide. Health Promotion Practice, 6(2), 134–147. https://doi.org/10.1177/1524839904273387 Senserrick, T., McRae, D., Wallace, P., De Rome, L., Rees, P., & Williamson, A. (2017). Enhancing higher-order skills education and assessment in a graduated motorcycle licensing system. *Safety, 3(2)*, *14*. https://doi.org/10.3390/safety3020014

Smith, L., Knowles, J., & Cuerden, R. (2013). *Analysis of Police collision files for motorcyclist fatalities in London, 2006-09*. Crowthorne: Transport Research Laboratory.

Taylor, K., Van Dijk, P., Newnam, S., & Sheppard, D. (2023). Physical and psychological hazards in the gig economy system: A systematic review. *Safety Science, 166(July)*, 106234. https://doi.org/10.1016/j.ssci.2023.106234

The Green Book (2022). *Central government guidance on appraisal and evaluation.* London: HM Treasury https://assets.publishing.service.gov.uk/media/623d99f5e90e075f14254676/Green_Book_2022.pdf

Tunnicliff et al. (2012). Understanding the factors influencing safe and unsafe motorcycle rider intentions. *Accident Analysis and Prevention, 49*, pp.133.141. https://eprints.qut.edu.au/41214/

Underwood, G., & Chapman, P. (1998). *Eye movements and hazard perception ability*. In: Grayson, G.B. (Ed.), Behavioural Research in Road Safety VIII. Crowthorne: Transport Research Laboratory.

# APPENDIX A LITERATURE REVIEW METHOD

The search for literature focused on two areas to inform the overall review:

1. Current provision of post-licence motorcycle interventions in Great Britain.
2. Published international literature relating to post-licence motorcycle interventions.

A systematic approach was taken with search terms defined and agreed between the report authors (see Table A.1). The search terms were used in combination with each other (i.e. key term plus level 1 and/or level 2). Wildcard searches were used to capture variations in terms (e.g. motorcycl* would show results for 'motorcycle' or 'motorcyclist').

*Table A.1: Search terms*

| Key terms | Level 1 | Level 2 |
|---|---|---|
| Motorcycl*<br>PTW*<br>MTW*<br>"Power Two Wheel*"<br>"Motorised Two Wheel*"<br>"Motorized Two Wheel*" | Intervention<br>Behav*<br>Attitud*<br>Knowledge<br>Skills<br>Training<br>Educat*<br>Program*<br>Prevent*<br>Simulat*<br>Learn*<br>Aware* | Systematic review<br>Meta-analysis<br>Evaluat*<br>Effect*<br>Trial<br>RCT<br>Compar*<br>Analys* |

The search for international literature was limited to English-language literature published between 2013-2024. Historical literature was included where it was clearly relevant and either referenced in the literature found (i.e. snowballing) or already known to the report authors. Geographically, preference was given to literature from the UK, Europe, Australia, and North America to ensure relevance to the motorcycle training context in Great Britain.

An online search was initially carried out on TRID (Transport Research International Documentation) – the world's largest and most comprehensive bibliographic resource on transportation research – and Google Scholar. The search results were cross-checked against search results from PubMed, ScienceDirect and the Australasian College of Road Safety (ACRS).

To establish existing post-licensure motorcycle interventions in Great Britain, and associated grey literature, a broader search was necessary. The collective knowledge of the research team was leveraged, enriched by discussions and communication with sector experts and professionals. This was supplemented by exhaustive searches across key websites (e.g. Road Safety GB, MCIA - Elite Rider Programme, BMF, DVSA, RoSPA, IAM RoadSmart, Young Riders Forum 2Wheels – London and Greater Manchester, Safe Driving For Life).

All post-licence interventions currently running in Great Britain were included for review, whether they had been evaluated or not. Publications that were directly related to providing context to these (e.g. describing intervention design and content) were included in the review without formal assessment for inclusion. All other literature found during the searches was assessed for relevance (e.g. how does it relate to the aims of the research), and quality (e.g. whether it is from a peer-reviewed source, national research agency or has taken clear actions to control for known biases).

Criteria were used to assess the suitability of the literature, to ensure that only the most relevant literature was included, and that it met a minimum quality standard (see Table A.2). The criteria were applied during an initial review of abstracts in order to develop a shortlist, and again during the full text review.

*Table A.2: Inclusion criteria*

| | Rejected | Include with limitations | Include |
|---|---|---|---|
| **Relevance** | Not relevant to the objectives of the project | Some indirect relevance to the objectives of the review (e.g. experimental research related to rider safety but not currently delivered as post-licence rider intervention) | Directly relevant to the objectives of the review (e.g. research which directly reviews or evaluates post-licence rider interventions) |
| **Quality** | Non-scientific study with demonstrably poor method | Non-peer reviewed scientific study lacking enough detail to demonstrate a fully robust method but appearing to have some credibility based on profile, research design or approach to analysis. This includes documents published by commercial organisations or government agencies | Peer-reviewed scientific study accounting for confounding variables through appropriate methods |

# APPENDIX B DESCRIPTION OF INTERVENTIONS

The following sections delve deeper into the specifics of each of the post-licensure motorcycle interventions currently available in Great Britain, identifying their aims, objectives and modes of delivery.

*Interventions are identified for whether they have been evaluated (that is in the public domain) or not using a thumbs up* 👍 *or thumbs down* 👎 *symbol. Reviews of the evaluations for those with a thumbs up can be found in section 3.2.*

## B.1 ADVANCED MOTORCYCLE TRAINING (ROSPA)

👎 Not evaluated

This four-day training course from RoSPA instructs riders in the theory and practice of responsible riding and prepares riders for the RoSPA advanced motorcycle test. The training is delivered by trainers registered with the DVSA Enhanced Rider Scheme. During the training, participants are introduced to a systems approach to pre-use motorcycle checks and the effect of human factors (e.g. attitudes and fatigue) on performance. The course focuses on a systematic and defensive approach to hazard management and risk reduction, including focusing on improving observations and awareness of potential road risks. To gain a high grade, riders are expected to have good knowledge of the current editions of the Highway Code and Motorcycle Roadcraft. The course runs with a maximum of three participants per trainer.

In addition, RoSPA Advanced Drivers and Riders have around 60 local groups that will provide training to help riders improve their riding skills and prepare for their Advanced Test. The test can be passed at either bronze, silver or gold level. Once the test has been passed, participants automatically become a subscribing member of RoSPA Advanced Drivers and Riders. Members are asked to retest every three years, with the costs of these retests included in the yearly subscription fee. Access to the RoSPA Advanced Drivers and Riders benefits platform includes discounts on insurance as well as other discounts.

## B.2 ADVANCED RIDER (IAM ROADSMART)

👍 Evaluated

This course[19] aims to provide participants with additional knowledge and skills to improve the safety and enjoyment of their on-road experience. To take part in the course, participants require a valid driving licence and their own motorbike. The programme involves riders being observed by an advanced rider assessor who, over a series of rides, seeks to assist participants in developing their core riding skills and to learn how to continuously apply the IPSGA framework (Information, Position, Speed, Gear, Acceleration)[20] to a variety of on-road environments such as bends, motorways and during overtakes. Riders are provided with a handbook to allow them to keep track of progress and to practice skills in between each session. Riders typically take 6-12 sessions with an observer. The participant will take an advanced test once their observer believes they are ready. On successful completion of the test, the rider will gain both 'Advanced Rider' and 'IAM RoadSmart Member' status.

[19] https://www.iamroadsmart.com/courses/advanced-rider/?utm_source=eliteridertraining&utm_medium=banner&utm_campaign=eliteridertraining

[20] https://www.iamroadsmart.com/IPSGA

A study[21] conducted by Agilysis on behalf of IAM RoadSmart sought to assess the effectiveness of the Advanced Rider course through conducting a survey of c.1,300 riders, comprising IAM RoadSmart members and non-advanced qualified motorists. The study sought to establish whether:

- IAM RoadSmart riders score lower on attitudinal scales associated with collision risk than non-members;
- IAM RoadSmart riders report fewer injury and damage only collisions than non-members;
- There are differences in self-reported speed choice between IAM RoadSmart riders and non-members; and whether
- IAM RoadSmart members differ from non-members in terms of general attitudes to safety.

The study found that course participants have safer attitudes on the roads and are involved in fewer collisions per mile travelled than demographically similar riders who have not completed the Advanced Rider coaching programme, once mileage is accounted for. Advanced riders were also found to be more aware of the limitations of other drivers and riders, and were therefore more likely to show consideration for other road users. IAM RoadSmart riders reported selecting higher speeds and being more confident in their skills. The authors of the report note that whilst rider confidence is not in and of itself negative, they recommend that care is taken to ensure that member confidence does not translate to over-confidence, which can have negative impacts on road safety outcomes – such as choosing higher speeds (Gregersen, 1996). There are several study limitations that should also be noted when interpreting the results of this study. First, the study was conducted as a post-test only control group design. As there are no pre-intervention measurements collected in this design, the study was not able to account for any pre-existing differences between groups that might affect the outcome (i.e. characteristics that attract motorcyclists to join IAM RoadSmart that could be influencing their attitudes and safety and riding in general). Consequently, it is more challenging to attribute any differences observed in the post-test results directly to the intervention, unlike with a pre-test – post-test control group design. Whilst the study notes that the intervention and control group are comparable, no statistical testing (i.e. Chi-Square test) was conducted to test whether proportionally the control and intervention groups comprised participants from comparable socio-demographic groups. Further research with more robust experimental designs is required to validate these findings.

### B.3 BIKERDOWN (FIRE AND RESCUE SERVICES)

👎 Not evaluated

This programme[22] has been developed by UK Fire and Rescue Services to address the first aid capabilities of motorcyclists, who are often the first person 'on scene' at a motorcycle collision. The Biker Down initiative was started in 2010, by Jim Sanderson of Kent Fire and Rescue Service who after using skills gained from his firefighter training, realised that there was value in providing training to motorcyclists who could also assist at the scene of a motorbike collision. The programme consists of three modules, where participants train in essential life skills and knowledge, based on operational fire-fighter training to help them cope should they encounter or be involved in a road traffic collision. Consequently, the programme also aims to increase riders' sense of responsibility when on the road and improve their road safety attitudes related to riding techniques and the support they can offer on

[21] https://iamwebsite.blob.core.windows.net/media/docs/default-source/research-reports/evaluation-of-advanced-motorcycling.pdf?sfvrsn=1310ee5c_2

[22] http://bikerdown.co.uk/

the roadside. The course is provided free of charge to motorcyclists of all ages and abilities. The three modules provide the following content:

- *Module 1 – Incident scene management*: This is led by operationally experienced firefighters who provide advice on how to offer first aid support to responders, motorcyclists, and anyone else involved. Advice is also included on alerting the emergency services.
- *Module 2 – Casualty care*: This module is delivered by qualified Life Support Instructors who address dealing specifically with motorcycle-related first aid (e.g. typical trauma, mechanism of injury to legs, dealing with major bleeds, basic life support, CPR, managing spinal injuries and crash helmet removal)
- *Module 3 - The thinking biker:* This module addresses how the brain interprets surroundings (e.g. motion camouflage, saccadic masking and looming) to emphasise that what is visible, is not always seen. Instructors offer advice on how motorcyclists can best be seen and how hi-vis clothing, day riding lights, retro-reflective materials do not on their own guarantee that motorcyclists will be seen by other road users.

The course is delivered in an interactive format, including hands-on first aid training. Participants are also offered the opportunity to ask questions and discuss the topics being considered. At the end of the course, participants receive a certificate of attendance and a medical crash card for medical details to be inserted and carried within the rider's helmet. There are 47 teams around the UK delivering Biker Down training, and Biker Down was launched in North America in 2021.

### B.4 BIKESAFE (POLICE)

👎 Not evaluated

BikeSafe[23] is delivered throughout the UK by the Police (38 police forces in total) who offer participants a police-led observed ride. BikeSafe aims to work with motorcycle riders in a relaxed environment to raise awareness of the importance and value of progressing on to accredited post-test training. BikeSafe is therefore not a training scheme in itself. Whilst there is some local variation in delivery, the BikeSafe workshop programme aims to cover rider attitude, systematic methods, collision causation, cornering, positioning, overtaking, observation, braking, hazard perception and use of gears. BikeSafe workshops are delivered for a minimum of 5 hours and a maximum of 8 hours, and include 2 hours of classroom-based theory, which includes the National BikeSafe curriculum. The on-road, observed ride element is approximately three hours in duration, which includes briefing, debriefing and feedback. Most forces run one-day workshops with the theory element in the morning and the observed ride in the afternoon, although some forces split the theory session and observed ride on separate days and some courses include a first aid element. The BikeSafe 'Bridging the Gap' (BTG) consists of an extended workshop which runs across two consecutive days. This typically includes a standard BikeSafe workshop on day one, with day two being delivered by approved post-test training providers (e.g. IAM RoadSmart, RoSPA, DVSA and post-test training from a recognised MCIA accredited Approved Training Body (ATB)). Details of the Greater Manchester[24] BikeSafe Programme are provided in Box A, as an illustration of how the core components are addressed within a local provision.

[23] https://bikesafe.co.uk/

[24] https://bikesafe.co.uk/greatermanchester/

**BikeSafe - Greater Manchester Police**

The stated primary aim of the Great Manchester BikeSafe programme is to identify one or two key areas of participant behaviour that, if improved, would significantly enhance participant's skills, safety and enjoyment on two-wheels. The intervention is open to all riders of machines from 125cc and up with a full motorcycle licence. To take part, riders are required to bring their UK driving licence, a valid MOT certificate (if an MOT is required) and evidence of valid insurance cover. Participants are asked to wear appropriate motorcycle clothing and are informed that they will not be able to ride unless they are wearing appropriate clothing. Participants are also informed that their motorcycles must be in roadworthy condition (e.g. tyres and number plates).

On booking, attendees are provided access to nine eLearning videos which cover: attitude; IPSGA (i.e. information, position, speed, gear, acceleration); cornering; overtaking; group riding; junctions; hazards; observation and filtering. The intervention describes these as the core elements of roadcraft, which the observed ride considers. An online bike theory class with an officer is also recommended for completion ahead of the observed ride. The observed ride consists of 2-3 hours on road, with a ratio of one observer to no more than two motorcyclists. Throughout the ride, the position of motorcyclists is alternated. Several road-side debriefs are held throughout the course of the ride, with a final comprehensive debrief provided at the end of the observed ride. In addition, assessors also provide signposting to further development opportunities (e.g. Advanced Rider qualification with IAM RoadSmart, RoSPA, BMF and/or the DVSA Enhanced Rider Scheme).

### B.5 BIKESENSE (STAFFORDSHIRE COUNTY COUNCIL AND SSRP)

👎 Not evaluated

This training[25] aims to reduce the number of motorcycle casualties on Staffordshire's and Britain's roads by providing training to enable motorcyclists to improve their riding skills, competence, and road safety awareness. The stated objectives[26] of the course are:

- To provide an assessment of a motorcyclist's riding ability and the provision of appropriate remedial and developmental training.
- To provide specific instruction to cover areas such as hazard perception, reading the road, road handling, braking, positioning, overtaking and defensive riding.

The training also has a bias towards riding on rural A-roads, given this is where most KSI collisions involving motorcyclists occur. The training also covers a range of riding environments but is tailored to the rider's individual needs.

### B.6 BIKERTEK (NATIONAL HIGHWAYS)

👍 Evaluated

This intervention[27] consists of a pop-up shop for bikers. The BikerTek range of parts aim to provide a serious message to bikers about the risk of serious injury associated with riding. Experienced bikers talk about the injuries they have sustained whilst biking as well as the enjoyment around biking. The pop-up shop, displaying parts for injured bikers (i.e. implants used to hold together bones together

[25] http://www.staffsbiker.co.uk/bikesense/
[26] http://www.staffsbiker.co.uk/wp-content/uploads/2020/05/BikeSense-Syllabus-2020.pdf
[27] https://nationalhighways.co.uk/road-safety/biker-safety/

etc.), are shown at biker events and cafes on behalf of National Highways. There is also an online version of the intervention[28]

This intervention was evaluated by National Highways in November 2022 (National Highways, 2022). The evaluation sought to understand awareness of the campaign, reactions to the campaign creative concept and any change in behaviour that were attributable to the campaign. The evaluation was conducted by Bauer, who emailed a self-completion online questionnaire from Motorcycle News to 50,000 individuals randomly selected from their database. An incentive (£250 Sportsbikeshop vouchers) was offered to increase the response rate. 1,800 respondents were included in the analysis. 97% of respondents were male, with 74% being 55+ years old. 72% of respondents had 20+ years of riding experience. Inexperienced riders were found to be more likely than experienced riders to describe their riding as: Steady, patient, calm and slow, and less likely to describe their riding as smooth, quick or skilled. Supersport owners were also more likely than Sports Tourer owners to describe their riding as quick.

56% of respondents said that they could remember seeing Bikertek content within the past 6 months, with older (i.e. over 55) being more likely to remember seeing the campaign. Almost 9 out of 10 of those who had seen Bikertek had seen it in motorcycle publications, with two thirds having seen Bikertek online and 21% at Bikertek events. When asked about what they thought about the campaign, the most used descriptive words were: 'good', 'interesting' and 'thought provoking'. Whilst the majority of responses to this question were positive, there were some comments that suggested it was 'confusing' or 'too clever'. The words most commonly selected to describe the campaign were 'informative', 'relevant' and 'important'. Over half of respondents reported that the campaign had changed their behaviour, with just 22% agreeing that the campaign had no effect on their riding or attitude to safety. Motorcyclists aware of the campaign were more likely to identify cornering and overtaking (two of the four focuses of the intervention – alongside speed and fatigue) as being the main causes of motorcycle collisions on UK roads.

While the intervention evaluation conducted garnered a substantial number of online survey responses, it is crucial to note that it was conducted as a process evaluation rather than an effectiveness evaluation. This distinction highlights a key limitation: the reliance on self-reported data to gauge awareness and behavioural change. Respondents' positive perceptions of the campaign and their self-reported behavioural changes cannot be unequivocally taken as evidence of actual behaviour modification. To robustly ascertain the campaign's effectiveness in altering behaviours, a controlled study with a before-and-after design is necessary. Such a study would provide more definitive evidence by comparing behavioural indicators prior to and following the intervention, thereby mitigating the subjective biases inherent in self-report post-intervention, non-controlled studies.

## B.7 BMF BLUE RIBAND RIDER AWARD (BMF)

👎 Not evaluated

The stated aim of this course is to assist experienced motorcyclists to improve their riding skills and increase the enjoyment they get out of motorcycling. The programme website also states that the course will improve rider's observation, planning and control, reduce errors and reduce the likelihood

[28] https://www.bikertekshop.co.uk/

of collisions *"The course seeks to encourage you to THINK about why?, and what? you are doing when you are riding, to be self critical and to be able to recognise your own strengths and weaknesses"* [29].

There are two different types of Blue Riband courses available:

- *Concentrated:* Held over a day and a half, this course starts with the theory of, and discussion about, the techniques that will be practised in the assessment and demonstration rides. The on-road ride includes stops and road debriefs. Providing participants have reached the required standard by the end of day one, the Blue Riband assessment is booked for the following day, or as soon after as possible. The assessment is conducted by another instructor and takes around 1 hour to complete, at the end of which participants are provided with written feedback about their performance, including advice on machine controls, information gathering, psychological judgement and roadcraft.
- Standard: As with the concentrated course, the session starts with a theory session and the practical sessions are broken down into separate sections and are held at convenient times for the candidate and the instructor. Once a participant reaches the required standard, the assessment is conducted in the same manner as the concentrated course.

Ahead of taking the course, participants are provided with a copy of motorcycle 'RoadCraft' and are encouraged to spend some time studying it ahead of the course. Participants are also advised to attend the course with a motorcycle that is capable of coping with the speeds adopted in and distances covered by the course. Participants are required to have held a full motorcycle licence for at least 6 months and have an appropriate level of experience to take part. There are 25 BMF approved training centres available across the UK[30].

On completion of the course, a copy of the written assessment is provided to BMF, a certificate and badge which is valid for three years will be issued alongside membership of the BMF for a 12 month period. The course site also recommends that riders provide details of the award to their insurance providers as many insurance companies provide a discount for the award.

## B.8 BMW RIDER TRAINING (BMW)

👎 Not evaluated

This course from BMW[3132] states that it can support riders to improve their confidence, technique, and skills. Three Advanced Road Skills courses are provided (Levels 1, 2 and 3 incl. RoSPA assessment), which teach advanced riding techniques. The topics covered by the programmes include:

- Returning to motorcycling after a break from riding;
- Slow speed riding control, balance and manoeuvring;
- Preparation for a new bike;
- Cornering analysis and execution – a systematic approach
- Manual handling – how to move your bike around without the engine running;
- Preparation for an advanced test;

[29] https://www.britishmotorcyclists.co.uk/about-us/bmf-blue-riband-rider-award/

[30] https://www.google.com/maps/d/u/0/viewer?mid=1UzrTwN7w28PVw_Creh63EO7FkbhkK1zy&hl=en&femb=1&ll=52.87023618477749%2C0.24157655000000222&z=6

[31] https://www.eliteriderhub.co.uk/bmw-rider-training/

[32] https://www.bmwridertraining.com/

- Pillion training – preparation of how to ride with a passenger, and also training for the pillion so that they are happy and comfortable;
- Overtaking and/or filtering – a systematic approach;
- Preparation for touring – distance travel, hairpin bends etc;
- Group riding;
- Theory refresher session;
- Correct use of gears and brakes;
- Fundamentals of defensive riding; and
- Emergency stop, braking and avoidance exercises.

## B.9 DIAMOND ADVANCED MOTORCYCLE TEST (DIAMOND)

👎 Not evaluated

This programme[33] provides participants with an advanced test and some additional post-test training, and is targeted to general members of the public with an interest in riding, with the suggestion that such training will be beneficial to couriers and delivery riders. Trainers focus on defensive and eco riding techniques. The test delivered by an examiner (who has received training from the DIA and is registered with the DVSA's voluntary motorcycle scheme) lasts for 60 minutes and covers a variety of roads, and where possible, motorways and rural areas. A pass is awarded to participants if they achieve no serious or dangerous faults and do not exceed 6 rider faults. The website for the test notes that having a Diamond advanced test certificate may qualify participants for discounts on insurance, with the pass certificate valid for 3 years.

Diamond also offers an Elite Motorcycle Test and post-test training package for those with a keen interest in riding who are looking to improve or enhance their current skills or are a professional rider training interested in becoming a Diamond examiner. The test lasts for 90 minutes covering a variety of roads. Participants are expected to carry out an emergency stop, figure of eight, a commentary ride for approximately 15-20 minutes and a slow riding exercise, if asked to do so. A pass is awarded to participants if they achieve no serious or dangerous faults and do not exceed two rider faults in the same category.

## B.10 ENHANCED RIDER SCHEME (DVSA)

👎 Not evaluated

This scheme[34] checks rider skills and provides post-test training with the aim of supporting riders to become safer and develop their riding skills. The enhanced rider scheme is suitable for riders who have just passed their test, are returning to riding after a break, are upgrading to a more powerful motorbike or want to have their riding standard checked with a professional trainer. Participants receive a rider assessment lasting between 1-2 hours with an expert trainer whilst travelling on different roads and conditions. Assessment is based on the seven core modules:

- structured planned approach to riding;
- defensive riding and hazard awareness;
- progress and use of speed;
- overtaking and filtering;
- bends and corners;
- slow control; and

[33] https://advancedmotoring.co.uk/services/diamond-tests/advanced-motorcycle-test/

[34] https://www.gov.uk/enhanced-rider-scheme/overview

- developing the correct rider attitude.

If after the rider assessment a participant does not require any more training, they are awarded a 'DVSA certificate of competence'. If this standard is not met, participants will receive personalised training to improve their skills and will receive a certificate at the end of their training. Extra optional training modules are also available for participants to sign-up to after they have received a DVSA certificate of competence, which cover the following:

- effective braking techniques;
- advanced level filtering;
- motorways and dual carriageways;
- carrying a passenger or load;
- delivery or courier riding;
- riding abroad;
- blood bikers;
- group riding;
- Biker Down and accident scene management;
- motorcycle maintenance and machine awareness;
- mobile phones, GPS, sat nav and Bluetooth; and
- training in alternative environments.

The DVSA certificate provides discounts at most motorcycle insurers and if additional training needs are identified, participants may be offered all-day courses or shorter-sessions to attend, depending on their particular needs. Riders can search for their nearest DVSA enhanced rider scheme trainer by entering their postcode into the gov.uk website for the programme.[35] The cost of the programme depends on the trainer and their training needs.

### B.11 FIREBIKE BETTER BIKING COURSE (ESSEX COUNTY FIRE & RESCUE SERVICE)

👎 Not evaluated

This free half day course[36] aims to provide advice, guidance and assessed ride feedback to improve participants' existing road riding skills and to support their enjoyment of riding. Following an initial classroom theory session, participants complete an assessed rider with a FireBike assessor who provides practice advice and guidance on participant riding, highlighting strengths and areas for improvement during practice. Tailored feedback is given on topics such as observation, positioning, gear selection and overtaking. At the end of the session, feedback is provided alongside a certificate of attendance, with written feedback sent shortly after the course. Insurance discounts are provided for course completion by a named provider.

### B.12 HONDA REFRESHER COURSE (HONDA)

👎 Not evaluated

The course[37] is available to riders who have not ridden for some time, or are interested in building back their confidence. This day-long course includes instruction from a Honda professional who focuses on teaching new skills, techniques and safety tips. The refresher training begins with some

[35] https://www.gov.uk/find-enhanced-rider-scheme-trainer

[36] http://old.essex-fire.gov.uk/Road_Safety/FireBike/FireBike_Better_Biking_Course/

[37] https://www.honda.co.uk/engineroom/honda-school-of-motorcycling/#section-7Rt7kH2cOJ

off-road practice, with the remainder of the day tailored to rider ability. On conclusion, participants receive a tailored assessment of their skills.

### B.13 HUGGER'S 1:1 SKILLS SESSION (NORFOLK COUNTY COUNCIL)

Not evaluated

This course[38] aims to provide individualised and personalised training to an individual on a 1:1 basis. It is advertised as a course that can support experienced riders to improve their cornering skills, their judgement whilst overtaking, as well as being a general check on their riding skills. The course includes key topics from the police Roadcraft manual and can be the first session in the Enhanced Rider Scheme (ERS) programme if the client chooses and is conducted by an ERS qualified trainer.

### B.14 KNOW THE DANGERS (SHINY SIDE UP)

Evaluated

The Know The Dangers social media campaign was designed to highlight the most common causes of collisions for motorcyclists. It comprises eight videos covering the topics of SMIDSY (Sorry Mate I Didn't See You - for parked vehicles, filtering and turning left), filtering, overtaking, bends, roundabout and right turns. The campaign was independently evaluated by Agilysis[39]. The videos were shared by the Shiny Side Up Partnership Facebook and Twitter pages. The creation of the resource and campaign was funded by the Road Safety Trust.

The independent evaluation of this programme , conducted by Agilysis, aimed to assess the effectiveness of this social media campaign, which focused on raising awareness about common causes of motorcycle collisions. Utilising social media metrics, website analytics, and an online survey, the campaign was found to achieve significant reach (671,892 views of the campaign), primarily driven by paid social media advertising. High viewership of the campaign's videos persisted over time, indicating sustained interest and a lack of message fatigue among the audience. Notably, the campaign's reach extended beyond social media, as evidenced by increased website traffic following social media promotions.

The survey, predominantly completed by experienced motorcyclists, revealed that the majority found the resources engaging, informative, and relevant. Respondents reported applying the tips from the films to their riding practices, and nearly half acknowledged an enhanced understanding of motorcycle collision risks. Importantly, the campaign's content on hazard recognition, observation, anticipation, and defensive riding techniques was effectively retained by the audience. There are limitations with the study such as the absence of a comparative analysis with other road safety campaigns, which limits the understanding of this campaign's relative effectiveness. Furthermore, the lack of follow-up studies to assess long-term behaviour change and message retention among the audience is a significant limitation.

### B.15 LIVE FAST DIE OLD (ROAD SAFETY SCOTLAND)

Evaluated

This campaign[40] from the Scottish Government and Road Safety Scotland features films of scenic rides in Scotland whilst providing the message to motorcyclists to take their time and enjoy the roads safely.

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[38] https://www.norfolk.gov.uk/roads-and-transport/roads/road-safety/road-education-and-training/training-for-drivers-and-motorcyclists/motorcyclists

[39] https://shinysideup.co.uk/wp-content/uploads/2022/11/SSUP-Know-the-Dangers-Evaluation-Report-.pdf

[40] https://livefastdieold.scot/

The campaign takes an alternative approach by celebrating the joy that biking can bring, whilst also providing tips on safe riding habits, in particular overtaking and going around bends. The campaign highlights in particular the need to negotiate left-hand bends safely, as this has been shown to be where one in three motorbike fatalities occur. The campaign is primarily aimed at male bikers aged 40-49 years who comprise 20% of all bikers in Scotland, but account for 30% of KSIs.

Whilst the full evaluation details of this campaign are not readily available, a summary of the evaluation findings reported on Road Safety GB website[41] outline that about half of the riders surveyed expressed a preference for group riding, underscoring a need for increased knowledge and awareness around safe group riding practices. 94% of bikers who viewed the campaign films self-reported a change in their riding behaviour, surpassing the campaign's target of 66%. This positive shift in behaviour included 39% of riders committing to more patience during overtaking manoeuvres; 34% approaching bends with greater caution; and 33% being more careful at junctions. However, it is important to note that these findings are based on self-reported survey responses, which may introduce biases and limit the reliability of the data. Additionally, the absence of a pre-survey assessment hinders the ability to measure actual behavioural changes, as opposed to perceived changes reported by the respondents. This lack of baseline data makes it challenging to conclusively attribute the reported behavioural shifts directly to the campaign's influence.

## B.16 MOTORCYCLE CORNERING ADVICE (ROSPA)

👎 Not evaluated

In 2020, RoSPA produced a six-minute video[42] to highlight the skills necessary – and the principals needed – to safely negotiate bends. The video features a police advanced motorcyclist, who shares some of his experiences to help riders plan for what they can realistically expect to happen. The video looks at limit points, what they are and why they are important to help riders tackle left, right and a series of corners on a rural road. RoSPA made the video with support from the DfT which has been made available for highways and road safety partnerships to use on their website and to support local motorcycle initiatives. RoSPA also produced four short social media videos, looking specifically at limit points, right and left-hand corners and series of corners. RoSPA have also provided further videos, such as group riding tips from Kevin Bryan, a motorcycle trainer with more than 28 years' experience. [43]

## B.17 NATIONAL RIDER RISK AWARENESS COURSE (NDORS)

👎 Not evaluated

This course[44] clarifies the sources of risks to riders and identifies ways in which they can reduce their risk through behaviour change. The aim of the course is to reduce participants' high risk riding behaviour, which will ultimately prevent attendees from experiencing the likely negative consequences of their risky riding, such as road traffic collisions or the loss of their licence. The course is provided for recreational/leisure riders and commuters, as well courier and delivery riders whose riding behaviour has brought them to the attention of the police with a wide range of offences triggering referral. The course lasts for 3 hours and can be taken online or in-person. A project funded by the Road Safety Trust[45] is currently ongoing at Nottingham Trent University in collaboration with

[41] https://roadsafetygb.org.uk/news/group-riding-the-focus-of-new-scottish-campaign/
[42] https://roadsafetygb.org.uk/news/video-helps-riders-safely-negotiate-bends-on-rural-roads/
[43] https://www.youtube.com/playlist?list=PLvtI7AaoseIF3HbBir3XyiS1u8_ru96rY
[44] https://www.ukroed.org.uk/courses/
[45] https://www.roadsafetytrust.org.uk/small-grants-awarded/nottingham-trent-university2

UKROEd (the provider of NDORS courses), to assess whether riders and drivers have different mental models of on-road danger and how this impacts their ability to spot hazards on the road. Findings from this work are expected to be included within future revisions of the NDORS National Rider Risk Awareness Course.

### B.18 RAISE YOUR RIDE (AVON AND SOMERSET POLICE AND SOMERSET ROAD SAFETY)

👎 Not evaluated

This intervention[46] is run for motorcyclists by motorcyclists with the aim of raising awareness and demonstrating the value of advanced riding techniques. The session introduces attendees to the police system of motorcycle riding including cornering, reading the road, planning and hazard avoidance overtaking and filtering. There are two options available as part of the programme: A 1 day group workshop, which aims to encourage riders to take up further training with organisations such as IAM RoadSmart or RoSPA; and a half day of one-to-one training is offered to improve performance and increase their safety margins.

### B.19 SAFER RIDER (NORFOLK CONSTABULARY)

👎 Not evaluated

This course is a joint initiative between Norfolk Constabulary and Norfolk County Council targeted at experienced motorcycle riders, which aims to reduce motorcycle casualties. The scheme comprises a series of online downloads for participants to keep, alongside a two-and-a-half hour evening session and a five hour road session. Riders are introduced to the Police Roadcraft system. The workshop delivered provides individuals with professional advice and identifies individual rider strengths and weaknesses. During the road session, participants receive a demonstration ride by a police rider and have the opportunity to have their riding assessed with feedback provided.

### B.20 STREET SPIRIT CAMPAIGN (SAFER ESSEX ROADS PARTNERSHIP)

👎 Not evaluated

The programme aims to provide young people with the knowledge and skills they need to become a safe rider. Five online videos, each approximately 3 minutes long are provided, alongside a knowledge check quiz to complete. The videos cover the following topics:

- Getting on the road;
- Protective clothing;
- Skills and positioning;
- Maintenance; and
- The Highway Code

[46] https://somersetroadsafety.org/motorcyclists/raise-your-ride/

# APPENDIX C: MOTORCYCLE CASUALTY SEGMENTATION

## C.1 SEGMENT ONE: URBAN JUNCTION COLLISIONS WITH SMALL MOTORCYCLES (10,414 COLLISIONS)

<table>
<tr><td colspan="2">This segment is involved in urban collisions when riding motorcycles with engines under 125cc. These collisions occur near T junctions and involve two vehicles, with the other vehicle a car. The collisions occur on weekdays in the afternoon and early evening, at Give Way or uncontrolled junctions. They tend to occur in daylight.<br><br>These roads are not on the SRN but are A roads or unclassified single carriageways. They tend to have 20mph or 30mph speed limits. In terms of road conditions, they tend to occur on dry roads. They were travelling straight ahead (or manoeuvre was unknown), implying that the involved car was entering or exiting the junction.<br><br>In terms of contributory factors, there is a combination of skills issues (poor turn, sudden braking, loss of control, following too close); perception issues (failed to look and failed to judge); and non-compliance issues (speed).</td></tr>
<tr><td>Segment One A: Londoners</td><td>Involved in collisions fitting the above description, these young men tend to be aged between 16 and 34 years old.<br>There are two types of background for these segments: the younger cohort (aged 25 to 34 years old), live in a flat, and have a household income of £20-40k. They work in lower managerial, administrative, or professional roles. There is low car ownership and mileage amongst this group. Thirty percent of all are riding for work purposes and they tend to come from these two Types.<br><br>The other segment are young families with higher income, living in a terraced house. They also work in lower managerial, administrative, or professional roles.</td></tr>
<tr><td>Segment One B: Non-Londoners</td><td>This segment is involved in the same type of collision but live outside of London. They are younger than the Londoners: males, aged between 16 and 24 years old.<br>They live in semi-detached or terraced housing and have a household income of £20-40k. These are families with teenaged children. They do own one car but there is low mileage. Household members work in lower managerial, administrative, or professional or semi-routine roles.</td></tr>
</table>

| Segment One: Urban junction collisions with small motorcycles (10,414 collisions) | | |
|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved MC Casualty: Yes<br>Crash Involved Motorcycle: Motorbike Up to 125cc<br>Junction Detail: T junction<br>Crash Location Urban Rural: Urban<br>Crash Number of Vehicles: 2<br>Junction Control: Give Way or uncontrolled | |
| **Engine Size** | Up to 125cc | |
| **Junction Type** | T junctions | 36% |
| **No. of Vehicles** | Two | 88% |
| **Other Vehicle Type** | Of those involving two vehicles, other vehicle is a car | 87% |
| **On SRN** | 0.4% of T Junction collisions | |
| **Urban/Rural** | Predominantly urban (T junction collisions) | 89% |
| **Weekday** | On weekdays, slight peak on Fridays | |
| **Junction control** | Give Way or Uncontrolled | 86% |
| **Lighting conditions** | 68% in daylight and 30% at night with lights lit | |
| **Road Class** | 47% on A roads and 32% on unclassified roads | |
| **Road Surface Conditions** | 74% on dry roads and 23% on wet damp roads | |
| **Road Type** | Single carriageways | 84% |
| **Severity** | 0.2% Fatal, 21.4% Serious, 78.4% Slight | |
| **Speed Limit** | 28% in 20mph and 69% in 30mph | |
| **Time of Day** | Peaks between 3pm - 6pm and 6pm – 9pm | |
| **Contributory Factor Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved Motorcycle: Motorbike Up to 125cc<br>Vehicle Related Driver Casualty: Yes<br>Junction Detail: T junction<br>Crash Location Urban Rural: Urban<br>Crash Number of Vehicles: 2<br>Junction Control: Give Way or uncontrolled (8,064 vehicles)<br><br>Contributory factor analysis is pre-filtered to only include police attended collisions and ones where at least one contributory factor was assigned. These factors reflect the reporting officer's opinion at the time of reporting and may not be the result of extensive investigation.<br><br>Participants can receive up to six factors. | |
| Received any contributory factor (rider thought to contribute) | | 64% |
| 405 Failed to look properly | | 20% |
| 406 Failed to judge other person's path or speed | | 16% |
| 602 Careless, reckless or in a hurry | | 11% |
| 403 Poor turn or manoeuvre | | 9% |
| 605 Learner or inexperienced rider | | 7% |
| 306 Exceeding Speed Limit | | 6% |
| 103 Slippery road surface | | 5% |
| 307 Travelling too fast for conditions | | 4% |
| 308 Following too close | | 2.8% |
| 701 Stationary or parked vehicles | | 2.8% |
| 410 Loss of control | | 2.8% |
| 408 Sudden braking | | 2.7% |

| Segment One A: Urban junction collisions with small motorcycles - Londoners (5,179) | | | | |
|---|---|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Casualty Class: Driver<br>Casualty Type of Related Vehicles: Motorbike Up to 125cc<br>Junction Detail: T junction<br>Crash Location Urban Rural: Urban<br>Crash Number of Vehicles: 2<br>Junction Control: Give Way or uncontrolled<br>Casualty Home: London | | | |
| **Age** | 31% 16-24 years<br>40% 25-34 years | | | |
| **Sex** | 92% Male | | | |
| **Manoeuvre** | 42% Straight ahead (24% not known) | | | |
| **Journey Purpose** | 54% Unknown, 15% commuting, 1% 'other', and **30% for work** | | | |
| **Acorn Type** | **6S53** | **5P44** | **3H22** | **4N38** |
| **Acorn Name** | Diverse families & sharers in flats | Urban, aspiring flat dwellers | Younger families and sharers in city terraces | Younger families, multi-occupancy and rented households |
| **Number of casualties** | 949 | 821 | 606 | 584 |
| **Index (against population[47])** | 148 | 164 | 144 | 139 |
| **5-17 years** | ✓ | | ✓ | ✓ |
| **18-24 years** | | | | |
| **25-34 years** | ✓ | ✓ | | |
| **35-49 years** | ✓ | ✓ | ✓ | ✓ |
| **No Education** | ✓ | | | ✓ |
| **GCSEs** | ✓ | ✓ | ✓ | ✓ |
| **Household income** | £20,000-£40,000 | £20,000-£40,000 | £60,000-£80,000 | £60,000-£80,000 |
| **House Type** | Flat | Flat | Terraced | Terraced |
| **Own car/van/motorbike** | 18.8% | 20.3% | 37.7% | 37.1% |
| **Annual Mileage** | Low | Low | Low | Low |
| **Low car ownership** | ✓ | ✓ | 2 cars | ✓ |
| **NS Social Economic Classification** | Lower Managerial, Adminstrative and professional (34%) | Lower Managerial, Adminstrative and professional (33%) | Lower Managerial, Adminstrative and professional (35%) | Lower Managerial, Adminstrative and professional (32%) |

[47] Over 100 indicates an over-representation compared to the local population

| Segment One B: Urban junction collisions with small motorcycles – Non-Londoners (4,639) | | | | |
|---|---|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Casualty Class: Driver<br>Casualty Type of Related Vehicles: Motorbike Up to 125cc<br>Junction Detail: T junction<br>Crash Location Urban Rural: Urban<br>Crash Number of Vehicles: 2<br>Junction Control: Give Way or uncontrolled<br>Casualty Home: Not London | | | |
| **Age** | 49% 16-24 years<br>26% 25-34 years | | | |
| **Sex** | 91% Male | | | |
| **Manoeuvre** | 66% Straight ahead | | | |
| **Journey Purpose** | 54% Unknown, 17% commuting, 15% 'other', and 13% for work | | | |
| **Acorn Type** | **4M37** | **5R52** | **5Q48** | **6S55** |
| **Acorn Name** | Restricted residents socially renting | Socially renting families in terraces | Routine occupations, socially renting families in semis | Families in low-value terraced housing |
| **Number of casualties** | 295 | 294 | 286 | 240 |
| **Index (against population[48])** | 195 | 220 | 151 | 169 |
| **5-17 years** | ✓ | ✓ | ✓ | ✓ |
| **18-24 years** | | | | |
| **25-34 years** | | | | |
| **35-49 years** | ✓ | ✓ | ✓ | ✓ |
| **No Education** | ✓ | ✓ | ✓ | ✓ |
| **GCSEs** | ✓ | ✓ | ✓ | ✓ |
| **Household income** | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 |
| **House Type** | Semi-detached | Terraced | Semi-detached | Terraced |
| **Own car/ van/ motorbike** | 63.4% | 62.3% | 70.5% | 56.5% |
| **Annual Mileage** | Low | Low | Low | Low |
| **Low car ownership** | 1 car | 1 car | 1 car | 1 car |
| **NS Social Economic Classification** | Lower Managerial, Adminstrative & professional (22%)<br>Semi-routine (20%) | Semi-routine (32%) | Semi-routine (25%)<br>Lower Managerial, Adminstrative & professional (23%) | Semi-routine (35%) |

[48] Over 100 indicates an over-representation compared to the local population

## C.2 SEGMENT TWO: URBAN NON-JUNCTION COLLISIONS WITH SMALL MOTORCYCLES (7,014 COLLISIONS)

<table>
<tr><td colspan="2">This segment is involved in urban collisions when riding motorcycles with engines under 125cc. These collisions away from junctions and involve two or more vehicles, with the other vehicle a car. The collisions occur on weekdays in the afternoon and early evening. They tend to occur in daylight.<br><br>These roads are not on the SRN but are A roads or unclassified single carriageways. They tend to have 20mph or 30mph speed limits. In terms of road conditions, they tend to occur on dry roads. They were travelling straight ahead (or manoeuvre was unknown).<br><br>In terms of contributory factors, there is a combination of skills issues (poor turn, sudden braking, loss of control, following too close); perception issues (failed to look and failed to judge); and non-compliance issues (speed).</td></tr>
<tr><td>Segment Two A: Londoners</td><td>Involved in collisions fitting the above description, these young men tend to be aged between 16 and 34 years old. These demographic backgrounds are exactly the same as for Segment One A.<br><br>There are two types of background for these segments: the younger cohort (aged 25 to 34 years old), live in a flat, and have a household income of £20-40k. They work in lower managerial, administrative, or professional roles. There is low car ownership and mileage amongst this group. Twenty-seven percent of all are riding for work purposes and they tend to come from these two Types.<br><br>The other segment are young families with higher income, living in a terraced house. They also work in lower managerial, administrative, or professional roles.</td></tr>
<tr><td>Segment Two B: Non-Londoners</td><td>This segment is involved in the same type of collision but live outside of London. They are younger than the Londoners: males, aged between 16 and 24 years old.<br>They live in semi-detached or terraced housing and have a household income of £20-40k. These are families with teenaged children. They do own one car but there is low mileage. Household members work in lower managerial, administrative, or professional or semi-routine roles. These demographic backgrounds are exactly the same as for Segment One B.</td></tr>
</table>

| Segment Two: Urban non-junction collisions with small motorcycles (7,014 collisions) | | |
|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved MC Casualty: Yes<br>Crash Involved Motorcycle: Motorbike Up to 125cc<br>Junction Detail: No Junction<br>Crash Location Urban Rural: Urban<br>Crash Number of Vehicles: 2 or more | |
| **Engine Size** | Up to 125cc | |
| **Junction Type** | None | 24% |
| **No. of Vehicles** | Two or more | 84% |
| **Other Vehicle Type** | Of those involving other vehicles, other vehicle is a car | 85% |
| **On SRN** | 0.7% of non-junction collisions | |
| **Urban/Rural** | Predominantly urban | 75% |
| **Weekday** | On weekdays, slight peak on Fridays | |
| **Lighting conditions** | 69% in daylight and 27% at night with lights lit | |
| **Road Class** | 45% on A roads and 38% on unclassified roads | |
| **Road Surface Conditions** | 74% on dry roads and 23% on wet damp roads | |
| **Road Type** | Single carriageways | 74% |
| **Severity** | 0.5% Fatal, 22.1% Serious, 77.4% Slight | |
| **Speed Limit** | 25% in 20mph and 65% in 30mph | |
| **Time of Day** | Peaks between 3pm - 6pm and 6pm – 9pm | |
| **Contributory Factor Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved Motorcycle: Motorbike Up to 125cc<br>Vehicle Related Driver Casualty: Yes<br>Junction Detail: No junction<br>Crash Location Urban Rural: Urban<br>Crash Number of Vehicles: 2+ (4,879 vehicles)<br><br>Contributory factor analysis is pre-filtered to only include police attended collisions and ones where at least one contributory factor was assigned. These factors reflect the reporting officer's opinion at the time of reporting and may not be the result of extensive investigation.<br><br>Participants can receive up to six factors. | |
| Received any contributory factor (rider thought to contribute) | | 69% |
| 405 Failed to look properly | | 19% |
| 406 Failed to judge other person's path or speed | | 16% |
| 602 Careless, reckless or in a hurry | | 12% |
| 605 Learner or inexperienced rider | | 9% |
| 403 Poor turn or manoeuvre | | 8% |
| 103 Slippery Road Surface | | 5.84% |
| 410 Loss of control | | 5.82% |
| 308 Following too close | | 5.2% |
| 306 Exceeding Speed Limit | | 5.0% |
| 408 Sudden braking | | 3.9% |
| 307 Travelling too fast for conditions | | 3.8% |
| 409 Swerved | | 3% |

| Segment Two A: Urban junction collisions with small motorcycles - Londoners (3,155) | | | | |
|---|---|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Casualty Class: Driver<br>Casualty Type of Related Vehicles: Motorbike Up to 125cc<br>Junction Detail: No junction<br>Crash Location Urban Rural: Urban<br>Crash Number of Vehicles: 2+<br>Casualty Home: London | | | |
| **Age** | 30% 16-24 years<br>40% 25-34 years | | | |
| **Sex** | 91% Male | | | |
| **Manoeuvre** | 39% Straight ahead (32% not known) | | | |
| **Journey Purpose** | 56% Unknown, 16% commuting, and **27% for work** | | | |
| **Acorn Type** | **6S53** | **5P44** | **4N38** | **3H22** |
| **Acorn Name** | Diverse families & sharers in flats | Urban, aspiring flat dwellers | Younger families, multi-occupancy and rented households | Younger families and sharers in city terraces |
| **Number of casualties** | 553 | 477 | 399 | 323 |
| **Index (against population[49])** | 142 | 156 | 156 | 126 |
| **5-17 years** | ✓ | | ✓ | ✓ |
| **18-24 years** | | | | |
| **25-34 years** | ✓ | ✓ | | |
| **35-49 years** | ✓ | ✓ | ✓ | ✓ |
| **No Education** | ✓ | | ✓ | |
| **GCSEs** | ✓ | ✓ | ✓ | ✓ |
| **Household income** | £20,000-£40,000 | £20,000-£40,000 | £60,000-£80,000 | £60,000-£80,000 |
| **House Type** | Flat | Flat | Terraced | Terraced |
| **Own car/van/motorbike** | 18.8% | 20.3% | 37.1% | 37.7% |
| **Annual Mileage** | Low | Low | Low | Low |
| **Low car ownership** | ✓ | ✓ | ✓ | 2 cars |
| **NS Social Economic Classification** | Lower Managerial, Adminstrative and professional (34%) | Lower Managerial, Adminstrative and professional (33%) | Lower Managerial, Adminstrative and professional (32%) | Lower Managerial, Adminstrative and professional (35%) |

[49] Over 100 indicates an over-representation compared to the local population

| Segment Two B: Urban junction collisions with small motorcycles – Non-Londoners (3,480) | | | | |
|---|---|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Casualty Class: Driver<br>Casualty Type of Related Vehicles: Motorbike Up to 125cc<br>Junction Detail: No junction<br>Crash Location Urban Rural: Urban<br>Crash Number of Vehicles: 2+<br>Casualty Home: Not London | | | |
| **Age** | 47% 16-24 years<br>26% 25-34 years | | | |
| **Sex** | 91% Male | | | |
| **Manoeuvre** | 64% Straight ahead | | | |
| **Journey Purpose** | 51% Unknown, 16% commuting, 19% 'other', and 12% for work | | | |
| **Acorn Type** | **5R52** | **4M37** | **6S55** | **5Q48** |
| **Acorn Name** | Socially renting families in terraces | Restricted residents socially renting | Families in low-value terraced housing | Routine occupations, socially renting families in semis |
| **Number of casualties** | 220 | 219 | 196 | 182 |
| **Index (against population[50])** | 219 | 193 | 184 | 128 |
| **5-17 years** | ✓ | ✓ | ✓ | ✓ |
| **18-24 years** | | | | |
| **25-34 years** | | | | |
| **35-49 years** | ✓ | ✓ | ✓ | ✓ |
| **No Education** | ✓ | ✓ | ✓ | ✓ |
| **GCSEs** | ✓ | ✓ | ✓ | ✓ |
| **Household income** | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 |
| **House Type** | Terraced | Semi-detached | Terraced | Semi-detached |
| **Own car/ van/ motorbike** | 62.3% | 63.4% | 56.5% | 70.5% |
| **Annual Mileage** | Low | Low | Low | Low |
| **Low car ownership** | 1 car | 1 car | 1 car | 1 car |
| **NS Social Economic Classification** | Semi-routine (32%) | Lower Managerial, Adminstrative & professional (22%)<br>Semi-routine (20%) | Semi-routine (35%) | Semi-routine (25%)<br>Lower Managerial, Adminstrative & professional (23%) |

[50] Over 100 indicates an over-representation compared to the local population

## C.3 SEGMENT THREE: RURAL COLLISIONS WITH SMALL MOTORCYCLES (7,452 COLLISIONS)

<table>
<tr><td colspan="2">This segment is involved in rural collisions when riding motorcycles with engines under 125cc. These collisions away from junctions and involve two or more vehicles, with the other vehicle a car or a goods vehicle. The collisions occur on weekdays in the morning or afternoon rush hours. They tend to occur in daylight.<br><br>These roads are not on the SRN but are A roads, B roads or unclassified single carriageways. They tend to be in 30mph or 60mph speed limits. In terms of road conditions, they tend to occur on dry roads. They were travelling straight ahead (or were on bends)<br><br>In terms of contributory factors, there is a combination of skills and inexperienced issues (inexperienced rider, loss of control, slippery road surfaces, deposit on road, poor turn, sudden braking, following too close); perception issues (failed to look and failed to judge); and non-compliance issues (speed or impaired by alcohol).<br><br>Due to the higher speed roads, this segment has a higher severity ratio and are more likely to be involved in a fatal or serious collision.</td></tr>
<tr><td>Segment Three:</td><td>Involved in collisions fitting the above description, these young men tend to be aged between 16 and 34 years old.<br><br>The Acorn Types for this segment share common characteristics: they tend to be families with children in the 5-to-17-year age group.<br><br>Those in the families have no education or hold GCSEs. The household income is of £0-40k and most work in lower managerial, administrative, or professional, or semi-routine roles. The houses are semi-detached or detached and there is one car owned by the family. Mileage is low, however.</td></tr>
</table>

| Segment Three: Rural collisions with small motorcycles (7,452 collisions) | | |
|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved MC Casualty: Yes<br>Crash Involved Motorcycle: Motorbike Up to 125cc<br>Junction Detail: All<br>Crash Location Urban Rural: Rural<br>Crash Number of Vehicles: All | |
| **Engine Size** | Up to 125cc | |
| **Junction Type** | No junction (52%) and T junctions (23%) | |
| **No. of Vehicles** | Two vehicles (29% were single vehicle) | 64% |
| **Other Vehicle Type** | Not necessarily involving a car: 57% car, 13% goods vehicle | |
| **On SRN** | 4.9% of collisions | |
| **Weekday** | On weekdays, slight peak on Fridays | |
| **Lighting conditions** | 74% in daylight and 13% at night with lights lit | |
| **Road Class** | 48% on A roads, 31% on unclassified roads and 17% on B roads | |
| **Road Surface Conditions** | 70% on dry roads and 28% on wet damp roads | |
| **Road Type** | Single carriageways | 78% |
| **Severity** | 1.9% Fatal, 37.7% Serious, 60.5% Slight | |
| **Speed Limit** | 33% in 30mph, 17% in 40mph, 33% in 60mph | |
| **Time of Day** | Peaks between 6am and 9am and particularly 3pm and 6pm | |
| **Contributory Factor Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved Motorcycle: Motorbike Up to 125cc<br>Vehicle Related Driver Casualty: Yes<br>Junction Detail: All<br>Crash Location Urban Rural: Rural<br>Crash Number of Vehicles: All (6,257 vehicles)<br><br>Contributory factor analysis is pre-filtered to only include police attended collisions and ones where at least one contributory factor was assigned. These factors reflect the reporting officer's opinion at the time of reporting and may not be the result of extensive investigation.<br><br>Participants can receive up to six factors. | |
| Received any contributory factor (rider thought to contribute) | | 74% |
| 605 Learner or inexperienced rider | | 17% |
| 410 Loss of control | | 14.22% |
| 405 Failed to look properly | | 14.14% |
| 406 Failed to judge other person's path or speed | | 12% |
| 103 Slippery Road Surface | | 11% |
| 602 Careless, reckless or in a hurry | | 10% |
| 403 Poor turn or manoeuvre | | 9% |
| 307 Travelling too fast for conditions | | 6% |
| 102 Deposit on road (oil, mud, chippings) | | 5% |
| 308 Following too close | | 4% |
| 306 Exceeding Speed Limit | | 3.9% |
| 408 Sudden braking | | 3.9% |
| 501 Impaired by alcohol | | 3% |
| 409 Swerved | | 3% |

| Segment Three: Rural collisions with small motorcycles (7,237) | | | | |
|---|---|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Casualty Class: Driver<br>Casualty Type of Related Vehicles: Motorbike Up to 125cc<br>Junction Detail: All<br>Crash Location Urban Rural: Rural<br>Crash Number of Vehicles: All<br>Casualty Home: England | | | |
| **Age** | 52% 16-24 years<br>22% 25-34 years | | | |
| **Sex** | 89% Male | | | |
| **Manoeuvre** | 55% Straight ahead, 9% ahead on a right-hand bend, 8% ahead on a left-hand bend | | | |
| **Journey Purpose** | 47% Unknown, 21% commuting, and 22% other | | | |
| **Acorn Type** | **4M37** | **3J27** | **5Q49** | **5Q48** |
| **Acorn Name** | Restricted residents socially renting | Professional families and couples in suburban, owner-occupied areas | Socially renting single adult households | Routine occupations, socially renting families in semis |
| **Number of casualties** | 502 | 439 | 357 | 336 |
| **Index (against population[51])** | 231 | 174 | 257 | 137 |
| **5-17 years** | ✓ | ✓ | ✓ | ✓ |
| **18-24 years** | | | | |
| **25-34 years** | | | | |
| **35-49 years** | ✓ | ✓ | ✓ | ✓ |
| **No Education** | ✓ | | ✓ | ✓ |
| **GCSEs** | ✓ | ✓ | ✓ | ✓ |
| **Household income** | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 |
| **House Type** | Semi-detached | Detached | Semi-detached | Semi-detached |
| **Own car/van/motorbike** | 63.4% | 76.0% | 67.7% | 70.5% |
| **Annual Mileage** | Low | Low | Low | Low |
| **Low car ownership** | 1 car | 1 car | 1 car | 1 car |
| **NS Social Economic Classification** | Lower Managerial, Adminstrative & professional (22%)<br>Semi-routine (20%) | Lower Managerial, Adminstrative & professional (35%) | Semi-routine (25%)<br>Lower Managerial, Adminstrative & professional (23%) | Semi-routine (25%)<br>Lower Managerial, Adminstrative & professional (23%) |

[51] Over 100 indicates an over-representation compared to the local population

## C.4 SEGMENT FOUR: URBAN JUNCTION COLLISIONS WITH LARGE MOTORCYCLES (4,682 COLLISIONS)

<table>
<tr><td colspan="2">This segment is involved in urban collisions when riding motorcycles with engines over 125cc. These collisions at T junctions and involve vehicles, with the other vehicle a car. The collisions occur on weekdays in the afternoon. They tend to occur in daylight.<br><br>These roads are not on the SRN but are A roads or unclassified single carriageways. They tend to have 20mph or 30mph speed limits. In terms of road conditions, they tend to occur on dry roads. They were travelling straight ahead (or manoeuvre was unknown).<br><br>In terms of contributory factors, there is a combination of perception issues (failed to look and failed to judge); non-compliance issues (speed); and skills issues (poor turn, sudden braking, loss of control, following too close).</td></tr>
<tr><td>Segment Four A: Londoners</td><td>Involved in collisions fitting the above description, these young men tend to be aged between 25 and 44 years old. These demographic backgrounds are exactly the same as for Segment One A.<br><br>There are two types of background for these segments: the younger cohort (aged 25 to 34 years old), live in a flat, and have a household income of £20-40k. They work in lower managerial, administrative, or professional roles. There is low car ownership and mileage amongst this group. Unlike those who are involved in collisions on smaller bikes at urban junctions, they are more likely to be commuting than working.<br><br>The other segment are young families with higher income, living in a terraced house. They also work in lower managerial, administrative, or professional roles.</td></tr>
<tr><td>Segment Four B: Non-Londoners</td><td>This segment is involved in the same type of collision but live outside of London. This segment has a wider age range than the Londoners: males, aged between 16 to 54 years old.<br>They live in semi-detached and have a household income of £20-40k. These are families with teenaged children. They do own one car but there is low mileage. Household members work in lower managerial, administrative, or professional or semi-routine roles. These demographic backgrounds are 50% of the same Acorn Types as for Segment One B.</td></tr>
</table>

| Segment Four: Urban junction collisions with large motorcycles (4,682 collisions) | | |
|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved MC Casualty: Yes<br>Crash Involved Motorcycle: Motorbike Over 125cc<br>Junction Detail: T Junction<br>Crash Location Urban Rural: Urban<br>Crash Number of Vehicles: 2<br>Junction Control: Give Way or uncontrolled | |
| **Engine Size** | Over 125cc | |
| **Junction Type** | T Junction | 61% |
| **No. of Vehicles** | Two or more | 86% |
| **Other Vehicle Type** | Of those involving other vehicles, other vehicle is a car | 88% |
| **On SRN** | 0.45% of T junction urban collisions | |
| **Urban/Rural** | Predominantly urban | 70% |
| **Weekday** | On weekdays, slight peak on Fridays | |
| **Lighting conditions** | 77% in daylight and 21% at night with lights lit | |
| **Road Class** | 48% on A roads and 33% on unclassified roads | |
| **Road Surface Conditions** | 82% on dry roads and 18% on wet damp roads | |
| **Road Type** | Single carriageways | 87% |
| **Severity** | 1.4% Fatal, 34.8% Serious, 63.8% Slight | |
| **Speed Limit** | 16% in 20mph and 77% in 30mph | |
| **Time of Day** | Peaks between 3pm - 6pm | |
| **Contributory Factor Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved Motorcycle: Motorbike Up to 125cc<br>Vehicle Related Driver Casualty: Yes<br>Junction Detail: T junction<br>Crash Location Urban Rural: Urban<br>Crash Number of Vehicles: 2<br>Junction Control: Give Way (4,075 vehicles)<br><br>Contributory factor analysis is pre-filtered to only include police attended collisions and ones where at least one contributory factor was assigned. These factors reflect the reporting officer's opinion at the time of reporting and may not be the result of extensive investigation.<br><br>Participants can receive up to six factors. | |
| Received any contributory factor (rider thought to contribute) | | 61% |
| 405 Failed to look properly | | 18% |
| 406 Failed to judge other person's path or speed | | 16% |
| 602 Careless, reckless or in a hurry | | 12% |
| 306 Exceeding Speed Limit | | 10% |
| 403 Poor turn or manoeuvre | | 8% |
| 307 Travelling too fast for conditions | | 4% |
| 601 Aggressive driving | | 3.5% |
| 701 Stationary or parked vehicles | | 3.2% |
| 410 Loss of control | | 3.1% |
| 103 Slippery Road Surface | | 2.8% |
| 605 Learner or inexperienced rider | | 2.3% |
| 408 Sudden braking | | 2.2% |
| 308 Following too close | | 2.1% |

| Segment Four A: Urban junction collisions with large motorcycles - Londoners (1,847) | | | | |
|---|---|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Casualty Class: Driver<br>Casualty Type of Related Vehicles: Motorbike Over 125cc<br>Junction Detail: T junction<br>Crash Location Urban Rural: Urban<br>Crash Number of Vehicles: 2<br>Casualty Home: London | | | |
| **Age** | 38% 25-34 years<br>24% 35-44 years | | | |
| **Sex** | 96% Male | | | |
| **Manoeuvre** | 49% Straight ahead | | | |
| **Journey Purpose** | 59% Unknown, 27% commuting, and 14% for work | | | |
| **Acorn Type** | **6S53** | **5P44** | **3H22** | **4N38** |
| **Acorn Name** | Diverse families & sharers in flats | Urban, aspiring flat dwellers | Younger families and sharers in city terraces | Younger families, multi-occupancy and rented households |
| **Number of casualties** | 246 | 216 | 203 | 170 |
| **Index (against population[52])** | 103 | 121 | 135 | 113 |
| **5-17 years** | ✓ | | ✓ | ✓ |
| **18-24 years** | | | | |
| **25-34 years** | ✓ | ✓ | | |
| **35-49 years** | ✓ | ✓ | ✓ | ✓ |
| **No Education** | ✓ | | | ✓ |
| **GCSEs** | ✓ | ✓ | ✓ | ✓ |
| **Household income** | £20,000-£40,000 | £20,000-£40,000 | £60,000-£80,000 | £60,000-£80,000 |
| **House Type** | Flat | Flat | Terraced | Terraced |
| **Own car/van/motorbike** | 18.8% | 20.3% | 37.7% | 37.1% |
| **Annual Mileage** | Low | Low | Low | Low |
| **Low car ownership** | ✓ | ✓ | 2 cars | ✓ |
| **NS Social Economic Classification** | Lower Managerial, Adminstrative and professional (34%) | Lower Managerial, Adminstrative and professional (33%) | Lower Managerial, Adminstrative and professional (35%) | Lower Managerial, Adminstrative and professional (32%) |

[52] Over 100 indicates an over-representation compared to the local population

| Segment Four B: Urban junction collisions with large motorcycles – Non-Londoners (3,248) | | | | |
|---|---|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Casualty Class: Driver<br>Casualty Type of Related Vehicles: Motorbike Over 125cc<br>Junction Detail: T junction<br>Crash Location Urban Rural: Urban<br>Crash Number of Vehicles: 2<br>Casualty Home: Not London | | | |
| **Age** | 17% 16-24 years<br>27% 25-34 years<br>17% 35-44 years<br>18% 45-54 years | | | |
| **Sex** | 96% Male | | | |
| **Manoeuvre** | 63% Straight ahead | | | |
| **Journey Purpose** | 60% Unknown, 33% commuting, and 6% for work | | | |
| **Acorn Type** | **5Q48** | **4M37** | **3G20** | **4L35** |
| **Acorn Name** | Routine occupations, socially renting families in semis | Restricted residents socially renting | Mixed life stages in semi-detached homes | Settled communities, semi-detached properties |
| **Number of casualties** | 182 | 219 | 157 | 141 |
| **Index (against population[53])** | 128 | 193 | 157 | 114 |
| **5-17 years** | ✓ | ✓ | ✓ | ✓ |
| **18-24 years** | | | | |
| **25-34 years** | | | | |
| **35-49 years** | ✓ | ✓ | ✓ | ✓ |
| **No Education** | ✓ | ✓ | | ✓ |
| **GCSEs** | ✓ | ✓ | ✓ | ✓ |
| **Household income** | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 |
| **House Type** | Semi-detached | Semi-detached | Semi-detached | Semi-detached |
| **Own car/ van/ motorbike** | 70.5% | 63.4% | 65.9% | 75.0% |
| **Annual Mileage** | Low | Low | Low | Low |
| **Low car ownership** | 1 car | 1 car | 1 Car | 1 car |
| **NS Social Economic Classification** | Semi-routine (25%)<br>Lower Managerial, Adminstrative & professional (23%) | Lower Managerial, Adminstrative & professional (22%)<br>Semi-routine (20%) | Lower Managerial, Adminstrative & professional (30%) | Lower Managerial, Adminstrative & professional (28%)<br>Semi-routine (20%) |

[53] Over 100 indicates an over-representation compared to the local population

## C.5 SEGMENT FIVE: SINGLE-VEHICLE RURAL NON-JUNCTION COLLISIONS WITH LARGE MOTORCYCLES (2,576 COLLISIONS)

<table>
<tr><td colspan="2">This segment is involved in rural collisions when riding motorcycles with engines over 125cc. These collisions away from junctions and involve no other vehicles. The collisions occur on weekends (particularly on Sundays) in the afternoon. They tend to occur in daylight.<br><br>This segment has the highest severity ratio of any of the previous segments.<br><br>These roads are not on the SRN (but there is a greater proportion than any of the previous segments) but are A roads, B roads or unclassified single carriageways. They tend to have 60mph speed limits. In terms of road conditions, they tend to occur on dry roads. They were travelling straight ahead or were on bends.<br><br>In terms of contributory factors, there is a combination of control issues (loss of control, careless, reckless or in a hurry, poor turn or manoeuvre, deposit on road, slippery road); non-compliance issues (speed); and road environment (road layout, object in carriageway).</td></tr>
<tr><td>Segment Five</td><td>This segment are older men (aged between 25 and 64 years old). Their journey purpose is unknown, and given the over-representation on Sunday afternoons, this segment could be riding for leisure purposes.<br><br>There men live detached or semi-detached houses and have a household income of £20-40k. They work in lower managerial, administrative, or professional or semi-routine roles. They own one car but have relatively low mileage.</td></tr>
</table>

| Segment Five: Single-Vehicle rural non-junction collisions with large motorcycles (2,576 collisions) | | |
|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved MC Casualty: Yes<br>Crash Involved Motorcycle: Motorbike Over 125cc<br>Junction Detail: No Junction<br>Crash Location Urban Rural: Rural<br>Crash Number of Vehicles: 1 | |
| **Engine Size** | Over 125cc | |
| **Junction Type** | None | 29% |
| **No. of Vehicles** | 1 | 38% |
| **On SRN** | 13% of non-junction collisions (66% of SRN collisions on A roads) | |
| **Urban/Rural** | Predominantly rural | 60% |
| **Weekday** | At weekends, particularly on Sundays | |
| **Lighting conditions** | 83% in daylight, 11% night with no lights, 4% at night with lights lit | |
| **Road Class** | 46% on A roads, 25% on unclassified roads, 20% on B roads and 4% on motorways | |
| **Road Surface Conditions** | 79% on dry roads and 18% on wet damp roads | |
| **Road Type** | Single carriageways | 81% |
| **Severity** | 6% Fatal, 56% Serious, 38% Slight | |
| **Speed Limit** | 54% in 60mph | |
| **Time of Day** | Peaks between Noon – 3pm and 3pm - 6pm | |
| **Contributory Factor Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved Motorcycle: Motorbike Over 125cc<br>Vehicle Related Driver Casualty: Yes<br>Junction Detail: No junction<br>Crash Location Urban Rural: Rural<br>Crash Number of Vehicles: 1 (2,190 vehicles)<br><br>Contributory factor analysis is pre-filtered to only include police attended collisions and ones where at least one contributory factor was assigned. These factors reflect the reporting officer's opinion at the time of reporting and may not be the result of extensive investigation.<br><br>Participants can receive up to six factors. | |
| Received any contributory factor (rider thought to contribute) | | 99% |
| 410 Loss of control | | 42% |
| 602 Careless, reckless or in a hurry | | 13.2% |
| 403 Poor turn or manoeuvre | | 13.1% |
| 102 Deposit on road (oil, mud, chippings) | | 12% |
| 103 Slippery Road Surface | | 11% |
| 307 Travelling too fast for conditions | | 9.6% |
| 306 Exceeding Speed Limit | | 9.5% |
| 109 Animal or object in carriageway | | 8.9% |
| 108 Road layout (bend, hill, narrow carriageway) | | 7% |
| 101 Poor or defective road surface | | 6% |
| 605 Learner or inexperienced rider | | 5.4% |
| 408 Sudden braking | | 5.2% |

| Segment Five: Single-Vehicle rural non-junction collisions with large motorcycles (2,347) | | | | |
|---|---|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Casualty Class: Driver<br>Casualty Type of Related Vehicles: Motorbike Over 125cc<br>Junction Detail: No junction<br>Crash Location Urban Rural: Rural<br>Crash Number of Vehicles: 1<br>Casualty Home: England | | | |
| **Age** | 21% 25-34 years<br>16% 35-44 years<br>20% 45-54 years<br>20% 55-64 years | | | |
| **Sex** | 94% Male | | | |
| **Manoeuvre** | 48% Straight ahead, 22% ahead right-hand bend, 18% ahead left-hand bend, 4% overtaking offside | | | |
| **Journey Purpose** | 53% Unknown, 34% other, 10% commute | | | |
| **Acorn Type** | **3J27** | **5Q48** | **4L34** | **4M37** |
| **Acorn Name** | Professional families and couples in suburban, owner-occupied areas | Routine occupations, socially renting families in semis | Older owner-occupier households in semis | Restricted residents, socially renting |
| **Number of casualties** | 120 | 116 | 107 | 97 |
| **Index (against population[54])** | 146 | 143 | 158 | 138 |
| **25-34 years** | | | | |
| **35-49 years** | ✓ | ✓ | | ✓ |
| **50-64 years** | ✓ | ✓ | ✓ | ✓ |
| **Degree** | ✓ | | | |
| **GCSEs** | ✓ | ✓ | ✓ | ✓ |
| **Household income** | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 |
| **House Type** | Detached | Semi-detached | Semi-detached | Semi-detached |
| **Own car/van/motorbike** | 76% | 70.5% | 77.0% | 63.4% |
| **Annual Mileage** | Low | Low | Low | Low |
| **Low car ownership** | 1 car/2 cars | 1 car | 1 car | 1 car |
| **NS Social Economic Classification** | Lower Managerial, Adminstrative and professional (35%) | Semi-routine occupations (25%) | Lower Managerial, Adminstrative and professional (28%) | Lower Managerial, Adminstrative and professional (22%) |

[54] Over 100 indicates an over-representation compared to the local population

## C.6 SEGMENT SIX: RURAL NON-JUNCTION COLLISIONS WITH LARGE MOTORCYCLES (4,128 COLLISIONS)

<table>
<tr><td colspan="2">This segment is involved in rural collisions when riding motorcycles with engines over 125cc. These collisions away from junctions and involve two or more vehicles, with the other vehicle a car. The collisions occur on weekends, particularly Sundays, in the afternoon. They tend to occur in daylight.<br><br>This segment has the highest proportion of fatalities.<br><br>A fifth of these collisions occur on the SRN on A roads and motorways. Away from the SRN, they occur on A roads, unclassified roads, and B roads. They tend to be in 60mph speed limits. In terms of road conditions, they tend to occur on dry roads. They were travelling straight ahead, overtaking on the offside or travelling on a left-hand bend.<br><br>In terms of contributory factors, there is a combination of perception issues (failed to look and failed to judge); skills issues (poor turn, sudden braking, loss of control, following too close, swerved); and non-compliance issues (speed an aggressive riding).</td></tr>
<tr><td>Segment Six</td><td>Involved in collisions fitting the above description, three of the Acorn Types are the same as Segment Five.<br><br>This segment are older men (aged between 25 and 64 years old). Their journey purpose is unknown, and given the over-representation on Sunday afternoons, this segment could be riding for leisure purposes.<br><br>There men live detached or semi-detached houses and have a household income of £20-40k. They work in lower managerial, administrative, or professional or semi-routine roles. They own one car but have relatively low mileage.</td></tr>
</table>

| Segment Six: Rural non-junction collisions with large motorcycles with other vehicles (4,128 collisions) | | |
|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved MC Casualty: Yes<br>Crash Involved Motorcycle: Motorbike Over 125cc<br>Junction Detail: No Junction<br>Crash Location Urban Rural: Rural<br>Crash Number of Vehicles: 2 or more | |
| **Engine Size** | Over 125cc | |
| **Junction Type** | None | 47% |
| **No. of Vehicles** | Two or more | 62% |
| **Other Vehicle Type** | Of those involving other vehicles, other vehicle is a car | 79% |
| **On SRN** | 21% of non-junction collisions (62% on A roads and 34% on motorways) | |
| **Urban/Rural** | Slightly rural (non-junction with other vehicles) | 53% |
| **Weekday** | On weekends, particularly Sundays | |
| **Lighting conditions** | 63% in daylight, 6% at night with no lights and 4% at night with lights lit | |
| **Road Class** | 56% on A roads, 18% on unclassified roads, 15% on B roads, 7% on motorways | |
| **Road Surface Conditions** | 85% on dry roads and 14% on wet damp roads | |
| **Road Type** | Single carriageways | 73% |
| **Severity** | 9% Fatal, 47% Serious, 44% Slight | |
| **Speed Limit** | 44% in 60mph and 15% in 30mph | |
| **Time of Day** | Peaks between Noon and 3pm and 3pm - 6pm | |
| **Contributory Factor Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved Motorcycle: Motorbike Over 125cc<br>Vehicle Related Driver Casualty: Yes<br>Junction Detail: No junction<br>Crash Location Urban Rural: Rural<br>Crash Number of Vehicles: 2+ (3,971 vehicles)<br><br>Contributory factor analysis is pre-filtered to only include police attended collisions and ones where at least one contributory factor was assigned. These factors reflect the reporting officer's opinion at the time of reporting and may not be the result of extensive investigation.<br><br>Participants can receive up to six factors. | |
| Received any contributory factor (rider thought to contribute) | | 68% |
| 406 Failed to judge other person's path or speed | | 17% |
| 405 Failed to look properly | | 16% |
| 602 Careless, reckless or in a hurry | | 13.4% |
| 410 Loss of control | | 12.8% |
| 403 Poor turn or manoeuvre | | 11.8% |
| 306 Exceeding Speed Limit | | 8% |
| 308 Following too close | | 7% |
| 307 Travelling too fast for conditions | | 6% |
| 408 Sudden braking | | 5% |
| 108 Road layout (bend, hill, narrow carriageway) | | 3.12% |
| 601 Aggressive driving | | 3.07% |
| 605 Learner or inexperienced rider | | 2.85% |
| 409 Swerved | | 2.77% |

| Segment Six: Rural non-junction collisions with large motorcycles with other vehicles (4,048) | | | | |
|---|---|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Casualty Class: Driver<br>Casualty Type of Related Vehicles: Motorbike Over 125cc<br>Junction Detail: No junction<br>Crash Location Urban Rural: Rural<br>Crash Number of Vehicles: 2+<br>Casualty Home: England | | | |
| **Age** | 20% 25-34 years<br>17% 35-44 years<br>22% 45-54 years<br>21% 55-64 years | | | |
| **Sex** | 95% Male | | | |
| **Manoeuvre** | 48% Straight ahead, 18% overtaking offside, 14% left-head bend | | | |
| **Journey Purpose** | 53% Unknown, 29% other, 13% commuting | | | |
| **Acorn Type** | **3J27** | **4M37** | **3G20** | **5Q48** |
| **Acorn Name** | Professional families & couples in suburban, owner-occupied areas | Restricted residents, socially renting | Mixed lifestages in semi-detached homes | Routine occupations socially renting families in semis |
| **Casualties** | 235 | 212 | 182 | 169 |
| **Index (against population[55])** | 166 | 175 | 142 | 121 |
| **18-24 years** | | | | |
| **25-34 years** | | | | |
| **35-49 years** | ✓ | ✓ | ✓ | ✓ |
| **50-64 years** | ✓ | ✓ | ✓ | ✓ |
| **No Education** | | ✓ | | ✓ |
| **GCSEs** | ✓ | ✓ | ✓ | ✓ |
| **Household income** | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 |
| **House Type** | Detached | Semi-detached | Semi-detached | Semi-detached |
| **Own car /van /motorbike** | 76.0% | 63.4% | 65.9% | 70.5% |
| **Annual Mileage** | Low | Low | Low | Low |
| **Low car ownership** | 1 Car | 1 car | 1 car | 1 car |
| **NS Social Economic Classification** | Lower Managerial, Adminstrative and professional (35%) | Lower Managerial, Adminstrative and professional (22%) Semi-routine occupations (20%) | Lower Managerial, Adminstrative and professional (30%) | Semi-routine occupations (25%) Lower Managerial, Adminstrative and professional (23%) |

[55] Over 100 indicates an over-representation compared to the local population

## C.7 SEGMENT SEVEN: RURAL JUNCTION COLLISIONS WITH LARGE MOTORCYCLES INVOLVING OTHER VEHICLES (3,411 COLLISIONS)

<table>
<tr><td colspan="2">This segment is involved in rural collisions when riding motorcycles with engines over 125cc. These collisions at T junctions or roundabouts and involve two or more vehicles, with the other vehicle a car. The collisions across the week, with peaks in the afternoons. They tend to occur in daylight.<br><br>These roads are not on the SRN but are A road single carriageways. They tend to have 60mph or 30mph speed limits. In terms of road conditions, they tend to occur on dry roads. They were travelling straight ahead or overtaking on the offside, which suggests the other vehicle was entering or exiting the junction.<br><br>In terms of contributory factors, there is a combination of perception issues (failed to look and failed to judge); skills issues (poor turn, careless, reckless, sudden braking, loss of control, following too close); and non-compliance issues (speed).</td></tr>
<tr><td>Segment Seven</td><td>Involved in collisions fitting the above description, three of the Acorn Types are the same as Segment Six.<br><br>This segment are older men (aged between 45 and 64 years old). Their journey purpose is unknown, this segment could be riding for leisure purposes. They are involved in collisions across the week.<br><br>There men live terraced, detached or semi-detached houses and have a household income of £20-40k. They work in lower managerial, administrative, or professional or semi-routine roles. They own one car but have relatively low mileage.</td></tr>
</table>

| **Segment Seven: Rural junction (T junctions and roundabouts) collisions with large motorcycles (3,411 collisions)** | | |
|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved MC Casualty: Yes<br>Crash Involved Motorcycle: Motorbike Over 125cc<br>Junction Detail: T Junction or Roundabout<br>Crash Location Urban Rural: Rural<br>Crash Number of Vehicles: 2 or more | |
| **Engine Size** | Over 125cc | |
| **Junction Type** | T junctions or roundabouts | 38% |
| **No. of Vehicles** | Two or more | 84% |
| **Other Vehicle Type** | Of those involving other vehicles, other vehicle is a car | 85% |
| **On SRN** | 11% of these junction collisions | |
| **Urban/Rural** | Predominantly urban | 68% |
| **Weekday** | Throughout the week with small peaks on Thursday and Sunday | |
| **Lighting conditions** | 88% in daylight | |
| **Road Class** | 64% on A roads | |
| **Road Surface Conditions** | 87% on dry roads | |
| **Road Type** | Single carriageways | 69% |
| **Severity** | 4% Fatal, 44% Serious, 52% Slight | |
| **Speed Limit** | 36% in 60mph and 27% in 30mph | |
| **Time of Day** | Peaks between noon - 3pm and 3pm – 6pm | |
| **Contributory Factor Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Crash Involved Motorcycle: Motorbike Over 125cc<br>Vehicle Related Driver Casualty: Yes<br>Junction Detail: T Junction or Roundabout<br>Crash Location Urban Rural: Rural<br>Crash Number of Vehicles: 2+ (3,060 vehicles)<br><br>Contributory factor analysis is pre-filtered to only include police attended collisions and ones where at least one contributory factor was assigned. These factors reflect the reporting officer's opinion at the time of reporting and may not be the result of extensive investigation.<br><br>Participants can receive up to six factors. | |
| Received any contributory factor (rider thought to contribute) | | 53% |
| 406 Failed to judge other person's path or speed | | 17.5% |
| 405 Failed to look properly | | 17.4% |
| 602 Careless, reckless or in a hurry | | 9.1% |
| 403 Poor turn or manoeuvre | | 9.0% |
| 306 Exceeding Speed Limit | | 6% |
| 410 Loss of control | | 4.2% |
| 308 Following too close | | 3.9% |
| 307 Travelling too fast for conditions | | 3.1% |
| 408 Sudden braking | | 2.8% |
| 706 Dazzling sun | | 1.9% |
| 108 Road layout (bend, hill, narrow carriageway) | | 1.8% |
| 605 Learner or inexperienced rider | | 3.9% |

| Segment Seven: Rural junction (T junctions and roundabouts) collisions with large motorcycles (3,267) | | | | |
|---|---|---|---|---|
| **Filters:** | Crash Location: England<br>Crash Date: 2018-2022<br>Casualty Class: Driver<br>Casualty Type of Related Vehicles: Motorbike Over 125cc<br>Junction Detail: T junction and roundabouts<br>Crash Location Urban Rural: Rural<br>Crash Number of Vehicles: 2+<br>Casualty Home: England | | | |
| **Age** | 23% 45-54 years<br>22% 55-64 years | | | |
| **Sex** | 95% Male | | | |
| **Manoeuvre** | 57% Straight ahead, 12% overtaking on the offside | | | |
| **Journey Purpose** | 55% Unknown, 25% other, and 15% commuting | | | |
| **Acorn Type** | **3J27** | **4M37** | **3G20** | **4O41** |
| **Acorn Name** | Professional families & couples in suburban, owner-occupied areas | Restricted residents, socially renting | Mixed lifestages in semi-detached homes | Living on modest means in terraces |
| **Number of casualties** | 193 | 155 | 143 | 142 |
| **Index (against population[56])** | 169 | 158 | 138 | 192 |
| **35-49 years** | ✓ | ✓ | ✓ | ✓ |
| **50-64 years** | ✓ | ✓ | ✓ | ✓ |
| **No Education** | | ✓ | | ✓ |
| **GCSEs** | ✓ | ✓ | ✓ | ✓ |
| **Household income** | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 | £20,000-£40,000 |
| **House Type** | Detached | Semi-detached | Semi-detached | Terraced |
| **Own car/van/motorbike** | 76.0% | 63.4% | 65.9% | 72.9% |
| **Annual Mileage** | Low | Low | Low | Low |
| **Low car ownership** | 1 Car | 1 car | 1 car | 1 car |
| **NS Social Economic Classification** | Lower Managerial, Adminstrative and professional (35%) | Lower Managerial, Adminstrative and professional (22%) Semi-routine occupations (20%) | Lower Managerial, Adminstrative and professional (30%) | Lower Managerial, Adminstrative and professional (28%) Semi-routine occupations (20%) |

[56] Over 100 indicates an over-representation compared to the local population

# APPENDIX D: DETAILED LOGIC MAPS

## D.1 MOTORCYCLE SAFETY INTERVENTION DESIGN FOR SEGMENT 1 APPLYING COM-B/BEHAVIOUR CHANGE WHEEL

**What is the aim of the intervention?**

Overarching aim: To reduce collisions and injuries involving lower-powered motorcycles in urban, junction settings by improving riders' self-awareness, hazard perception and anticipation of other road users' behaviours.

Specific objectives:

- *Enhancing hazard perception skills:* Educate riders on the importance of heightened awareness while riding in urban areas, particularly in recognising and reacting to potential hazards that are common around junctions.
- *Predict other drivers' behaviours:* Raise awareness among riders of the cognitive and perceptual limitations that cause car drivers to fail to identify or accurately assess interactions with motorcyclists.
- *Improving defensive riding skills:* Provide targeted training to improve motorcyclists' handling and control of motorcycles (<125cc), focusing on road positioning and anticipation of hazards.
- *Safe work-related riding practices*: Provide guidance for safe work-related riding practices (including commuting) and empower riders to know their rights and good practice in relation to safety-related behaviours such as PPE, taking breaks and managing time.

**Who is the target audience**

Young men aged between 16 and 34 years, who ride motorcycles with engines under 125cc for work and/or commuting. This group has typical household incomes ranges from £20,000 to £40,000 and holds lower managerial, administrative, or professional roles or is engaged in semi-routine occupations.

**What do they need to do differently to achieve the desired change?**

Riders need to:

- Enhance their situational awareness and hazard perception skills to better recognise and react to potential hazards common in urban areas.
- Improve their defensive motorcycle skills, focusing on safe road positioning and anticipation.
- Develop and adhere to strategies that counteract time pressure when riding for work or commuting.
- Understand the perspective and limitations of other road users in order to predict their behaviour and plan for perceptual failures.

**When do they need to do this behaviour?**

The desired behaviours should be consistently practiced but specifically when riding for work and when commuting.

**Where do they need to be to do it?**

When riding on all roads, with particular emphasis on urban roads around junctions, where the risk of collisions is highest.

**How often do they need to perform the behaviour?**

Every time they ride.

**With whom do they need to perform the behaviour with?**

On their own and when travelling with other riders.

**What needs to change (applying COM-B)?**

There is a need to influence behaviour across all COM-B (i.e. Capability, Opportunity and Motivation) components:

*Physical capability* – Defensive rider skills such as road positioning and speed choice

*Psychological capability* – Increase knowledge and understanding about the risks associated with riding in urban areas and the perceptual skills needed for safe riding. Increase understanding of other drivers' limitations and behaviours around motorcycles.

*Physical opportunity* – Create cues that encourage and remind riders to practice safe riding behaviours, particularly when riding for work or commuting.

Social opportunity – Develop an environment that supports and promotes safe riding practices as the norm when riding for, or to and from, work.

*Reflective motivation* – Foster beliefs in the benefits of safe riding practices for personal safety and the well-being of others in urban settings.

*Automatic motivation* – Encourage the development of safe riding habits that become automatic responses in urban situations around junctions.

**What intervention functions should be employed?**

*Education* – Use co-creation style engagement to encourage problem solving and increase knowledge about the specific risks of riding in urban settings around junctions, emphasising and the importance of hazard perception and anticipating others' actions.

*Persuasion* – Use motivational messages to encourage a shift in attitudes towards defensive riding even when under time pressure.

*Training* – Provide skill-based training focusing on defensive riding such as anticipation of other road users' behaviour around junctions and safe road positioning. Self-reflection with trained facilitators could be effective.

*Modelling* – Providing an example of people to aspire to or imitate with regard to safe riding behaviours.

*Enablement* – Facilitate access to resources or tools that support the adoption of safe riding practices, such as advanced riding courses or safety gear.

**What BCTs should be employed**

- *Goal Setting (Behaviour)*: Encourage riders to set personal safety goals for each ride (e.g. practicing defensive riding skills such as predicting other drivers' behaviours).
- *Action planning*: Work with riders to develop strategies to manage their time when riding for work.
- *Instruction on how to perform a behaviour*: Provide hazard perception training using this to raise awareness of limitations.
- *Self-Monitoring*: Prompt riders to reflect on their perceptual and cognitive limitations and identify areas for managing these when riding under time pressure.
- *Feedback on Behaviour:* Provide feedback on riders' performance via trained instructors or through apps that monitor riding habits.
- *Problem Solving:* Help riders to identify potential barriers to safe riding (e.g. time pressure, poor hazard perception skill) and develop strategies to overcome them.
- *Anticipated regret*: Get riders to imagine how they would feel if they were involved in a collision because they were in a rush versus the actual loss of time per journey if riding cautiously.
- *Social Support:* Encourage companies employing the target audience to promote and support safe and defensive riding practices. Identify this behaviour as desirable among this community.

**What is the logic model for this intervention?**

*Inputs* – Providing targeted safe riding training sessions, social media campaigns, and commercial engagement activities will…

*Immediate impacts* – Result in the delivery of assets and programmes that improve riders' situational awareness, decision-making, and adherence to defensive riding practices which will…

*Short term impacts* – Lead to increased awareness and understanding of the risks associated with riding in urban settings near junctions, fostering the development of anticipatory skills necessary for safe riding in this environment. This will contribute to a measurable increase in the adoption of defensive riding behaviours, such as improved hazard perception, road positioning, and understanding of other drivers' limitations and behaviours. The intervention will also provide supportive strategies to manage riding under time pressure, which will…

*Behavioural impacts* – Result in greater care taken when riding around junctions in urban settings as evidenced by better road positioning and anticipation of other road users' behaviours. Riders should also show better management of their behaviour when under time pressure (e.g. more appropriate speed choice) and make better use of safety gear. Work with companies should promote a culture of safety within the community who ride for work which will ultimately…

*Health Outcomes* – Lead to a reduction in the number of collisions and fatalities involving motorcycles in urban settings around junctions, improving safety for all users. This outcome will not only benefit the direct participants of the intervention but also contribute to the overall safety of those involved in collisions with riders, and the well-being of the broader community by reducing the social and economic costs associated with motorcycle collisions.

**What would need to be measured, before and after the intervention was delivered, to establish whether it is successful?**

*Recipients' Knowledge of Safe Riding Practices:* Assess the level of understanding among the target audience regarding the benefits of situational awareness, hazard perception, and the utilisation of defensive riding skills to enhance safety.

*Behaviour Related to Safe Riding:* Monitor and record changes in actual riding behaviours such as road positioning and application of defensive riding behaviours in urban settings.

*Attitudes Toward Safe Riding:* Evaluate hazard perception skill and attitudes towards the importance of safe riding practices, particularly when under time pressure.

*Commitment to Safe Riding:* Assess the degree of commitment among riders to adhere to safe riding practices consistently, including the willingness to put safety ahead of work pressures.

*Intentions Towards Safe Riding:* Measure any changes in riders' intentions to practice safe riding behaviours, particularly in scenarios that previously might have encouraged risky behaviours around junctions (e.g. not slowing down, running amber lights).

*Plans for Safe Riding:* Evaluate the development and implementation of specific plans or strategies by riders to maintain safe riding behaviours when under time pressure, such as knowing how to manage and speak-up about unrealistic work-related pressures.

*Perceived Behavioural Control:* Assess riders' confidence in their ability to maintain safe riding practices, even in the face of challenges such as time pressure.

*Social Norm (Others' Views) on Safe Riding:* Measure changes in the social norms within the riding for work motorcycle community regarding safe riding practices, including the extent to which safe riding is promoted, supported, and practiced within peer groups and wider community networks.

## D.2 MOTORCYCLE SAFETY INTERVENTION DESIGN FOR SEGMENT 5 & 6 APPLYING COM-B/BEHAVIOUR CHANGE WHEEL

**What is the aim of the intervention?**

Overarching aim: To reduce collisions and fatalities involving other vehicles and large motorcycles in rural, non-junction settings by improving riders' situational awareness, decision-making, and adherence to safe riding practices.

Specific objectives:

- *Enhancing Situational Awareness:* Educate riders on the importance of heightened awareness while riding in rural areas, including in anticipating and reacting to other drivers' behaviours.
- *Improving Defensive Riding Skills:* Provide targeted training to improve motorcyclists' handling and control of large motorcycles (>125cc), focusing on manoeuvres such as overtaking and navigating bends safely.
- *Promoting Compliance with Speed Limits:* Encourage adherence to speed limits through awareness campaigns and potentially through technological interventions, given the tendency for these collisions to occur in areas with 60mph speed limits.

- *Addressing Attitudinal and Behavioural Factors:* Target perception issues, skills issues, and non-compliance issues through behavioural change strategies. This includes addressing the failure to look properly, judge other vehicles' speeds and paths, poor manoeuvring, loss of control, and the propensity for speeding and aggressive riding.
- *Encouraging Safe Riding Cultures:* Foster a community culture that values safety and responsible riding, particularly among the demographic of older men aged between 25 and 64, who may be riding for leisure purposes.
- *Predict other drivers' behaviours:* Raise awareness among riders of the cognitive and perceptual limitations that cause car drivers to fail to identify or accurately assess interactions with motorcyclists

**Who is the target audience**

Older men aged between 25 and 64 years, who ride motorcycles with engines over 125cc primarily for leisure, especially on weekends and Sunday afternoons. This group often resides in detached or semi-detached houses with household incomes ranging from £20,000 to £40,000 and holds lower managerial, administrative, or professional roles or is engaged in semi-routine occupations.

**What do they need to do differently to achieve the desired change?**

Riders need to:

- Enhance their situational awareness to better recognise and react to potential hazards common in rural areas.
- Improve their defensive motorcycle skills, focusing on safe overtaking and navigating bends.
- Adhere to speed limits, recognising the increased risk of collisions at higher speeds.
- Shift attitudes towards valuing safety over speed and establish ways to enjoy riding without risk-related thrill-seeking behaviours.
- Develop and adhere to strategies that counteract risky peer influences, support each other and promote a culture of safety.
- Understand the perspective and limitations of other road users in order to predict their behaviour and plan for perceptual failures.

**When do they need to do this behaviour?**

The desired behaviours should be consistently practiced during all motorcycle rides.

**Where do they need to be to do it?**

When riding on all roads, with particular emphasis on rural roads at or away from junctions, where the risk of fatal collisions is highest.

**How often do they need to perform the behaviour?**

Every time they ride.

**With whom do they need to perform the behaviour with?**

On their own and when travelling with other riders.

**What needs to change (applying COM-B)?**

There is a need to influence behaviour across all COM-B (i.e. Capability, Opportunity and Motivation) components:

*Physical capability – Defensive rider skills, e.g. road positioning and speed choice*

*Psychological capability* – Increase knowledge and understanding about the risks associated with riding large motorcycles in rural settings and the skills needed for safe riding. Increase understanding of other drivers' limitations and behaviours around motorcycles.

*Physical opportunity* – Create cues that encourage and remind riders to practice safe riding behaviours, particularly in rural settings.

Social opportunity – Build a social environment where peers support and promote safe riding as the norm within this motorcycle riding community.

*Reflective motivation* – Foster beliefs in the benefits of safe riding practices for personal safety and the well-being of others.

*Automatic motivation* – Encourage the development of safe riding habits that become automatic responses in relevant situations.

**What intervention functions should be employed?**

*Education* – Use co-creation style engagement to encourage problem solving and increase knowledge about the specific risks of riding in rural non-junction settings and the importance of situational awareness and interaction with other vehicles.

*Persuasion* – Use motivational messages to encourage a shift in attitudes towards safe, defensive riding, speed management and compliance with speed limits.

*Training* – Provide skill-based training focusing on defensive riding such as anticipation of other road users' behaviour, safe overtaking, and navigating bends.

*Modelling* – Providing an example of people to aspire to or imitate with regard to safe riding behaviours, in particular how to develop cues for when to start thinking defensively (e.g. when in rural settings).

*Enablement* – Facilitate access to resources or tools that support the adoption of safe riding practices, such as advanced riding courses or safety gear.

**What BCTs should be employed**

- *Goal Setting (Behaviour)*: Encourage riders to set personal safety goals for each ride (e.g. adhering to speed limits, practicing defensive riding skills such as predicting other drivers' behaviours).
- *Self-Monitoring*: Prompt riders to reflect on their riding behaviours and identify areas for improvement.
- *Feedback on Behaviour:* Provide feedback on riders' performance via trained instructors or through apps that monitor riding habits.
- *Social Support:* Encourage rider groups or clubs to promote and support safe and defensive riding practices. Identify this behaviour as desirable among this community.
- *Problem Solving:* Help riders to identify potential barriers to safe riding (e.g. peer pressure, overconfidence) and develop strategies to overcome them.

**What is the logic model for this intervention**

*Inputs* – Providing targeted safe riding training sessions, co-creation workshops, social media campaigns, and community engagement activities will…

*Immediate impacts* – Result in the delivery of assets and programmes that improve riders' situational awareness, decision-making, and adherence to defensive riding practices which will…

*Short term impacts* – Lead to increased awareness and understanding of the risks associated with riding large motorcycles in rural settings, fostering the development of skills necessary for safe riding. This will contribute to a measurable increase in the adoption of defensive riding behaviours, such as improved situational awareness, speed management, and understanding of other drivers' limitations and behaviours. The intervention will also bolster resilience against peer pressure to engage in risky riding behaviours which will…

*Behavioural impacts* – Result in enhanced riding behaviours, including more consistent use of safety gear, increased compliance with speed limits, improved motorcycle handling skills, and a heightened sense of responsibility among riders towards their own safety and that of others on the road. These changes will promote a culture of safety within the motorcycle riding community which will ultimately…

*Health Outcomes* – Lead to a reduction in the number of collisions and fatalities involving large motorcycles in rural, junction and non-junction settings, making rural roads safer for all users. This outcome will not only benefit the direct participants of the intervention but also contribute to the overall safety and well-being of the broader community by reducing the social and economic costs associated with motorcycle collisions.

**What would need to be measured, before and after the intervention was delivered, to establish whether it is successful?**

*Recipients' Knowledge of Safe Riding Practices:* Assess the level of understanding among the target audience regarding the benefits of situational awareness, adherence to speed limits, and the utilisation of defensive riding skills to enhance safety.

*Behaviour Related to Safe Riding:* Monitor and record changes in actual riding behaviours, such as adherence to speed limits, use of safety gear, and application of defensive riding behaviours (e.g. lane positioning and speed choice) in rural settings.

*Attitudes Toward Safe Riding:* Evaluate shifts in attitudes towards the importance of safe riding practices, including the perception of risk associated with aggressive or unsafe riding behaviours.

*Commitment to Safe Riding:* Assess the degree of commitment among riders to adhere to safe riding practices consistently, including the willingness to change long-standing riding habits.

*Intentions Towards Safe Riding:* Measure any changes in riders' intentions to practice safe riding behaviours, particularly in scenarios that previously might have encouraged risky behaviour.

*Plans for Safe Riding:* Evaluate the development and implementation of specific plans or strategies by riders to maintain safe riding behaviours in rural settings, such as participating in continuous training, planning routes or adapting behaviour in high-risk rural riding scenarios.

*Perceived Behavioural Control:* Assess riders' confidence in their ability to maintain safe riding practices, even in the face of challenges such as peer pressure or adverse road conditions.

*Social Norm (Others' Views) on Safe Riding:* Measure changes in the social norms within the motorcycle riding community regarding safe riding practices, including the extent to which safe riding is promoted, supported, and practiced within peer groups and wider community networks.

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