Safety in numbers: an investigation into reductions in road traffic collisions across North East Scotland, 2011-2020.

HOOD, C.

2024

SAFETY IN NUMBERS:

An investigation into reductions in road traffic collisions across North East Scotland, 2011-2020

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Acknowledgements

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February 2024

Executive Summary

Background to the Research

During the ten-year period 2011-2020 recorded road collisions and casualties in North East Scotland saw significant reductions. In the six vulnerable road user categories, i.e., children; motorcyclists; young drivers; older drivers; pedal cyclists; and pedestrians, the recorded decreases ranged from 59% to 84%. While the statistical performance for the final year of the review period, 2020, was doubtless affected by COVID-19 related issues, the years leading to 2020 had already seen sustained periods of significant year-on-year reductions. The Safe System approach is leading Scotland forward in road safety and road casualty reduction during the decades ahead, however, to pursue further successes there is a strong argument that we need to fully understand how these reductions were achieved.

In a North East Scotland context, there is no confirmed explanation as to why the reductions have been achieved. Clearly fewer collisions are the primary reason for fewer casualties, however, we cannot with any confidence provide a definitive explanation about why the reductions have occurred. In an area of work which is sometimes quite literally life and death related, such uncertainty is unacceptable.

Many of the reductions seen locally have also been replicated across Scotland, and yet, even nationally there is limited understanding about the confirmed causal influences, with seemingly no other research having been commissioned to review this issue. While the proposed research focuses on North East Scotland, it will likely also have significant national relevance and therefore the ability to inform broader road safety policy in Scotland under the Safe System umbrella.

Purpose of the research

The aim of the research is to investigate the potential causes of the reduction in road collisions and casualties across North East Scotland between 2011 and 2020.

There are four objectives associated with this research, as follows:

- **Objective 1**: to analyse existing data, policy, and background information held by relevant public bodies in North East Scotland in relation to road safety campaigns for the period 2011-2020.
- **Objective 2**: to identify existing systems of collision and casualty reporting in North East Scotland and the corresponding data for the period 2011-2020.
- **Objective 3**: to identify relevant preventative vehicular and non-vehicular measures in relation to road casualties and collisions.
- **Objective 4**: to investigate both professional and public perceptions of road safety in North East Scotland.

Key findings & recommendations

- No single factor can be identified as the sole cause of casualty reduction. Both preventative vehicular and non-vehicular measures have the potential to contribute to casualty reduction.
- A combination of road safety interventions across the 4Es are required to both achieve and sustain casualty reduction measures, complemented by appropriate evaluation.
- It is recommended that utilising KSI data to understand the role of gender in RTCs could offer a further avenue for behaviour change and educational initiatives **(Recommendation 1).**
- It is recommended that young drivers remain an area of focus, particularly in relation to their ability to adapt to changing road conditions and/or environment and through enhancement of anticipation skills **(Recommendation 2).**
- It is recommended that the "fitness to drive" approach for older road users continues to be a focus for road safety management in North East Scotland **(Recommendation 3).**
- It is recommended that local authorities consider whether enhancements to road markings and signage at areas of known risk could offer potential casualty reductions **(Recommendation 4).**
- It is recommended that improvements in data sharing practices should be considered to enable more rapid understanding of emerging trends at local and regional level **(Recommendation 5).**
- It is recommended that that there is consistent recording and reporting of data around road casualties in Scotland, to ensure that accurate and high-quality data is available to practitioners **(Recommendation 6).**
- It is recommended that a mechanism of recording damage only collisions is considered to assist local authorities in identifying common factors and/or areas of risk across their networks **(Recommendation 7).**

1. Background & Introduction

1.1. Casualty Reduction in North East Scotland

During the ten-year period 2011-2020 recorded road collisions and casualties in North East Scotland saw significant reductions. In the six vulnerable road user categories, i.e., children; motorcyclists; young drivers; older drivers; pedal cyclists; and pedestrians, the recorded decreases ranged from 59% to 84%. While the statistical performance for the final year of the review period, 2020, was doubtless affected by COVID-19 related issues, the years leading to 2020 had already seen sustained periods of significant year-on-year reductions. The Safe System approach is leading Scotland forward in road safety and road casualty reduction during the decades ahead, however, to pursue further successes there is a strong argument that we need to fully understand how these reductions were achieved.

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- **Objective 4**: to investigate both professional and public perceptions of road safety in North East Scotland.

1.3. Road Safety Framework

One of the twelve Strategic Actions identified in the **Road Safety Framework** (RSF) to address current and emerging road safety challenges is: *'Knowledge and Data Analysis: we will ensure our actions are*

evidence-led to support the delivery of the Safe System.' In essence, this means that future road safety approaches and interventions should be based upon evidence from a range of sources, one of which will be historical road collisions and casualty data, but it is suggested that this should also be supplemented by appropriate qualitative data.

It is intended that this project could potentially assist in future road safety approaches, in support of the interim 2030 targets, by assimilating existing quantitative data with new qualitative data, placing the human being at the centre of the research, and thereby informing the safe system approach. Specifically, in contributing to the goal of seeking to eradicate fatal and serious injuries by contributing to knowledge and understanding of road safety approaches in Scotland. It is also anticipated that the scope of the work, in encompassing a variety of road user groups in addition to professionals, will provide a more comprehensive review and therefore offer an important contribution to road safety research in Scotland.

1.4.   Limitations of the Research

It is important to note the potential limitations of this research, specifically the size and geographic location of the survey sample. In common with all qualitative research, caution should be exercised in relation to the generalisability of the research findings to other settings.

All information is correct at the time of publication (February 2024). Any errors that remain are the author's sole responsibility.

2. Methodology

2.1. Overview

The methods adopted for this research were as follows:

- Desk- based research (**Objectives 1, 2, 3**)
- Questionnaire surveys (**Objective 4**)
- Interviews (**Objective 4**)

The approaches together are intended to provide as holistic an account as possible of the potential causes of the reduction in road collisions and casualties across North East Scotland between 2011 and 2020. Desk-based research methods were employed in fulfilment of **Objective 1, Objective 2,** and **Objective 3.** As part of **Objective 1**, a literature review was undertaken comprising of: (i) relevant policy materials; and (ii) academic literature relevant to the research area.

2.1.1. KSI Statistics

Data requests were sent to each of Aberdeen City Council, Aberdeenshire Council, and Moray Council to obtain KSI information for the period 2011-2020. Each local authority provided the required data, and it was intended to bring together the three data sets to provide an overview of the data for the region. However, when analysis was attempted of this data, it was determined that the data sets contained several omissions and repetitions that potentially compromised the integrity of the intended analysis. Furthermore, due to differences in reporting formats, it was also not possible to integrate the three data sets.

As a result, it was instead agreed with RSNES to utilise data published in the relevant *Reported Road Casualties Scotland* publications. This information is set out further below.

2.1.2. Road Safety Interventions – Case Studies

To provide practical examples of successful road safety interventions, representatives from Aberdeen City Council, Aberdeenshire Council, and Moray Council were asked to identify examples of good practice at strategic locations.

Once the information was received from the local authorities, it was initially planned to conduct site visits to these locations. However, on reviewing the potential safety implications for the research team taking photographs at the designated locations, a desk-based analysis was conducted utilising Google Maps and the written and graphical information provided by the local authorities.

2.2. Questionnaires

In fulfilment of **Objective 4**, two separate web-based questionnaire surveys were used to gather original research data for the project. Consistent with accepted approaches within social research, in

each instance data was coded and analysed using an open coding process, followed by a thematic analysis (see further Bryman 2016).

2.2.1. Members of the Public

A web-based survey hosted on the JISC Online Survey platform was distributed to members of the public through publicity via social media[1]. Further publicity of the survey was achieved through inclusion of the survey link on an internal workplace noticeboard, facilitated by one of the initial research participants.

The survey was accessible online for one calendar month between 16th May 2023 and 16th June 2023. In total, 35 responses were received of which 100% were appropriate for inclusion in the research. It is noted that the survey sample only contains respondents residing in the Aberdeen City and Aberdeenshire local authority areas. However, given the mix of urban and rural settings offered in these areas, that this sample can offer appropriate insight.

2.2.2. Professionals

A web-based survey hosted on the JISC Online Survey platform was circulated directly to members of the *Road Safety North East Scotland Lead Officers' Group* via email. The survey was available for one calendar month between 9th May 2023 and 9th June 2023. In total, 8 responses were received of which 100% were appropriate for inclusion in the research. Respondents to the survey were drawn from organisations representing local authorities, the RTP, Police Scotland and national organisations.

2.3. Interviews

In pursuit of **Objective 4,** and to allow for more in-depth discussion of themes covered within the questionnaires, the opportunity was given to respondents to the professional's questionnaire to participate in a semi-structured interview. Interviews with 4 participants were conducted in late June 2023, utilising an in-person or Microsoft Teams format. All interviews were recorded and transcribed for data analysis purposes. Transcription was achieved via Microsoft Teams for the online interviews, and via *Otter.ai* for in-person interviews. Transcripts were checked for accuracy by the researcher prior to data analysis. As above in Section 2.3, interview data was coded and analysed using an open coding process, followed by a thematic analysis (see further Bryman 2016).

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[1] Aberdeenshire Council, Nestrans, and Robert Gordon University assisted with the promotion of the survey via social media.

3. Policy Context – Statistics & Policy Environment

The purpose of this Section 3 is to set out relevant statistics and policy approaches that have informed the approach to road safety in North East Scotland between 2011 and 2020. It begins with establishing KSI data for the three local authority areas, before considering policy at a national, regional, and local level.

3.1. KSI Data

The purpose of this section is to set out relevant KSI statistics for the region and Sections 3.1.1. to 3.1.3. provide further information and context on the respective statistics for each local authority area[2]. For context, it should be noted that comprehensive information about personal injury road statistics in Scotland reported to Police Scotland via STATS19 returns are available annually via the *Reported Road Casualties Scotland* reports.

3.1.1. Aberdeen City
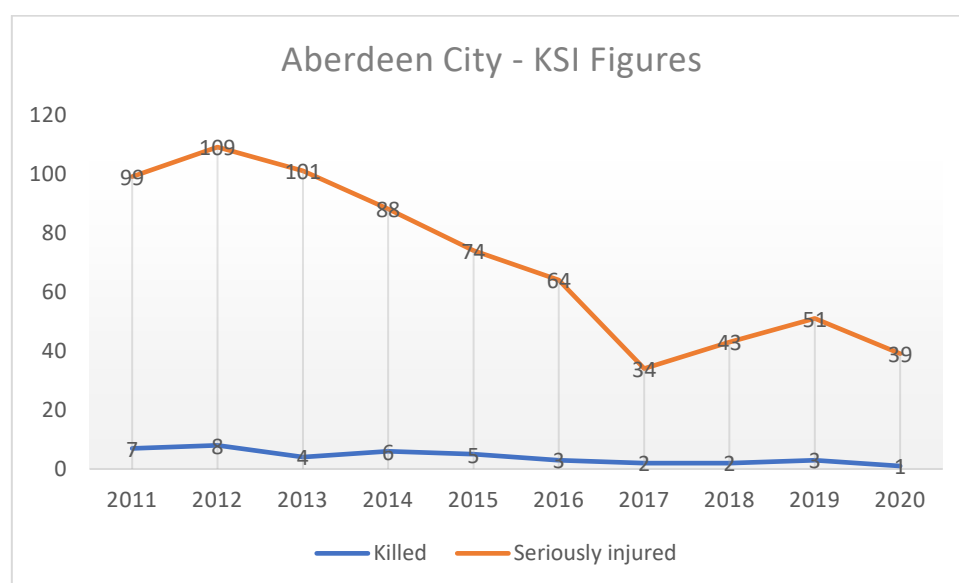
Local Authority	Year	Killed	Seriously Injured
Aberdeen City	**2011**	7	99
	2012	8	109
	2013	4	101
	2014	6	88
	2015	5	74
	2016	3	64
	2017	2	34

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[2] All data available for inspection via https://statistics.gov.scot/data/road-safety

	2018	2	43
	2019	3	51
	2020	1	39

3.1.2. Aberdeenshire
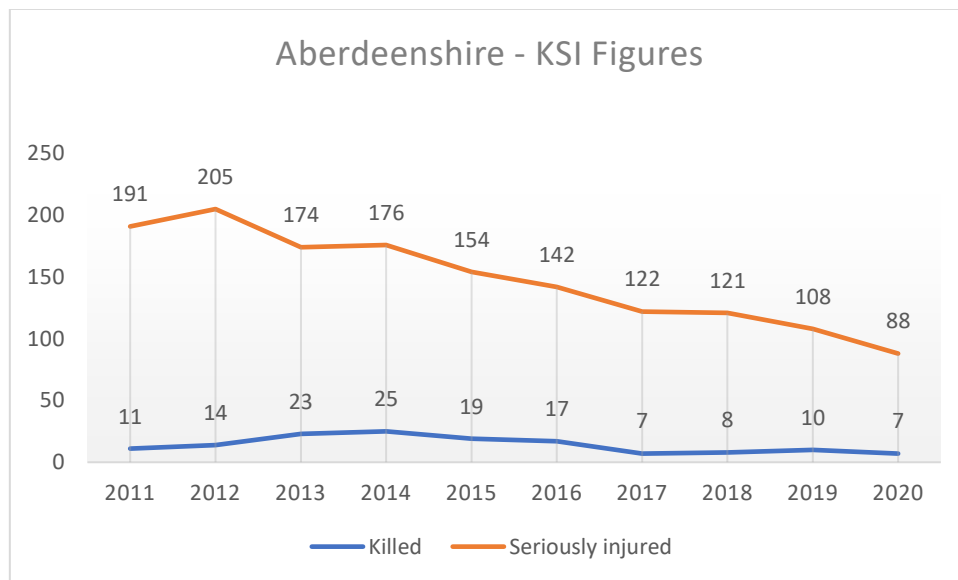
Local Authority	Year	Killed	Seriously injured
Aberdeenshire	**2011**	11	191
	2012	14	205
	2013	23	174
	2014	25	176
	2015	19	154
	2016	17	142
	2017	7	122
	2018	8	121
	2019	10	108
	2020	7	88

3.1.3. Moray
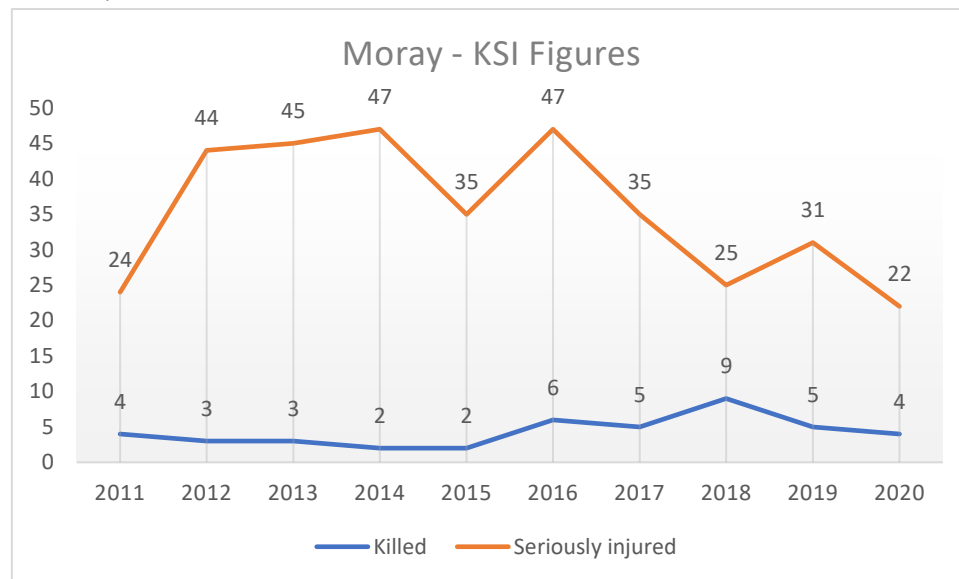
Local Authority	Year	Killed	Seriously injured
Moray	**2011**	4	24
	2012	3	44
	2013	3	45
	2014	2	47
	2015	2	35
	2016	6	47
	2017	5	35
	2018	9	25
	2019	5	31
	2020	4	22

3.2.   National Policy

Scotland's Road Safety Framework to 2020 was published on 15 June 2009. It was Scotland's first national road safety plan and established the following targets for casualty reduction:

- 40% reduction in fatalities.
- 44% reduction in serious injuries.
- 50% reduction in fatal child causalities.
- 65% reduction in children seriously injured based on a 2004-2008 average.
- 10% reduction in the slight casualty rate (Scottish Government 2009).

These targets are the basis of the other policies and strategies set out in this Section 3, with national regional, and local government working towards these objectives. The remainder of this Section 3.2 will focus on the policy monitoring and development undertaken by Transport Scotland in its role as

the national transport agency for Scotland, alongside the roles occupied by Road Safety Scotland and Police Scotland.

The document focuses on several key areas, each designed to contribute to making Scotland's roads safer. These include:

- **Working together for safer roads**
- **Being responsible on the roads**
  - Children and young people
  - Pedestrians
  - Motorcyclists
  - Pedal cyclists
- **Driving for life**
  - Pre-drivers
  - Young drivers (17-25)
  - People who drive for work
  - Older drivers
  - Drivers from abroad
- **Reducing risk**
  - Rural roads
  - Impairment
  - Seatbelts
  - Speed
  - Distraction
- **Designing for human error** (engineering)

Each of these thematic areas is then supported by a selection of short-, medium- and long-term commitments as appropriate.

From a national perspective it is also important to note the formation of Police Scotland in 2013 and the merging of forces across Scotland as a result. It has been observed that the transition from Grampian Police to Police Scotland saw removal of the provision of road safety education in schools (Moray Council 2018 p. 3). The role of road safety education is now fulfilled via Road Safety Scotland (Section 3.2.1).

3.2.1. Road Safety Scotland

Road safety Scotland, operating as part of Transport Scotland, *"works to promote awareness of road safety issues in Scotland"* alongside ensuring co-operation and communication between relevant stakeholders (Road Safety Scotland 2024). The education and awareness campaigns designed and promoted by Road Safety Scotland are therefore of relevant to the wider policy landscape in North East Scotland.

An example of a Road Safety Scotland campaign was the "*Don't risk it*" umbrella used to focus on several strategic areas including country road driving, cycling, drink and drug driving, and motorcyclists[3]. The campaign was based on the idea that road collision often result from risky driver behaviours, e.g., drink driving, road rage, distraction when children are in the car, or driving too fast for the conditions (Road Safety GB 2014).

A further example of Road Safety Scotland's work can be found in the motorcycle focussed 'Live Fast Die Old' initiative intended to promote safe riding across Scotland's rural road network. Operational since 2015, what has been described by motorcycle journalists as a 'cool road safety campaign' (McKenzie 2019) combing riding tips with 'breathtaking' routes across Scotland to engage motorcyclists with the underlying road safety message. Road Safety Scotland's Michael McDonnell stated that, 'We understand the thrill of biking and don't want to take that away, but we want to ensure that groups of motorcyclists are looking out for each other on the road and practicing safe manoeuvres together' (McKenzie 2019).

3.2.2.   Police Scotland – Road Safety & Crime Strategy 2015-18

The stated strategic intention of the 2015-18 Strategy is 'to influence road user behaviour and make Scotland's roads safer' (Police Scotland 2015 p. 4). This priority aligns with the relevant Scottish Government Road Safety Framework and is supported by two Strategic Priorities. These are: (i) to reduce road casualties; and (ii) to reduce road crime and positive impact on the use of roads by criminals (Police Scotland 2015 p.4). For the purposes of this research, only the first Strategic Priority is of significance.

Further defining the broad Strategic Intention and Strategic Priorities are five objectives that encompass themes such as, 'effective patrolling of the roads', 'improve road user behaviour', and 30 'tackle anti-social use of the roads' (Police Scotland 2015 p. 4). It is noted that all these objectives are in turn informed by the 'Three E's' approach of enforcement, education, and engineering (Police Scotland 2015 p. 7).

3.3.   Regional Policy

For Aberdeen City and Aberdeenshire, the Nestrans regional strategy relevant for the period 2011-2020 is the Regional Transport Strategy (RTS) 2008, and the Regional Transport Strategy Refresh 2013. These documents are also supported by the Regional Transport Strategy Delivery plan 2010-2021. For Moray Council, the Hitrans Regional Transport Strategy 2008, and associated 2018 refresh is relevant, along with the supporting Hitrans Delivery Plan 2008. In both regional strategies, casualty reduction is noted as a key feature of improving road safety.

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[3] The Don't Risk It website is now no longer operational.

3.3.1. Nestrans Regional Transport Strategy

The Nestrans 2008 RTS states that *"improving road safety is a key objective of this strategy"* (Nestrans 2008 p. 66), and this is embedded at a strategic level throughout the document, considering the safety concerns associated with each transportation mode. Specifically, it is stated that, *"improving the safety and security of travel is an important part of this strategy. Nestrans will support measure that promote safety and security for all uses of the transport network, including public transport"* (Nestrans 2008 p. 79). This will be achieved through engineering, education, enforcement, and encouragement measures (Nestrans 2008 p.79), in partnership with local authorities and emergency services.

It is noted that many of the serious accidents in the North East of Scotland occur on the trunk and primary road networks, with speed being a significant contributor (Nestrans 2008 p.31). As a result, *"reducing the number and severity of road accidents needs to continue to be a priority at both a national and north east level and the contribution to improving road safety should be a major consideration in determining investment in road improvement schemes"* (Nestrans 2008 p.31).

3.3.2. Hitrans Regional Transport Strategy

The Hitrans 2008 RTS focusses on the promotion of safety, as part of its overall objectives, alongside the improvement of safety and security of travel (Hitrans 2008). It is noted that this is in keeping with the goals of the Transport (Scotland) Act 2005, and the requirement to "promote public safety, including road safety and the safety of users of public transport" and translates into a high-level objective of "improve safety of journeys".

The 2018 refresh document notes that, *"over the life of the present RTS there has been a marked improvement in road safety across the region. There has been a near 60% reduction in the number of people killed or serious injured on the region's roads between 2007 and 2014"* (Hitrans 2018 para 2.9.7.4). The refresh document also refers to the importance of not only safeguarding improvements in road safety, but also *"tackling the barriers caused by real and perceived safety issues"* (Hitrans 2018 para 3.3.3.5).

3.4. Local Policy

Under the Road Traffic Act 1988, local authorities have a statutory duty to prepare and carry out a programme of measures designed to promote road safety. Within this remit, local authorities in Scotland each produce a road safety plan. These are discussed below in respect of each local authority located in North East Scotland.

3.4.1. North East Scotland Casualty Reduction Strategy (2017)

Road Safety North East Scotland (RSNES) also play an important role in the promotion of road safety and identification of appropriate strategy in the North East of Scotland, with the production of an

associated Casualty Reduction Strategy (RSNES 2017). RSNES consists of several organisations[4], working together to reduce casualty levels in Aberdeen, Aberdeenshire, and Moray. Additionally, RSNES maintains a positive social media presence, promoting awareness of road safety and the specific needs of vulnerable road users.

The RSNES Casualty Reduction Strategy (2017) identifies three priority areas – Speed, Age, and Vulnerable Road Users – that acts as a focus for RSNES' activities.

3.4.2.   Joint Road Safety Plan (2011-2015)

A joint road safety plan was prepared by Aberdeen City Council, Aberdeenshire Council, and Moray Council for the period 2011-2015. This was on the basis that there were *"commonalities between the areas in terms of the nature of accidents, and the close partnerships that have been built taking forward other joint road safety campaigns"* (Aberdeenshire Council 2011 p.1). The strategy was intended to complement policy at national and regional levels, with the overarching theme of road safety being everyone's responsibility. The strategy also aligns with the national government 2020 casualty reduction targets.

The strategy has the overarching vision of *"to improve road safety within Aberdeen City, Aberdeenshire, and Moray in order to significantly reduce the levels of people being killed or seriously injured, and the associated pain and suffering"* (Aberdeenshire Council 2011 p.4). This vision is then underpinned by a serious of connected objectives, as follows:

1. Continue to work with partners to deliver a strong road safety message in Aberdeen City, Aberdeenshire, and Moray.
2. Be intelligence-led.
3. Facilitate and promote engagement with local communities to promote the road safety message.
4. Maximize the use of innovative technologies which contribute to enhanced road safety in Aberdeen City, Aberdeenshire, and Moray
5. Seek to lead by example on road safety practices and draw upon examples of best practice from elsewhere.
6. Use the media to disseminate the road safety message to the people of Aberdeen City, Aberdeenshire, and Moray (Aberdeenshire Council 2011 p.4).

It is then intended that these objectives are achieved via the "Four E's" of education, engineering, enforcement, and encouragement (Aberdeenshire Council 2011 p. 4). The strategy identifies the following groups as key stakeholders in this process:

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[4] Aberdeen City Council, Aberdeenshire Council, Moray Council, Nestrans, North Safety Camera Unit, NHS Grampian, Police Scotland, Road Safety Scotland, Scottish Fire and Rescue Service and Transport Scotland
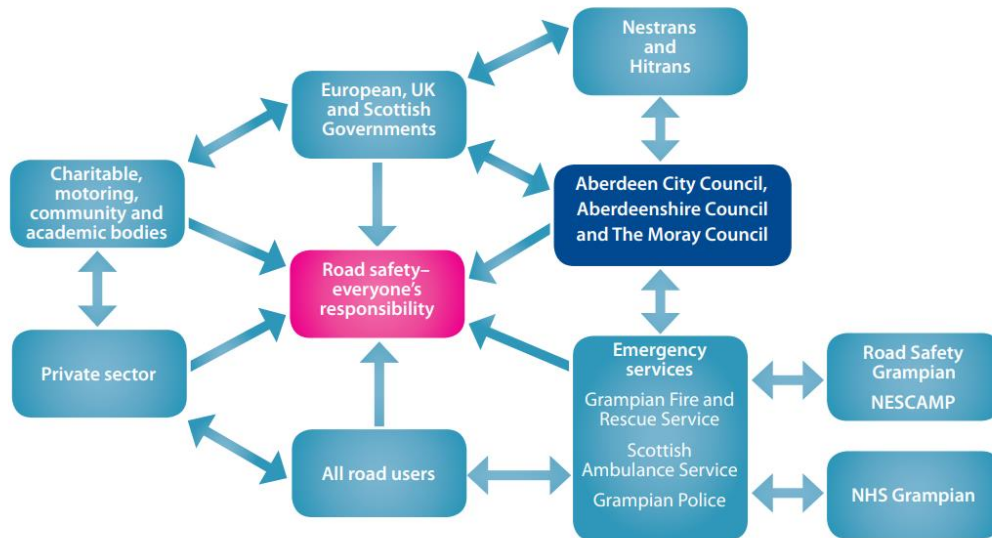
Figure 1: Road safety key stakeholders (Aberdeenshire Council 2011 p.5)

The strategy also identifies the following groups as vulnerable, and therefore as distinct focus areas with defined objectives:

- Children
- Older people
- Pedestrians
- Cyclists
- Motorcyclists
- Young drivers
- People with disabilities (Aberdeenshire Council 2011)

Alcohol and drugs, driving for work, and agricultural vehicles are considered under the category of "other road users" (Aberdeenshire Council 2011 p.20)

3.4.3. Aberdeen City Council (2019-2022)

Aberdeen City Council prepared an updated Road Safety Plan in 2019. The plan notes that, "*While ongoing developments in vehicle technology may bring this ambition a step closer, **we are not proposing a "vision zero" policy at this time** and are instead focused on maintaining the declining trend in Aberdeen's road injury rates, which would be a significant step in the right direction*" (Aberdeen City Council 2019 p.4, emphasis added). Instead, the plan adopts the vision from the North East Scotland Casualty Reduction Strategy, and *"a future where no one is killed on North East roads and the injury rate is much reduced"* (Aberdeen City Council 2019 p.5).

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The plan will be progressed via the "5 E's" of **engineering** (providing safer roads infrastructure); **education** (in schools); **enforcement** (via policing and legislation); **encouragement** (via promoting safer driver and pedestrian behaviour); **evaluation** of findings; and **enforcement** by City Wardens and Police Scotland (Aberdeen City Council 2019 p.9).

The revised plan has a focus on vulnerable road users that are perceived to be at greater risk. These are identified as:

- Pedestrians (older pedestrians and children)
- Children under the age of 16
- Cyclists
- Young drivers
- Motorcyclists
- Older road users (Aberdeen City Council 2019 p.14)

3.4.4. Aberdeenshire Council (2021-2030)

Aberdeenshire Council did not produce an updated Road Safety Plan until 2021, aligning this new strategy with Nestrans *Regional Transport Strategy 2040* and Transport Scotland's *Road Safety Framework to 2030*. As this document falls outside the remit of this research, it will not be considered in-depth. However, the document provides some relevant statistical information which helps provide context for this report and is set out below.

- Since 2015, 78% of driver fatalities are male and 75% of all fatalities are male.
- Since 2015, 60% of all motorcycle collisions are serious or fatal.
- Based on the difference between the 2004-2008 average and the 2016-2020 average, 824 casualties reduced to 319 (Aberdeenshire Council 2021 p. 5).

3.4.5. Moray Council (2018-2022)

Following on from the joint plan produced in 2011, Moray Council's next Road Safety Plan was produced in 2018. It is noted that since the production of the last report, several new challenges have arisen in the field of road safety for Moray, including increased budgetary constraints (Moray Council 2018 p.2).

The plan identifies the following priority areas to 2022:

- Speed & motorcyclists
- Age (pre-drivers, young drivers (age 17-25) and older drivers)
- Vulnerable road users (cyclists & pedestrians) (Moray Council 2018 p. 10)

It is established that these priority areas will be addressed through *"an appropriate combination of educational methods, engineering measures, enforcement, and encouragement"* (Moray Council 2018 p.10) and commits to a further review of the plan in 2021/22 (Moray Council 2018 p. 25).

4. Existing Research

There exists a wealth of literature examining the contribution of human and non-human factors to RTCs. The causes of collisions are identified as being complex and dependent on driver characteristics, alongside factors such as driver fatigue, and risk-taking behaviours (Rolison et al 2018; Smith 2016). However, it is not only the role of the individual that needs to be considered. In a comprehensive study of fatalities in Germany, the role of road safety policies, innovations in car engineering, post-crash care, traffic related measures, alcohol/drugs policy, and seat belt usage enforcement were all identified as significant contributory factors to fatality reductions (Ernstberger et al 2015).

Other external factors can also be relevant. There is a question of the role that socio-economic status plays, particularly in relation to children where those from disadvantaged backgrounds are an increased risk of being killed or seriously injured in a road collision (O'Toole and Christie 2018; Christie 2018). For example, reviewing data from the period 2007 to 2015 it can be demonstrated that the economic recession contributed to a reduction to fatalities on the UK roads due to decreases in HGV traffic, reductions in young male drivers, and reductions in speeding and drinking driving offences (Lloyd, Wallbank, and Broughton 2015). The COVID-19 pandemic also contributed to a 14% reduction in road deaths in the UK (Christie 2021), which are likely reflective of the reduction in journeys made due to lockdown restrictions.

The purpose of this section is to provide an overview of key topics within this field of research, and to provide a general understanding of the complexity of this area, in terms of contributory factors to RTCs.

4.1. Behaviour

It is well established in academic literature that aspects of human behaviour are relevant factors in relation to RTCs. These errors and violations are primarily identified through research utilising Driver Behaviour Questionnaires (DBQs) to classify problem behaviours (Smith 2016; Amos, Davids, & Fosdick 2015; de Winter & Doudou 2010). These behaviours can be grouped together as: (i) speeding; (ii) errors; (iii) lapses of attention; and (iv) aggressive driving.

It is established that speeding increases the risk of RTC and the severity of the crash too (Aarts and van Schagen 2006). Furthermore, driver behaviour in general, driver fatigue, and risk taking are all predictors of involvement in RTCs (Smith 2016). It has been observed that increasing levels of driver aggression are associated with an increased crash risk (Wickens et al 2016). Furthermore, that speeding is the most common form of aggressive driving, which is replicated in the high number of speeding-related crashes in road fatalities (Kockelman and Ma 2018).

The relationship between human beings and technology is also relevant, with in car distractions such as mobile phones playing an important role in risk taking behaviours. Mobile phone usage while driving has been established as dangerous, due to the distraction it creates for the driver (Sullman et al 2021;

Rolison et al 2018). Route familiarity is also potentially problematic, due to the potential for "mind wandering" (Intini, Colonna, and Ryeng 2019; Young et al 2018; Yanko and Spalek 2014; Yanko and Spalek 2013). It is also important to consider the context in which these errors occur, with research suggesting that the social influence of a passenger decreases the number of incidences of these problem behaviours when compared with drivers who are alone (Rosenbloom and Perlman 2016).

In addition to these areas, the overarching theme of risk perception and risk-taking attitudes is also relevant to understanding a variety of human behaviours in relation to driving (Cordellieri et al 2016; Noland 2013; Musselwhite 2006). This also includes the specific behaviours associated with mobile phone use and the concurrent need for interventions that target attitudinal change to increase risk perception around this behaviour (Sullman et al 2021). Musselwhite (2006) identifies four different groups of risk-takers: (i) those who take risks unintentionally (the largest group); (ii) reactive risk takers who take risks when reacting to stress or in a hurry; and (iii) a calculated risk-taking group who take risks when it feels safe to do so; and (iv) a continuous risk-taking group who take risks for their own sake. In addition to thinking about these types of risk takers, the role of gender and risk taking may also be significant. Corellieri et al (2016) determined that while there is not a difference between judgment of risk between genders, females exhibit greater concern about the consequences of the risk, i.e., of being involved in an accident, than males.

4.2. Drink & Drug Driving

Driving while under the influence of alcohol or drugs presents a "significant risk factor" for RTCs (WHO n.d), leading to injury and fatalities on the roads (Love et al 2024; Keatley, O'Donnell, and Joyce 2020). Similarly, drug driving is an equally significant factor in increasing the risk of RTCs (Hasan et al 2022). It is acknowledged that a range of social, legal, and psychosocial factors influence both drink and drug driving (Hasa et al 2023).

It has been identified that drug drivers are mainly male and under 35 years of age (Hasan et al 2022). However, it was identified that fatal road crashes in those over 35 were linked with use of depressants and opioids (Hasan et al 2022). Social influences have been identified as critical in drug driving, with peer influence identified as an important social factor that can induce or inhibit drug driving (Hasan et al 2022). For drink drivers, the literature is consistent in identifying young adult males, driving at night on dry roads, on rural routes (Owen et al 2019). There is also a second category of road users at risk of drink driving that Owen et al describe as "older; living in communities characterized by low income levels; single households; low education levels and work status; poor health status; high alcohol consumption; high acceptance of antisocial behaviour; and lack of trust in the police" (2019 p. 458).

Also relevant for the Scottish context is the reduction in permitted blood alcohol concentrations from 80mg/100ml of blood to 50mg/100ml of blood[5]. Research has determined that lowering the limit has not facilitated a decrease in RTCs, and when considered in isolation has not improved RTC outcomes

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[5] Road Traffic Act 1988 (Prescribed Limit) (Scotland) Regulations 2014

in Scotland (Francesconi and James 2021; Cooper, Gehrsitz, and McIntyre 2020; Lewsey et al 2019; Haghpanahan 2018). This lack of impact has been attributed to the unavailability of cheaper transportation modes, and "weak" law enforcement (Francesconi and James 2021). However, it has been proposed that a reported decrease in RTCs after the introduction of minimum alcohol pricing in Scotland in 2018[6] requires further investigation to fully understand the long-term impacts (Vandoros and Kawachi 2021).

4.3.   Infrastructure Design

Road infrastructure is identified as playing a critical role in the development of safer roads, and a corresponding reduction in RTCs (European Commission n.d(a)). Indeed, safe infrastructure is integral to the Safe System approach and has been identified as being supportive of appropriate road safety behaviours (speed, road positioning) and in providing a "forgiving road environment" in the event of a crash (The World Bank 2022 p.2). However, the type of road infrastructure is also significant, with collisions on motorways contributing to a higher rate of injury than elsewhere on the road network with corresponding higher fatality levels (Michalaki et al 2016). This risk is exacerbated by increased presence of heavy goods vehicles and the impact of weather conditions (Michalaki et al 2016). Furthermore, in longitudinal analysis of the M74 motorway extension in Scotland it was determined that a reduction in RTCs is not associated with the motorway extension itself and was part of a wider trend of RTC reductions in the whole area (Olsen et al 2016). It is concluded that policymakers can therefore not solely rely on a predicted reduction in RTCs as justification for new urban motorway infrastructure (Olsen et al 2016 p. 1093). Indeed, the impacts of infrastructure spending on road safety may well be overestimated without considering the impact of regulatory changes and road user behaviours (Albalate, Fernandez, and Yarygina 2013).

The design of infrastructure has also been identified as representing a significant factor in RTCs involving older road users (Amin 2020). For example: (i) lighting conditions; (ii) unsignalized pedestrian crossings, footbridges, or subways, and central refuge areas near junctions increases accident risk; and (iii) complex road geometry have all been identified as being of relevance (Amin 2020). However, for other road users it has been identified that bright street lighting does not lead to an improvement in road safety and may indeed compromise safety due to changes in driver behaviour (Marchant, Hale, and Sadler 2019). Research from Australia also determined that road user error was the most significant factor in older road user crashes and conclude this indicates a limited capacity of the road system to accommodate these errors (Koppel et al 2018).

From a financial perspective, it is documented that the road network will inevitably require improving and modifying in response to traffic volumes and additional safety requirements, but that such infrastructure related safety improvements are capital-intensive (Byaruhanga and Evdorides 2022). It has also been observed that investing in maintenance has a safety benefit and translates to reduction in casualties (Albalate, Fernandez, and Yarygina 2013). Therefore, it is important to consider the

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[6] Alcohol (Minimum Pricing) (Scotland) Act 2012

intended benefits that any infrastructure related investment will bring when planning for capital investment.

4.4.   Motorcyclists

Motorcyclists will not be considered in depth in this report, as this work formed part of previously commissioned work by Transport Scotland, *Motorcycle Safety Strategies in North East Scotland* (Hood 2021).

4.5.   Older Road Users

In 2021, drivers aged 65 and over accounted for 22% of all licence holders in the UK (Hawley and Wesson 2022 p. 15). For older road users, visual, cognitive and mobility impairments along with medication usage have been identified as contributory factors to collisions (Rolison et al 2018). Visual impairments have been identified as relevant in the detection of vulnerable road users (e.g., Ranchet et al 2022) and in offering decreased visual acuity in poor light and contributing to RTC risk as a result (Amin 2020). Auditory distractions have also been identified as being potentially significant, with crash risk increased through hazard perception impairment associated with such distractions (Folli and Bennett 2023 p. 31; Karthaus et al 2020). Finally, in relation to medication it has been identified that prescribing opioid painkillers, hypnotics, and anxiolytics need to be carefully considered in older road users due to the potential for these groups of drugs to impair driving ability (Zitoun et al 2022).

More generally, it has been identified that age, and changes to cognitive and visual function associated with age, are not consistent predictors of the ability of older road users perceive hazards on the road (Folli and Bennett 2023). Indeed, in relation to cognition and the specific brain regions associated with safe driving, research has concluded that it is unclear which structures in the brain are associated with hazard perception and therefore caution need to be exercised around this aspect of older road users too (Folli and Bennett 2023 p. 31).

Caution also needs to be exercised in treating older road users as a homogenous group, with research demonstrating nuances in hazard perception abilities across older age groups (Folli and Bennet 2023 p.30). For example, that those in the 75–84-year demographic have poorer hazard perception capabilities than those aged 65-74 years (Folli and Bennett 2023 p. 30). However, the ageing process is associated with several changes to visual abilities, and it has been noted that "eye-sight disorders, contrast sensitivity, visual acuity, and motion sensitivity" are all relevant visual factors when considering hazard perception abilities in older road users (Folli and Bennet 2023 p. 31).

Research into risk perception of older road users found that typically older persons construct risk as an external factor, than can be managed internally (i.e., through skills) (Siren and Kjaer 2011). Consequently, older road users may well self-regulate their own driving because of the behaviours of others rather than because of their own abilities (Siren and Kjaer 2011). It has been identified that

training could offer enhanced hazard perception performance for older road users as a potential mechanism for reducing risk (Folli and Bennett 2023 p. 32; Anstey et al 2018).

4.6.   Pedal Cyclists

In an analysis of STATS19 reports relating to severe and fatal crash injuries in the UK, it was found that, "increasing the age of casualty from 35 years onwards, being hit by a goods vehicle, road speed limit 40mph and over, and the months of May and June were predictors of fatal and severe cycle casualties" (Mason-Jones et al 2022 p. 338). It is also notable that casualties over 70 and older were identified as being almost three times more likely to have a fatal or severe crash outcome, when compared with those aged 16 or younger (Mason-Jones et al 2022 p. 338). Also of relevance when interpreting crash related data is the identification of consistent underreporting of non-fatal cyclist casualties, which DfT identifies as a "long known" issue (DfT 2018).

From an infrastructure perspective, it has been identified that intersections are strongly associated with risk of injury (Kapousizis, Goodman, and Aldred 2021). Furthermore, on road painted cycle lanes are also associated with significant injury risk and the narrow width, sharing of footways, and lack of protection at junctions all cited as relevant factors (Kapousizis, Goodman, and Aldred 2021). It has been identified that "low cycling speed, (one-way) bicycle paths and intersection treatments such as speed reducing measure" are all significant contributors to cycle safety in the Netherlands (Schepers et al 2017 p. 270).

It should be noted that in addition to crash risk itself, perceived crash risk is a significant factor which should also be considered from a policy perspective as it can act as a deterrent to cycling (Useche et al 2019; Puchades 2018). There is no evidence that strict liability laws contributed towards the low risk of bicycle/vehicle collisions in the Netherlands (Schepers et al 2017 p. 271).

4.7.   Pedestrians

The relationship between excess speed and pedestrian fatalities is well established (WHO 2023; Hussain et al 2019) and this relationship has had an impact on road safety policy. Specifically, that in those nations with lowest road fatality rates, a Safe System Approach to road safety dictates speeds of 30-40 km/h in busy pedestrian areas (Hussain et al 2019). Zeeger and Bushell (2012), also identify several factors that influence pedestrian crash trends in addition to speed. These are grouped into: driver factors; vehicle factors; demographic, social and policy factors; pedestrian factors; and roadway and environmental factors (Zeeger and Bushell 2012 p. 6). These are summarised for ease of reference as follows:

Driver Factors	Vehicle Factors	Demographic, social, and policy Factors	Pedestrian Factors	Roadway & Environmental Factors
Distracted driving	Heavy goods	Legislation & enforcement	Alcohol or drugs	Vehicle speeds & volume
Age – young drivers and older road users	Vehicle malfunction	Land use	Age – children and older pedestrians	Roadway design
Speed & unsafe driving practices	Quiet vehicles (EVs)	Migrant populations	Distraction	Availability of crossing points
Alcohol or drugs	High speed vehicles	Impact of transport costs	Disabilities	Design of intersections
Skills & vision	Vehicle design	Social housing	Volume and mix of pedestrians	Roadway lighting
Driver licensing	School bus design and operations	Parking policies	Pedestrian behaviours	Weather
	High vehicle volume	Travel trends		Urban planning & design
	Vehicle technologies			Traffic & pedestrian signals
				Signs & markings
				Bus stop locations
				Maintenance issues

Table 1: Factors associated with pedestrian crash risk, adapted from Zeeger and Bushell 2012 p. 6

To address the risk pedestrians face as vulnerable road users, WHO makes a number of recommendations around specific interventions for improving pedestrian safety (WHO 2023). These include:

- Reducing pedestrian exposure to vehicular traffic
- Reducing vehicle speeds
- Improving distance and visibility between motorised vehicles and pedestrians
- Improving pedestrian and motorist safety awareness and behaviour
- Improving vehicle design for pedestrian protection
- Improving care for injured pedestrians (WHO 2023 pp. 16-17).

Overall, while pedestrian fatalities are decreasing in high-income nations such as the UK, it is noted that these nations are also seeing reductions in pedestrian numbers and so the effectiveness of strategies cannot be assumed (Tiwari 2020).

4.8. Post-Crash Care

RTCs are the second most common cause of major trauma in the UK (Nutbeam et al 2021) and the role of post-crash care is important in addressing the immediate, treatment, and follow-up aspects of the collision event (WHO 2016). It is reported that approximately 50% of people who lose their lives on the road die in the immediate aftermath of the crash or during transfer to hospital, and that therefore there is a critical importance of ensure medical attention within the "Golden Hour" period (European Commission n.d.). Viewing post-crash care holistically, WHO recommends that an effective strategy ensures the integration of injury care, mental health support, legal support, and collection of data on RTCs and associated injuries (WHO 2016).

Focussing on the aspect of injury care, along with being ejected from the car during the collision event, patients can remain trapped in the vehicle. Research indicates that such entrapment is associated with an increased mortality risk (Nutbeam et al 2021), and that extraction is often required before critical care can be provided (Vaughan-Huxley et al 2023). It has been identified that collaborative working between emergency services is an important factor for scenes where extraction is required is important, alongside the ability to make informed decisions about risk, and make evidence-based decisions about care (Vaughan-Huxley et al 2023; Nutbeam et al 2021).

In addition to the clinical care provided as part of immediate post-crash care, a qualitative study into understanding the experiences of those entrapped in motor vehicles following a RTC found that good communication, companionship, and planned post-incident follow up improved the overall extrication experience (Nutbeam et al 2022 p.8). It was found that communication failures, loss of autonomy, poor pain management, delays to communication with family members, and the use of social media by onlookers all negatively impacted the experience (Nutbeam et al 2022 p.8). For those RTCs which have fatal outcomes, it has been identified that there is a negative impact including poor mental health outcomes for family members following such a bereavement, and that there exists limited support in the UK following a RTC (Attwood, Benkwitz and Holland 2023).

4.9. Vehicle Safety

There are several primary (crash avoidance) and secondary (crash protection) measures available in vehicles to reduce risk to occupants. Electronic Stability Control (ESC) has been standard in all new cars in the EU (including the UK) since November 2014[7], acting as "active safety device […] which aims at improving driving dynamics and at preventing accidents which result from loss of control" (Erke 2008 p.167). This is achieved through the prevention of skidding and loss of control when oversteering or understeering is present (Erke 2008 p. 167). Studies focussing ESC confirm that crash reductions are greatest in single-vehicle crashes where there is a loss of control, with greater benefit derived in the wet and at higher crash speeds (Fildes et al 2013 pp. 278-279). Moreover, there is more benefit for SUV type vehicles than for smaller passenger vehicles (Fildes et al 2013 p. 278).

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[7] Per Article 12 and Article 13 of Regulation (EC) no 661/2009

Unsurprisingly, airbags have also contributed to improvements in crash outcomes for vehicle occupants. For example, the presence of side curtain airbags in nearside impact collisions have been found to provide protection again partial ejection from the vehicle, and a reduction in risk of corresponding severe soft tissue injuries (Kaufman et al 2017). Research indicates that partial ejection is associated with increased injury severity and risk of morbidity and mortality of crash victims (Funk et al 2012). However, the presence and deployment of airbags does not fully eliminate risk of traumatic injury (Burnside and McManus 2014) and for unbelted drivers, it has been observed that air bags may increase fatality risk in single vehicle accidents (Hoye 2010).

Autonomous Emergency Braking (AEB) and Forward Collision Warning (FCW) systems are part of a variety of Advanced Driver Assistance Systems that incorporate assistive technology into vehicles. AEB systems apply the brakes in anticipation of collision when the vehicle is travelling at speeds of up to ~19mph (Fildes et al 2015 p. 24). In some cases, this is preceded by an acoustic warning sound, and the brakes are applied if the driver fails to respond (Fildes et al 2015 p.24). Research conducted in 2015 reports that that low-speed AEB technologies offer a 38% overall reduction in rear-end crashes when compared with vehicles without AEB (Fildes et al 2015). This is further supported by additional research that found FCW alone reduced rear-end crashes by 27%, low-speed AEB by 43%, and by 50% when FWC and AEB were both present (Cicchino 2017). Even at speed limits of 50mph and above, it has been determined that AEB still reduces rear-end striking crashes (Cicchino 2017).

4.10. Young Drivers

For young drivers, inexperience, lack of skill, and risk-taking behaviours (excessive speed and drink and/or drug taking) have been identified as contributory factors to collisions (Rolison and Moutari 2020; Rolison et al 2018). It has also been identified that drivers who speed in the past are more likely to do so in the future, so speed remains a significant factor for future driving behaviours too (Vankov, Shroeter, and Twisk 2021).

For young drivers it has been identified that it is a combination of factors that include road environment, travelling too fast for the conditions, inexperience, and loss of control, which contribute to single-vehicle collisions involving young drivers (Rolison and Moutari 2020 p. 175). Failure to adapt to conditions and the road environment is identified as being a result of poor anticipation, rather than because of a lack of manoeuvring skills which are falsely thought to be more important than the ability to anticipate (Rolison and Moutari 2020 p. 175). These factors are further impacted by alcohol consumption, with evidence that this raises the risk of young drivers breaking the speed limit (Rolison and Moutari 2020 p. 176).

It is important to understand the changes in driving behaviour that relate to young driver injury and fatality risk, with a view to shaping education programs (Roman et al 2015). Therefore, it has been identified that graduated driving licences (GDLs) could be of benefit, particularly if they are targeted at the factors underlying young driver crashes (Rolison and Moutari 2020 p. 176). This is a position

also supported from a public health perspective (Greenwood et al 2020). However, it has been noted that telematics offer several benefits over GDLs, due to the relative ease of implementation (Green et al 2020). It is also observed that while traffic violations are a known risk factor among young drivers, the targeting of "young drivers' tendency to disobey right-of-way, stop signs, and road markings as a route cause of some of their crashes involving other road users" (Rolison and Moutari 2020 p. 176).

A further mechanism for influencing young driver behaviour is via telematics. Recent research conducted in Western Australia found that personalised feedback via smartphone-based telematics was not on its own capable of adjusting behaviour in young and provisional drivers, and that an additional incentive was required (e.g., financial) (Meuleners et al 2023 p. 172). The idea that financial incentives may deliver appropriate reductions in risky driving behaviours has been established in other literature, although in a wider age range of road users (Stevenson et al 2021). Caution has been advised around the claimed effectiveness of telematics, partially due to the lack of research, and that it requires users opting into the scheme thereby potential excluding those who choose to engage in risk driving behaviours (Green et al 2020).

5. Results

The purpose of this section is to present the main findings of the research, as interpreted from the data collection from both public and professional participants.

5.1. Public Participants

5.1.1. Statistical Information – Participant Profile

Gender

Most participants responding to the online survey identified as male (65.7%), with 28.6% of participants identifying as female.
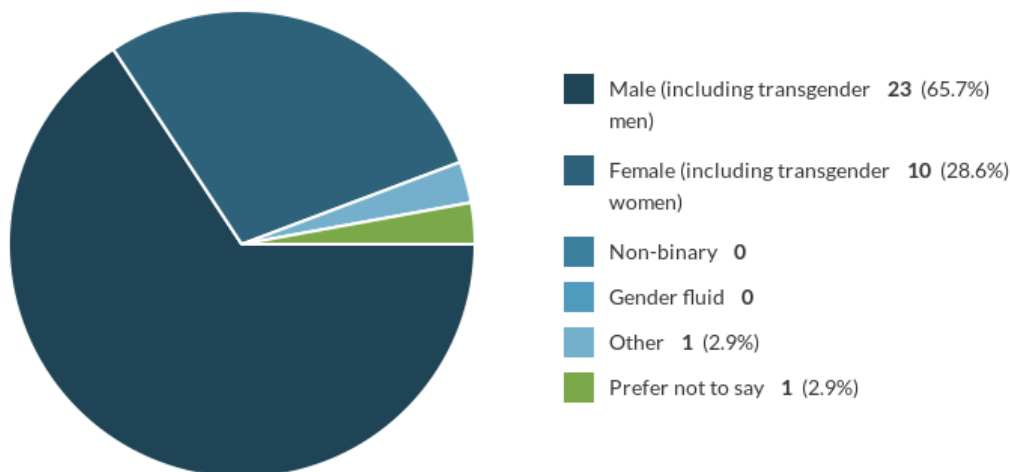
Figure 2: Gender identity of public participants

Age
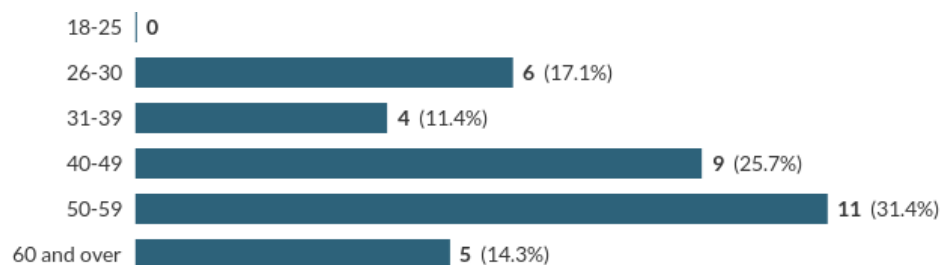
Figure 3: Age range of public participants

Local Authority of Residence
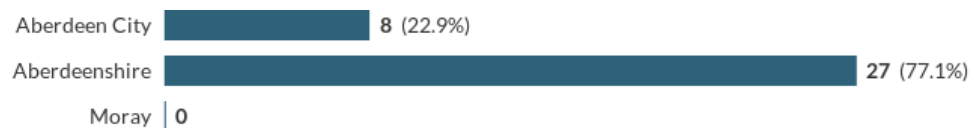
Figure 4: Residence by local authority of public participants

Mode(s) of Transport

To help build a profile of individuals who responded to the survey, participants were asked to select which modes of transport they used.
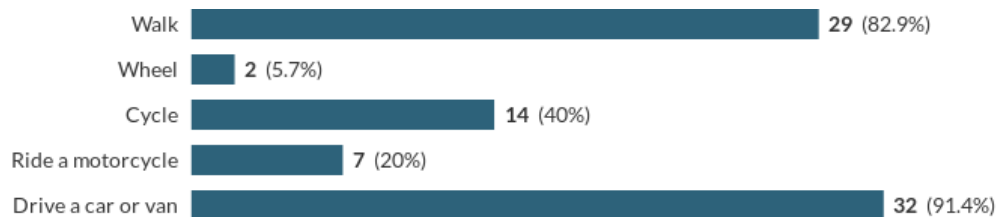
Figure 5: Transport mode(s) of public participants[8]

5.1.2. Use of the road network

Participants were asked to consider the question, "*how do you feel about using the road network in the North East of Scotland?*". A selection of responses is set out below:

> *"I feel road conditions are the issue at the moment with cars, bikes motorbikes having to swerve & avoid large potholes etc within the general road surfaces in built up areas & public roads"* (Participant 16B)

> *"Cautious due to quality of driving of other road users."* (Participant 26B)

> *"Generally safe, with some driver related issues"* (Participant 1B)

> *"As a car/truck driver no issues using the network, as a cyclist and motorcyclist I do feel very vulnerable due to bad drivers"* (Participant 15B)

> *"The road surface conditions are improving but there are still lots of roads with broken tarmac or poor repairs. This is quite stressful when cycling or on a motorcycle as it can mean quick reactions*

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[8] Multi answer: Percentage of respondents who selected each answer option (e.g., 100% would represent that all this question's respondents chose that option)

and sudden changes of directions to miss any large cracks or potholes as going over one is quite dangerous and can cause damage…" (Participant 12B)

"I also factor in the time of day as if it is rush hour I will avoid side and narrower routes as I do not or have had any trust in other road users for some time" (Participant 29B)

"Generally fine except I think main cycle arteries (away from fast traffic) are limited and I hate driving the A90/92 (AWPR is good)" (Participant 33B)

5.1.3.   Factors contributing to RTCs

Participants were asked to consider, *"what do you believe are factors contributing to road traffic collisions on roads in NE Scotland?"*. Responses can be categories into: (i) speed; (ii) driver behaviours/skill; (iii) infrastructure (maintenance & quality); and (iv) policing and enforcement. A selection of relevant quotations is set out below.

(i)   Speed

Many participants simply stated "speed" as a factor, however some offer more detailed perspectives on this issue:

"Some cars going too fast on bends on narrow rural roads" (Participant 2B)

"Everyone seems in such a rush to get somewhere" (Participant 7B)

"…speeding is still a major contribution" (Participant 16B)

(ii)   Driver behaviour/skill

There were several reflections on the overall competences and behaviours exhibited by road users, as perceived by survey participants. As follows:

"Inexperienced young drivers" (Participant 4B)

"…teenagers on motorbikes without a helmet" (Participant 5B)

"…mobile phone use" (Participant 8B)

"If there are accidents normally a lack of concentration or visibility" (participant 11B)

"…I'm more important than you" attitude of drivers" (Participant 15B)

"Lack of concentration & in car distractions like phones etc" (Participant 16B)

"…poor decision making, poor planning and anticipation" (Participant 17B)

"Frustrations, massive idiots that "know the road" (Participant 20B)

"Young drivers with high powered vehicles" (Participant 24B)

"Use of phones in the car. Drivers unfamiliar with roads being driven […] Lack of communicating intention to pull out or change lanes in traffic with indicators" (Participant 30B)

"Inexperienced young drivers. Arrogant alpha males who think that because they're in oil they're invincible" (Participant 32B)

(iii)   Infrastructure

Several participants comment on the perceived role of infrastructure in contributing to RTCs. For example:

"The network of roads is not at a suitable standard for the volume & types of traffic using them" (Participant 14B)

"Lack of safe over taking opportunities with no dual carriage way after Inverurie" (Participant 18B)

"Poor state of the roads (potholes etc) in general has a large impact in either changing the driving style of the user to be more aware of and avoid the poor road surfaces or to take unpredictable avoiding action where driving style has not been altered" (Participant 22B)

(iv)   Policing & enforcement

Finally, a small number of participants commented on the perceived role policing and enforcement can play. As follows:

"...limited enforcement by Police" (Participant 26B)

"Lack of enforcement of laws by the Police" (Participant 28B)

5.1.4.   Approaches for reducing RTCs

Participants were asked to reflect on, *"what do you think are effective approaches for reducing RTCs and the associated number of road casualties?"*. The responses to this question scan be summarised into the following categories: (i) policy, enforcement & detection; (ii) alternatives to car travel; (iii) infrastructure improvements; (iv) education; and (v) safety cameras and average speed cameras. A selection of relevant quotations is set out below.

(i)   Policy, enforcement & detection

Several participants comment on the perceived value of increased levels of enforcement and detection in playing a role in reducing RTCs and associated casualties, alongside some additional policy measures. As follows:

"Tighter restrictions on young drivers. Tiered licences for young drivers. Regular competency/ health/ eye tests for older drivers" (Participant 4B)

"Getting vehicles in poor condition off the road" (Participant 5B)

"The presence of traffic police on the road would go a long way in making people more mindful of their actions" (Participant 7B)

"Ability to catch drivers using mobile devices while driving including social media, music, Texting and all other distractions that mobile devices cause" (Participant 8B)

"Mandatory re-tests for drivers over the age of 70. Automatic de-activation of mobile phones" (Participant 10B)

"Actual roads policing by traffic police rather than more and more cameras" (Participant 15B)

"…more police presence on the roads" (Participant 16B)

"Increase in Roads Policing and enforcement. Better speed calming measures" (Participant 17B)

"I believe that should you have a black box fitted in your car that monitors your speed/driving capabilities when you first pass with an incentive to keep the box for another year through your insurance this will make huge changes in young drivers being killed. I also think that the £100 fine and 3 points are good, but we also need to have re-offenders fitted with this box through their insurances" (Participant 20B)

"As with motorcycles limit the power of vehicle with age/experience" (Participant 24B)

(ii)   Alternatives to car travel

Two participants observed that risk reduction could be achieved through offering alternatives to private car travel. For example:

"Measures to reduce numbers of cars, particularly improving public transport. Although I do not often cycle, I think cycle lanes are helpful" (Participant 2B)

"Improving public transport and making it affordable would help take cars off the road which would hopefully result in less accidents" (Participant 12B)

(iii)   Infrastructure improvements

Several participants comment on the perception that enhanced infrastructure would facilitate casualty reduction:

"Passing places and pull in points" (Participant 1B)

"Main road improvement works, passing places, slow [crawler] lanes" (Participant 9B)

"Improving road layouts to improve visibility and traffic flow and again road surface conditions" (Participant 12B)

"Improvements to network to allow vehicles to pass slower moving traffic easier" (Participant 14B)

"I think there should be investment in the extension of a dual carriage way up to Inverness" (Participant 18B)

"Increased signage and road markings at the appropriate spots" (Participant 22B)

(iv)   Education

Participants were also aware of the role that education can play in improving road safety, and made the following suggestions and observations:

"Safety awareness and campaigns introduced to younger audience with stories from people who have experienced road traffic collisions first hand. Scare tactics, real incident pictures, give understanding of the potential consequence of being reckless and irresponsible" (Participant 21B)

"People need to be aware of their responsibility when driving" (Participant 6B)

"The safe drive, stay alive road show was an excellent idea" (Participant 32B)

"Getting message out that speed kills and don't use your phone while driving" (Participant 27B)

"…educating road users on awareness, the correct use of carriageways & checking mirrors. A very common example leading to frustration and tailgating is incorrect usage of lanes. Drivers not pulling back into the inside lane once they have overtaken a slower moving vehicle allowing faster moving/accelerating vehicles to pass" (Participant 35B)

(v)   Safety cameras and Average Speed Cameras

Finally, several participants also commented on the role of safety cameras, safety camera vans, and the application of average speed cameras to casualty reduction. As follows:

"More speed cameras" (Participant 11B)

"I hate to say it but the average speed cameras, more speed cameras" (Participant 20B)

"…use of traffic management systems and surveillance cameras regarding speed etc" (Participant 26B)

"Speed Camera vans in appropriate places-not somewhere obvious that is easy to spot and slow down in time" (Participant 29B)

"Average speed cameras" (Participant 33B)

5.1.5. Impact of road safety campaigns

Participants were asked to, *"describe any previous road safety campaigns or initiatives (local or national) that you feel have contributed to the improvement of road safety in North East Scotland".* Responses to this question were somewhat varied, and while some responses identified specific campaigns such as Operation CEDAR (per Participant 14B) and Operation Close Pass (per Participant 7B), many participants could not articulate specific campaigns, e.g., *"Can't remember any of top of my head"* (Participant 11B) but could discuss the perceived impact of general road safety measures through education, engineering, engagement, and enforcement strategies. As follows:

"Motorcycle safety campaigns and signage" (Participant 4B)

"The current campaign regarding cyclist is good" (Participant 8B)

"Think Bike campaign" (Participant 13B)

"Safe drive stay alive. Drink driving campaigns by police Scotland" (Participant 18B)

"To be honest nothing comes to mind, other than the usual ones on TV about the motorcyclist THINK" (Participant 19B)

"I personally haven't seen any. Apart from the awful Grandma in the car advert that I always switch over" (Participant 20B)

"Speed awareness campaigns. Think Bike. Give cyclists space" (Participant 22B)

5.1.6. Primary contributors to casualty reduction

Participants were asked to explain *"who or what do you think is primarily responsible for ensuring a reduction in the number of road traffic collisions and associated road casualties?".*

As with the previous questions, responses were mixed and there is no clear consensus across the collected data. However, responses can be grouped into the following core themes: (i) driver behaviours; (ii) in-car technologies; (iii) infrastructure improvements; and (iv) policing and enforcement. A selection of relevant quotations is set out below.

(i)   Driver behaviours

It is not entirely clear whether participants were stating that drivers themselves *have* made the roads safer, or whether they merely have the capacity to do so. Therefore, caution is applied in reporting this data. However, one participant was clear that enhanced training was potentially impacting a new generation of drivers:

"Better education and training of new drivers and young people due to start driving has also hopefully led to a shift in attitudes" (Participant 17B)

Another participant felt that driver behaviour was being influenced by the presence of safety cameras and Average Speed Cameras:

"…cameras, average cameras are putting the responsibility back on the driver to be more sensible" (Participant 20B)

(ii)   In-car technologies

A few participants referenced the role they felt that modern car technology played in achieving casualty reduction:

"Advances in automobile technology" (Participant 4B)

"Car safety features" (Participant 19B)

"Modern vehicles designed with user safety and survivability in mind" (Participant 22B)

(iii)   Infrastructure improvements

Two participants specifically mention the role they felt infrastructure has played in casualty reduction:

"Improvement of the road layout meaning less cars on roads that aren't able to cope with high traffic flow. Traffic can cause peoples stress levels to increase and affect decision making where mistakes and risk taking increase" (Participant 12B)

"AWPR" (Participant 32B)

(iv)   Policing & enforcement

Several participants reflect on the role that enforcement has on road safety, with some simply citing the role of Police Scotland (e.g., Participants 7B, 11B, 28B), with others offering more detail on the specific aspect of enforcement they felt were helpful in the form of safety cameras and Average Speed Cameras (Participants 5B, 11B, 21B).

5.2.   Professional Participants – Survey responses

A total of 8 survey participants with a professional background relating to road safety in NE Scotland completed an online questionnaire, with 5 of these participants electing to provide further data via interview. This section presents the data from the online survey.

5.2.1.   Specific road safety interventions

In response to the question "*do you feel that there are any road safety interventions (local or national) that have potentially contributed to the reduction of RTCs in NE Scotland?*", participants made the following observations in relation to policy:

"*Vehicle design (including air bags, crumple zones and higher safety specs). Reduction in drink driving limits. Introduction or 20mph zones*" (Participant 1A)

"*Highway Code changes and travel hierarchy. Reduction in 'allowance' for drink driving*" (Participant 3A)

"*Lowering of drink drive limit; drug driving legislation; power to seize vehicles for no insurance or licence; powers in relation to antisocial behaviour in vehicles; 20mph speed limits; mobile camera enforcement; average speed camera enforcement*" (Participant 8A)

"*The longer I am involved with road safety the more questions I pose in terms of the validity of some road safety approaches. In 2013, with the demise of Grampian Police and its various road safety approaches, there was a concern that road collisions and casualties would rise. Despite very little local road safety proactivity from 2013 onwards, collisions and casualties continued to fall - quite significantly - and these reductions remained sustained across most, if not all, casualty classes. **The question which has to then be asked is: does road safety activity actually work or are reductions simply due to societal change?**" (Participant 7A, emphasis added)

From an infrastructure perspective, participants noted that the following aspects were relevant:

"*…investment in segregated cycling. Road investment including new roads (AWPR), stacking lanes, skid resistant surfacing, safety barriers, advance stop lines, ped crossings….*" (Participant 1A)

"self-explaining roads through signage strategies / visibility improvements / skid resistance improvements / crossing infrastructure" (Participant 4A)

"Developments such as the average speed cameras on the A90 appear to have made a significant benefit on local road safety, however, this is just one route" (Participant 7A)

"AWPR and reduction of through traffic in Aberdeen" (Participant 8A)

Finally, in relation to behaviour change messaging, participants noted that the following campaigns and initiatives were of significance:

"Give Cyclists Space, Getabout Be Seen at Night campaign, "In Town, Slow Down" and speed activated signage" (Participant 1A)

"Cultural change and messaging is key. Reduction in amount allowed to drink and drive" (Participant 3A)

"I would like to think that all national road safety campaign work has in some way contributed to road safety. There have been numerous campaigns developed by Road Safety Scotland or Police Scotland over the years and too many to mention here. I would give a particular mention to longstanding campaigns such as summer and winter drink / drug drive campaigns and motorcycle campaigns which at least put road safety in the forefront of the public's minds each year" (Participant 8A)

However, it should be noted that one participant urged caution and reflected on the impossibility of making a causal link between behaviour change messaging and casualty reduction (Participant 2A), while another observed that it is,

"Difficult to quantify albeit national bodies advise that the audience reach of such approaches is significant" (Participant 7A)

5.2.2. Vulnerable road users and casualty reduction

In response to the question, "*reflecting on the six vulnerable road user categories, do you feel that the overall casualty reduction within any of these user groups can be attributed to specific factors?*", participants offered the following:

*"**Engineering** – safer roadsides, self explaining routes, pedestrian crossing facilities, streets design for lower speeds, safety audit of infrastructure, collision mitigation schemes. **Education** – cycle and pedestrian training, national campaigns for these groups. **Enforcement** – speeding, close pass"* (Participant 4A, emphasis added)

*"**Children** – are there as many children using the roads? Do we have younger generations who go out on the roads (walk/cycle) less? **Motorcyclists** – it would be nice to think that Op Zenith/Rider Refinement North have made a positive difference and the user feedback has been positive. **Young drivers** – easy to state that approaches such as Safe Drive Stay Alive have worked, however, areas with no SDSA approach have also seen reductions. **Others (older drivers/pedestrians and pedal cyclists)** – with fewer casualties, these groups have received limited new interventions"* (Participant 7A, emphasis added)

*"…Pedal cyclists (casualty numbers statistically low?) – Give Cycle Space campaigns, off road cycle routes, **perceptions of road danger impacting on-road cycling rates**"* (Participant 8A, emphasis added)

5.2.3. Data & data sharing practices

In relation to data and data sharing practices, participants were asked: *"Reflecting on the period between 2011 and 2021, what are your thoughts on the changes to the collision recording processes and the data made available to partners involved in the delivery of road casualty reduction strategies and initiatives?"* In response to this question, participants commented on the following:

- **Quality of data**
  - *"any improvements in the collection and quality of data are to be welcomed, and the more high-quality data the better. We have perhaps lost a bit of the jigsaw in the disappearance of damage only incidents right enough"* (Participant 2A)

  - *"Very varied quality of data dependant upon the reporting officer"* (Participant 4A)

  - *"Systems such as MAST and Crashmap provide easy access to data which then allows you to provide accurate reporting"* (Participant 7A)

- **Consistency of data**
  - *"More consistent reporting is required and sharing of data (personal data not required)"* (Participant 3A)

- **Sharing of data**
  - *"Better sharing has increased awareness and led to combined interventions"* (Participant 6A)

- **Changes to recording of incidents & impact of CRASH**
  - *"dramatic decrease in the amount of data due to no longer receiving damage only data - this was invaluable in establishing common factors or areas of risk on the network"* (Participant 4A)
  - *"I think that the changes to Police Scotland and in particular not recording damage only accidents. Then the change to the Crash system has resulted in a massive reduction in the number of slight accidents recorded"* (Participant 5A)

  - *"As I understand, changes to Police Scotland RTC recording processes have led to some concerns that not all collisions/casualties are being reported"* (Participant 7A)

  - *"New CRASH system has seen adjustments to serious / slight injury figures going back a number of years. This provides more accurate reporting regarding serious injuries. Going forward we should have better data to refer to.   These adjusted figures are reflected in Reported Road Casualties but not in MAST, which is what I am using now, which makes use of data before 2019 problematic for those agencies not able to directly access the collision data"* (Participant 8A)

5.2.4.   Measures to further enhance casualty reduction

Participants were asked to consider, *"in your professional opinion, what do you think could further enhance road casualty reduction in North East Scotland?"*

Some participants were focussed on infrastructure improvements as a mechanism for further casualty reductions. For example:

"Investment in road safety measures (including major schemes such as Laurencekirk grade-separated junction, Toll of Birness and upgrades of A90 and A96); segregated active travel measures" (Participant 1A)

"Further education on changes to highway code and for infrastructure to be built reflecting the changes and hierarchy. At present car is still King" (Participant 3A)

"…better road maintenance for better skid resistance and verge cutting to improve sightlines" (Participant 5A)

"Average speed cameras on A96 or it being dualled. Complete planned changes at Laurencekirk" (Participant 6A)

"Cyclists - separate cycle infrastructure / lanes" (Participant 8A)

There was also discussion of relevant policy adjustments that could be beneficial:

"Local Transport Strategies to focus on mode shift, less car dependence and safety measures (e.g. school zones, traffic-free areas, pedestrian priorities, traffic management, etc)" (Participant 1A)

"Full adoption of the safe system, as well as a a local coordinated focus on the most at-risk groups" (Participant 2A)

"Having L.A skid policies setting out investigatory levels to allow L.A's to be more pro-active rather than reactive" (Participant 4A)

"Effective interventions to address age-related fitness to drive   Graduated driver licensing for young drivers Measures to promote / reduce traffic levels and shift to more sustainable transport / active travel 20mph limits [...] delivery of Bikeability training to all school children, wider delivery of Cycle Awareness Training to occupational drivers and business users, enforcement of careless / dangerous driving behaviours   Central police portal for submission of video evidence from road traffic incidents- will widen reach of enforcement" (Participant 8A)

Finally, one participant also drew attention to the status of road safety within the broader political agenda in Scotland:

"Having RS high on the political agenda, attaining greater behavioural change in respect of speed compliance and general driving behaviour" (Participant 4A)

While another observes that:

"Given the relatively low levels of serious crashes we now see, it's actually challenging to know where we go next to maximise our partnership resources and enhance road casualty reduction" (Participant 7A)

5.2.5. Responsibility for casualty reduction

Participants were asked to consider, *"who or what do you think is primarily responsible for ensuring the reduction in RTCs and associated road casualties?"*. The majority cited a range of factors:

"A package of factors all prioritising casualty reduction - vehicle design, road design, investment in measures, insurance companies and others driving behaviour change, enforcement (including camera enforcement)" (Participant 1A)

"casualty reduction engineering measures; better vehicle technology/safety, and high-profile deterrence (Participant 2A)

"It is a collaborative effort of many partners and initiatives. Education, Engineering, Enforcement, Encouragement none would work on their own requires a joint approach" (Participant 3A)

"Partnership working on the 4E's / car design / emergency response time and treatment" (Participant 4A)

"Government policy" (Participant 5A)

"Ultimately the driver, however, I don't think any one agency has greater responsibility" (Participant 6A)

"Road users themselves - supported by a range of organisations and agencies for advice, guidance and support" (Participant 7A)

"The road safety landscape is inherently complex and the large number of stakeholders underlines the challenges in delivering consistent and effective interventions. Ultimately, Transport Scotland are responsible for casualty reduction on trunk roads and setting national road safety policy (2030 RS Framework), and local authorities the same for local roads (engineering and education measures), supported by all other agencies, such as the police who are responsible for enforcement (and DVSA for goods/PSVs)" (Participant 8A)

5.2.6.   Looking back and looking forward

Participants were asked to use their professional insight to reflect on *"where do you think the focus of road safety messaging has been or will be located: (i) in the past ten years; and (ii) in the next ten years"*.

(i)   Road safety messaging in the past ten years

In response to this question, participants offered the following observations:

"Infrastructure, vehicle design, air bags" (Participant 1A)

"Speed management, young drivers" (Participant 2A)

"Speed, drink driving, mobile phones" (Participant 3A)

"Speeding/seatbelts/ drug and drink driving/young drivers" (Participant 4A)

"Motorbikes and young drivers" (Participant 5A)

"TV, traditional media, posters, roadside messaging" (Participant 6A)

"A dual answer here: Arguably the police have taken the local lead, even with the hiatus which occurred between 2013 and 2016. Undoubtedly, the gravitas which the police bring adds considerable value in this regard. On a national basis, Road Safety Scotland have added considerable value with their offering, and I hope this continues" (Participant 7A)

"Young drivers, motorcyclists, drink / drug driving, speeding / 20mph limits, bad driving (careless / dangerous)" (Participant 8A)

(ii)   Road safety messaging in the next ten years

Participants offered the following observations on where they thought road safety messaging would be in the next ten years:

"Messaging - unacceptability of drink driving, speeding. Vehicles - including greater potential for technology to minimise risks. Infrastructure - continued investment in measures to reduce speeds, minimise dangers and provide protection to vulnerable users. Enforcement" (Participant 1A)

"Speed management; older road users" (Participant 2A)

"Speed, drink and drugs, sleep, use of technology" (Participant 3A)

"micro-mobility / car technology / active travel / speed / drink drugs / seatbelts / older drivers" (Participant 4A)

"Older drivers and probably still motorbikes" (Participant 5A)

"Social media, in-car technology" (Participant 6A)

"Predicted increase in cyclists due to active travel policies - work required to ensure casualty rates for cyclists do not increase at the same rate.   Increasingly autonomous vehicles and understanding of impact of this. E-scooters and micro-mobility" (Participant 8A)

Both Participants 7A and 8A felt that the previous areas of focus would remain for the next ten years too.

5.3.   Professional Participants – Interviews

Interviews were conducted the 4 individuals who have road safety as part of their professional remit. The purpose of the interviews was to expand on the themes explored within the surveys. Key thematic areas are set out below, along with supporting quotations. These are largely complementary of the data set out in Section 5.2. above and a selection of relevant quotations are set out below.

5.3.1.   Enforcement- Safety cameras and Average Speed Cameras

Participants A, C, and D discussed Average Speed Cameras as being a contributor to casualty reduction in North East Scotland, with Participant D expressing that, *"it should, in my opinion, should be across the whole of the trunk road network"* (Participant D).

Reflecting on the utility of Average Speed Cameras, Participant A observed that:

"I think people are much less likely to speed because they know they're more likely to get caught" (Participant A)

When asked if Participant A would like to see Average Speed Cameras extended to other locations in North East Scotland, they commented that:

"I think there's definitely a place for them and in some locations absolutely and bearing in mind I was involved in writing in the handbook and rules and guidance for safety cameras. I do actually think that particularly in low population rural areas it is too restrictive. The guidelines and the rules for it suits highly populated very urban areas with much higher casualty ratings […] I think there's definitely opportunities for policy change around" (Participant A)

They also observed that:

"I think we do need to get back to areas where speed is definitely an issue and rather than just focusing on, there's been accidents here in the past" (Participant A)

This connects with Participant D's comments about mobile safety cameras:

"There's been much more of a shift over to mobile enforcement rather than fixed cameras […] I still feel that […] the way they work it is pretty inflexible, although they call it flexible deployment, it's quite inflexible to some degree" (Participant D)

5.3.2. Policy, enforcement, and engagement

Looking at policy holistically, Participant C reflected that:

"I remember when Sweden started talking about Vision Zero. People almost laughed at them. It's not possible. And we've talked about it within our team previously within [redacted] the emphasis has got to be towards zero fatalities. And without being utopian […] we still think it's the right thing to be aiming towards" (Participant C)

Participant A, C and D also reflected on the change to drink driving legislation (Section 4.2), as being a potential factor. Participant D also felt the introduction of roadside drug wipe kits had been beneficial for policing from a detection perspective and removing risky drivers from the road.

In relation to drink driving, Participant A noted that:

"Most people now won't have anything at all because they know the limit is so low in Scotland now and I think that certainly in terms of culture, that has made a big difference" (Participant A)

From an enforcement perspective, Participant A felt that most road users were compliant with the legislation and that there *"is a lot of legislation in place now for road safety"* but the problem was for *"outlying people"* who demonstrated non-compliance with the law.

Participant B discussed the role of policy, commenting that:

"I think the [casualty] reduction plans have been quite useful actually" (Participant B)

All participants reflected that they would not be comfortable identifying a single intervention. This is best articulated by Participant A:

"…It has to be a mix of these interventions […] we always talked about you know the three E's of education, engineering, and enforcement. And I do still think that that's still true. You need a mix of the interventions to make it work" (Participant A)

5.3.3. Infrastructure considerations

Participant B observed that:

"Truthfully, I don't think there's very much that we've actually done engineering wise that has actually made a significant difference. In the money that we've spent, I would say in the last 10 years has mostly been through active travel and it's about more encouraging modal shift than road safety." (Participant B)

The significance of local authority budgets and the ability to spend on infrastructure improvements was also noted:

"…the other thing that that we identified was loss of control accidents. But that was to do with the lack of skid resistance on the road network because of poor or longer periods between maintenance because they just we just can't afford to do that sort of work anymore" (Participant B)

In a related comment, Participant D noted that:

"…things like surface treatments, it's good skid resistance [...] helping people to keep control of their cars [...] that sort of basic stuff" (Participant D)

5.3.4. Partnership working & collaboration

Participant A reflected on the role of partnership working when it came to road safety messaging:

"…the fact that we work closely with local authorities, the regional Transport Partnership, academic institutions and the police, the fire Service, Ambulance and NHS as well. I think that is a big thing" (Participant A)

Specifically, that:

"…we're not just seeing it as the police say this or the local authority saying this, it's, you know, the health service, they're saying this and I think that makes it a much more powerful and message" (Participant A)

From a very practical perspective, Participant A noted that:

"…we're quite lucky in the North East. We have our partnership and we do go through the fatal and serious accidents and just have a very generalised discussion about what the initial thoughts of the causation factors were and that" (Participant A)

Participant D also commented on partnership working in the Nort East of Scotland:

> *"The impression I get it that it's quite a cohesive group and […] everybody's on the same wavelength"* (Participant D)

However, Participant B felt that there was a gap in partnership working when it came to Police Scotland:

> *"I think we don't really have, advocates like that, you know, [name redacted] used to go to the Police College and do a talk to the recruits on why we need this data and what data what we use it for and how, the impacts of it. I don't, and I certainly I'm not aware of that happening anymore. And I think that there's, […] although when good at talking about partnership working and don't think we actually do it as well as we did before"* (Participant B)

Participant B also discussed the impact the formation of Police Scotland had:

> *"I think Police Scotland being very Glasgow based has, has been quite negative for us because having them in Aberdeen and having them in Aberdeen making decisions, well, like we were able to influence some of the stuff […] I don't think we can influence anything that the Police do these days"* (Participant B)

Participant C also reflected on a perceived lack of understanding between policymakers in Transport Scotland and what was occurring at a regional and local level:

> *"I think that there's a gulf of understanding there. They don't fully appreciate sometimes, what we're trying to do here, and particularly the big shift of population from Shire to city areas, and that people are using rural routes to commute"* (Participant C)

5.3.5. Active travel

Participants A, C and D all discussed active travel in the context of school transport, as well as more general modal shift. For each of these participants, they felt that education could play a role here too.

Participant A noted that in relation to walking and cycling initiatives,

> *"…if you don't include the road safety element, you're still going to have that people's perception fear. It's not safe to cycle or whatever"* (Participant A)

And that the focus needs to be on,

> *"…just very basics, you know, making sure that our pavements are wide enough, we've got the drop kerbs. People aren't parking on the pavements, so pedestrians aren't having to go out onto the road"* (Participant A)

Participant D felt that the "Give me cycle space" campaign had been a positive for cycling and cycle awareness.

5.3.6. Data & statistics

All interview participants comment on the role that data plays, with Participant D describing the lack of data as "*a big barrier that we need to try to overcome*" (Participant D), particularly in relation to underreporting.

For example, Participant A noted that in relation to data,

> "*…it's so old by time you see it that it's almost not worth seeing anymore because by time it's officially published…*" (Participant A)

And also, that there is a lack of information,

> "*…we don't know enough about the slight and damage only or the near misses, that's just not collated anywhere. So that's very difficult […] we don't really have the whole picture of what's going on* (Participant A)

This perceived lack of data was also mentioned by Participant C:

> "*…there's an awful lot of data available at national level. I would like to see it at the very least the regional level, but for me, really, at that local authority level is the minimum […] I would like to see more detail*" (Participant C)

Participant C further elaborates on the availability of data:

> "*it feels like there's a lot of discussion about collecting lots of data. But I feel that maybe it's not being made available to the people who could really use it*" (Participant C)

Participant D also noted that in relation to data:

> "We don't have what we need, and even with what we do have, my experience has been that it remains difficult to access it, let alone actually analyse it […] even within the Police […] you didn't have the capacity within the analytical support to get everything what we needed from the collision recording system. So what that meant was that you were still very much relying on your own professional judgement and understanding of what was going on" (Participant D)

Participant B commented on the changes to data recording:

> *"I think for me Police Scotland, coming in to be in in the way that they recorded the data led to shift and it's quite a significant shift [downwards] [...] Then CRASH came in and CRASH apparently was really complicated to start with. It wasn't that user friendly, and it has become slightly more user friendly and now the accidents are starting to go back up again"* (Participant B)

Participant B also noted that:

> *"...we're basing all these assumptions on people reporting it to you. And then that report being recorded accurately. So, there's a number of different places that falls down"* (Participant B)

And that,

> *"I think part of the problem it is that we haven't got good information for the last [...] Ten years. Haven't really got that good information for the last 10 years [...] I still think that it's seen by the police as, it's the traffic cops problem. It's not mine, em, and I think that, em, they don't value the information that they're collecting"* (Participant B)

Participant B also noted there needs to be more understanding of what data can and cannot tell us about road safety. For example,

> *"one thing that kind of frustrates me about the numbers is that people say "ohh there's been a fall in accidents" and I'm like, you can't compare this year with last year. You have to look right over a much longer period of time and you know the speed, statistical significance [...] It might have dropped, but if it's not, if it's only dropped a little bit, it doesn't mean that it's really dropped. It's just the natural randomness of them."* (Participant B)

And also that statistics without appropriate context can have an impact:

> *"...that one crash on the A96? And you know where three children were killed. I mean our stats went through the roof, but actually it was one incident [...] well, not diminishing the effect of that, it, should that change our interventions so significantly that?"* (Participant B)

Participant C also echoed this sentiment:

> *"But you need to look at more than the headline statistics. Yeah, otherwise, it looks like there can be terrible things going on"* (Participant C)

In terms of what is required moving forwards, Participant A noted that:

"I think enhanced reporting absolutely would be useful, but I certainly find even in my wider role that we just don't have the stats and particularly in terms of intersectionality, you know, gender, other protected characteristics" (Participant A)

5.3.7. Future enhancements and areas of focus

In general terms, Participant D felt that the traditional areas of focus such as young drivers, motorcycles, vulnerable road users within active travel, and older road users should remain a core focus of road safety initiatives moving forward.

Participant A noted that older road users will be a focus of future road safety initiatives around fitness to drive. For example

"a lot of people only finally gave up their driver's licence when they were involved in an accident" (Participant A)

Participant B felt that an enhanced police presence would be beneficial:

"...[reflecting on the past] when the police had maybe a little bit more presence and not as sparse as they are just now" (Participant B)

This was echoed by Participant D, who observed that with the reduction in police numbers:

"anything we can do to facilitate the remote detection of offences" (Participant D)

And that perhaps the adoption of reporting for members of the public could assist:

"...promote reporting for the members of the pubic in terms of dashcam video footage [...] but again the Police are strapped for cash and can't introduce it at the moment [...] but that could potentially be a game changer" (Participant D)

For Participant C, the focus was partially around infrastructure enhancements:

"...there is a need for further infrastructure investment. We've identified priorities, particularly at junctions on trunk roads, such as Laurencekirk, Toll of Birness and other. I'm a little bit concerned that almost seems to be a moratorium moment on investment in roads. No one's used the word moratorium officially..." (Participant C)

But also notes the role of public perceptions, particularly in relation to mode shift:

"...perception of safety is a big one" (Participant C)

Participant D hoped that there could be a similar culture change to speeding, as has been seen to other behaviours such as drink driving. They observed that:

"everybody's speed, everybody that has a car speeds. It's just that the degree" (Participant D)

Finally, Participant D commented on the availability of funding to implement future road safety initiatives, and that:

"...local authorities find it difficult to cut through the red tape and the bureaucracy and get access to extra [funding] [...] To make a difference I still think there needs to be a much more coordinated approach across the board. (Participant D)

5.3.8. Public perceptions of road safety

Participant A describes the public's relationship with road safety in the following terms:

"...they want their streets where their children or grandchildren play to be completely safe 20 mile an hour zones have crossing points everywhere. Speed bumps. All the interventions you can think of, but want to be able to drive themselves in any which we choose and don't like 20 mile an hour speed limits, don't like this, don't like that..." (Participant A)

Participant B offered this observation:

"I think they think all our roads are really dangerous. I think a genuinely think they do [...] they actually did a survey for [...] something I saw in the last couple of days and people's highest priority was about roads and road safety, and I'm like, you do realise there's not really a problem? Well, at the moment I'm not identifying anywhere" (Participant B)

However, Participant D felt that there was a level of complacency amongst the public when it came to road safety, and that:

"people don't really think about it until they've had the collision or lost loved ones in a collision, or the other experience is someone that they know has been killed in a collision, because the vast majority of people are law abiding" (Participant D)

Participant A and D both commented on the role of the media in reporting RTCs and that this can contribute to levels of complacency about road safety, as road deaths then become an accepted part of life. A parallel was also drawn by these participants in respect of the reporting of road deaths, and deaths on the railway such as the fatal incident at Carmont in August 2020.

5.4. Case Study – Local Authority Site Selection

The three local authorities were asked to identified specific road safety interventions that were considered to have offered enhanced safety benefits. Each local authority put forward engineering focussed interventions, and these are set out below.

5.4.1. Aberdeen City

As an example of a successful road safety intervention, Aberdeen City Council put forward an example of use of Klaruw to restore skid resistance at accident sites within the local authority's road network. No data could be provided in relation to any casualty reductions, and in the response, it was noted that retexturing work has not been carried out by the local authority for some time.

The locations were: (i) B979 Malcolm Road; (ii) B979/C92K Little Mill of Clinterty; (iii) C21C Upper Persley Road; and (iv) C88C Newhills Road. The following route action plans provide further information on the works and their respective locations.

5.4.1.1. B979/Malcolm Road
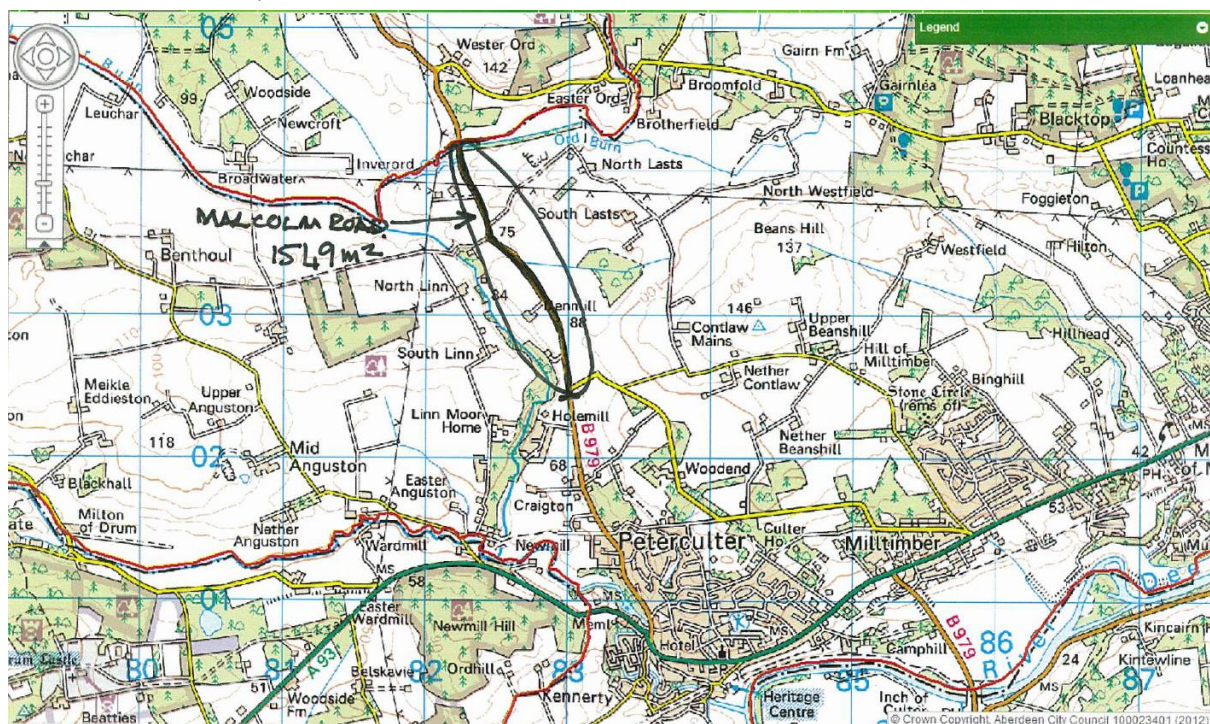
Figure 6: Location map of B979 Malcolm Road and proposed area of works, 1:25000 scale (c) Aberdeen City Council
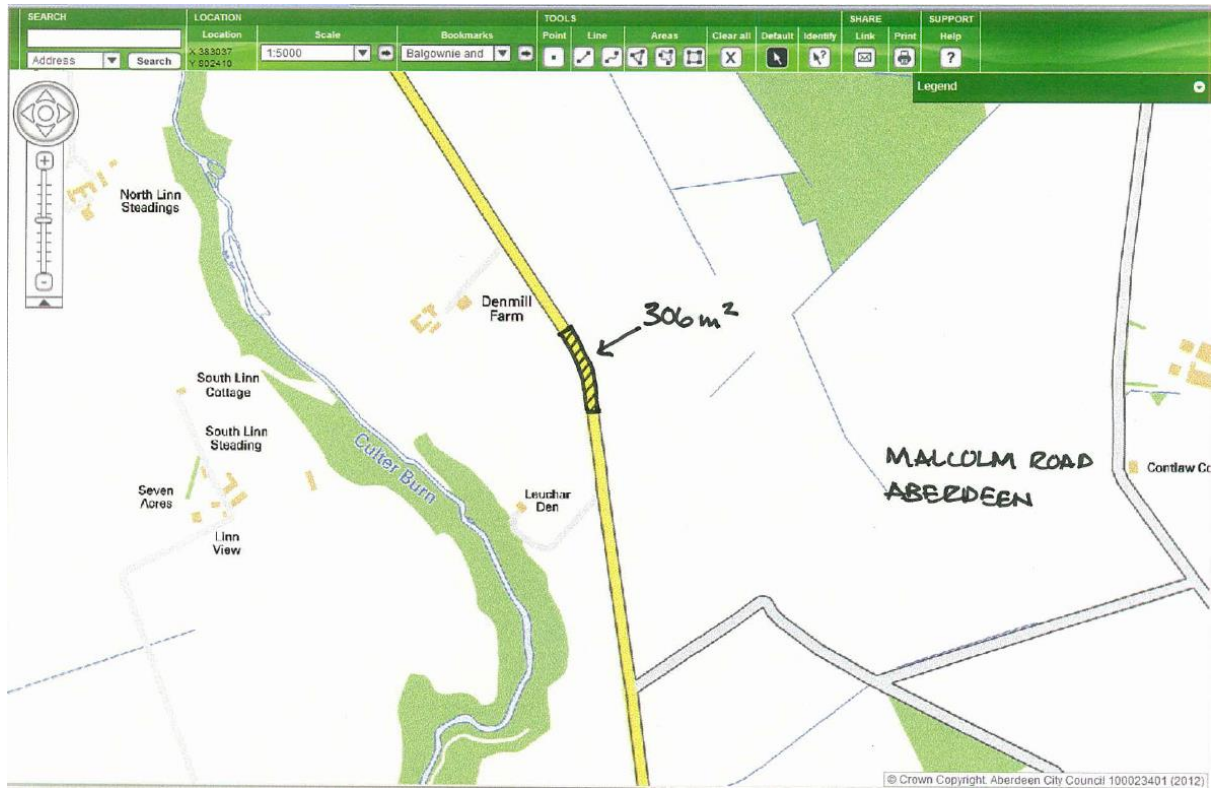
Figure 7: B979 Malcolm Road, 1:5000 scale (c) Aberdeen City Council

Figure 8: B979 Malcolm Road, 306m2 section (c) Google 2023
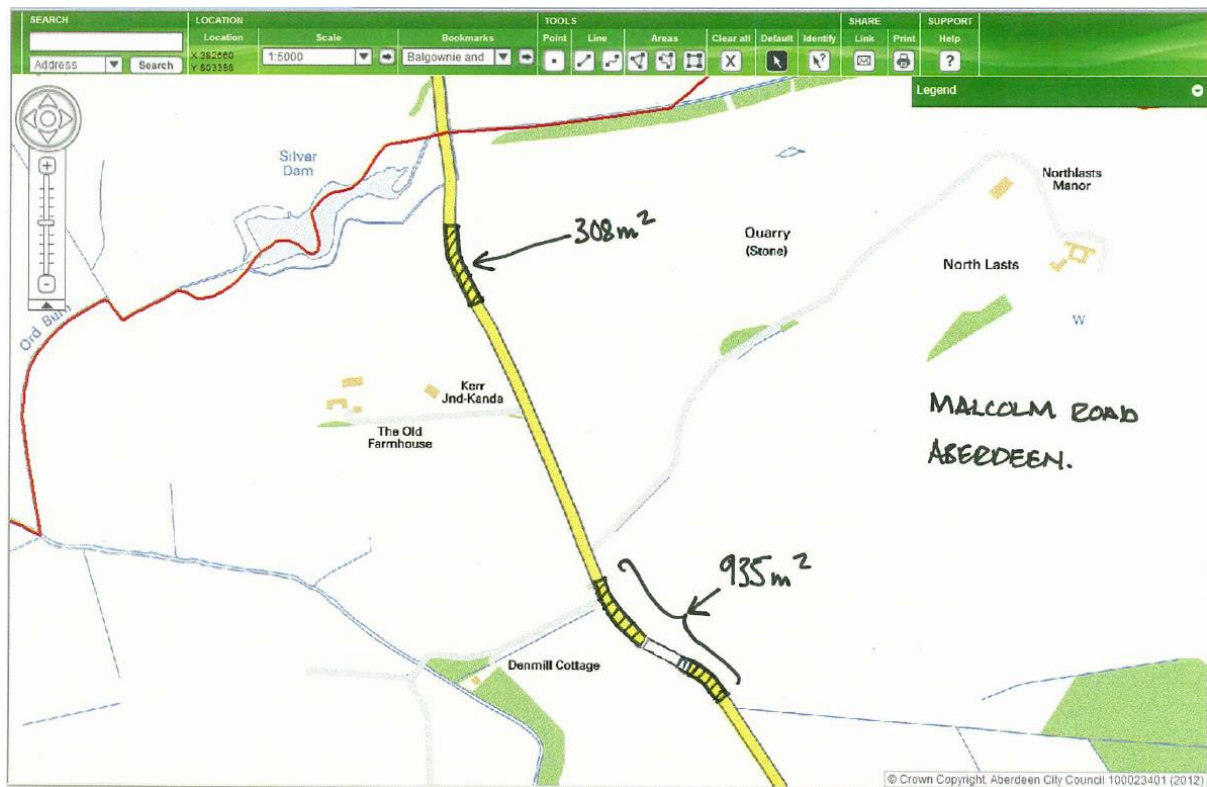
Figure 9: B979/Malcolm Road, 1:5000 scale (c) Aberdeen City Council

Figure 10: B979/Malcolm Road 308m2 section (c) Google 2023

Figure 11:B979/Malcolm Road 935m2 section part 1 (c) Google 2023

Figure 12: B979/Malcolm Road 935m2 section part 2 (c) Google 2023

5.4.1.2.   B979/C92K Little Mill of Clinterty
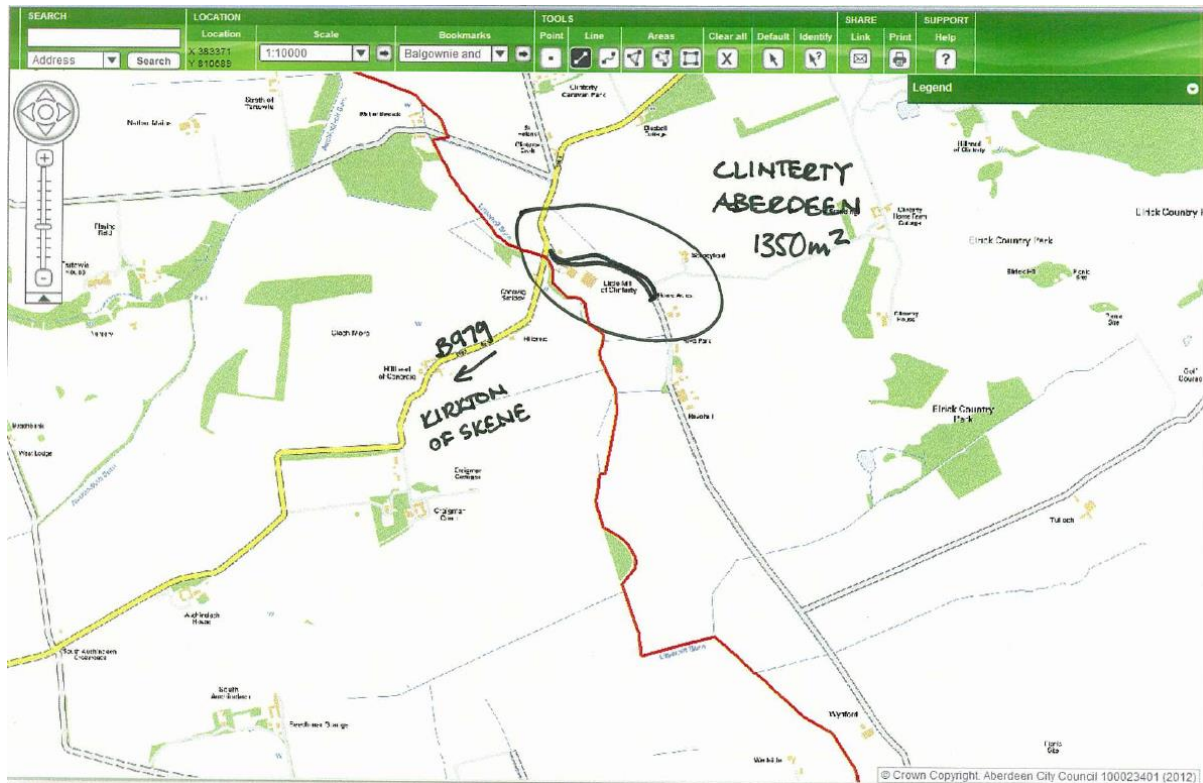
Figure 13: B979/C92K Little Mill of Clinterty, 1:1000 scale © Aberdeen City Council

Figure 14: B979/C92K Little Mill of Clinterty, image 1 © Google 2023

Figure 15: B979/C92K Little Mill of Clinterty, image 2 © Google 2023

5.4.1.3.   C88C Newhills Road
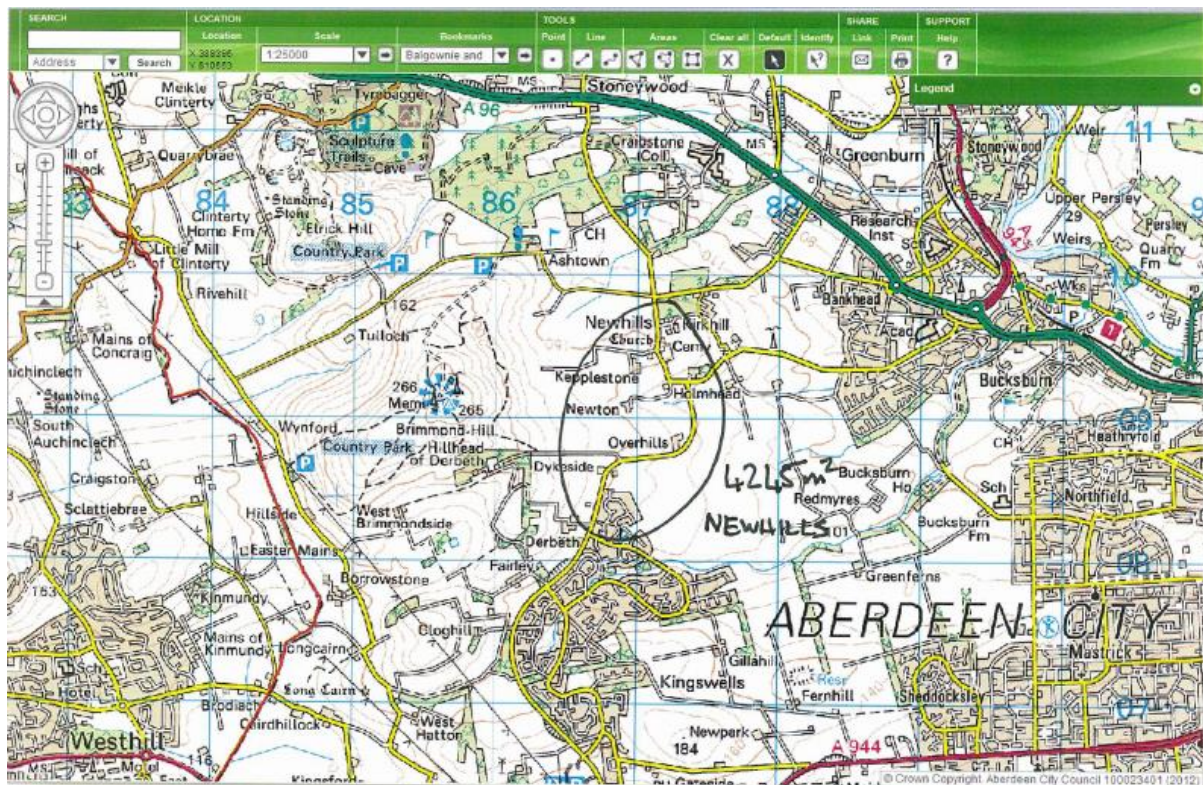
Figure 16: C89C Chapel of Stoneywood – Fairley Road, 1:25000 scale © Aberdeen City Council
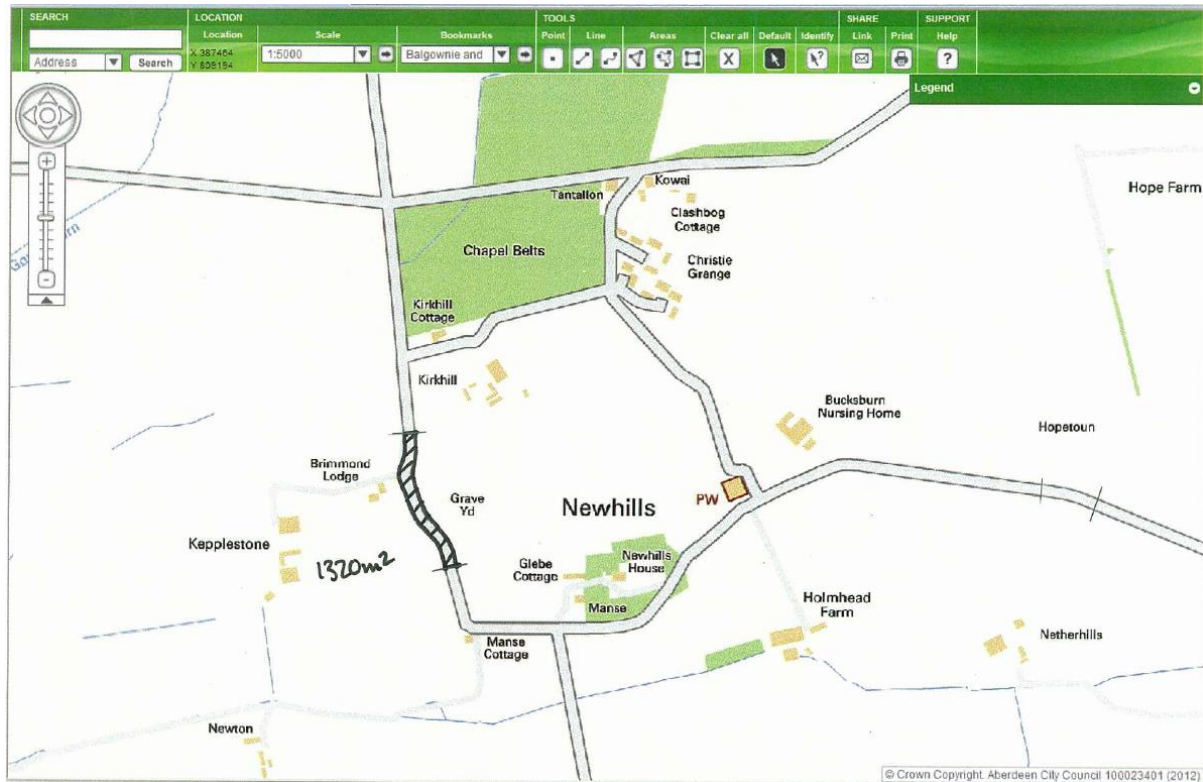
Figure 17: C89C Chapel of Stoneywood – Fairley Road (Part 1), 1:5000 scale © Aberdeen City Council

Figure 18: C90C Chapel of Stoneywood - Fairley Road, 1320m2 section © Google 2023

5.4.2. Aberdeenshire Council

Aberdeenshire Council offered the following interventions as examples of road safety mitigation works. Collision data provided below is accurate as of April 2023. Aberdeenshire Council offered a review of crash data from 2005-2023, so this was included in the information set out below for further context.

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### 5.4.2.1.	B977 Leylodge

It was advised that the requested works, including hazard marker posts and signs, were installed in May 2019 and that the area was also surface dressed in 2020. Prior to works, there were 11 recorded collisions (1 x 2011; 1 x 2012; 1 x 2014; 1 x 2015; 2 x 2016; and 5 x 2017). **Post works, no collisions have been recorded.** The following image illustrates the "SLOW" road marking, centre lines, hazard warning sign, and bollards:

Figure 19: B977 Leylodge © Google 2024

### 5.4.2.2.	A947 Plaidy

It was advised that the recommended works consisted of improvements to signage and road markings, and that the area was surface dressed in 2020. Prior to the works, there were 39 recorded collisions (4 x 2005; 2 x 2006; 2 x 2007; 3 x 2008; 7 x 2009; 5 x 2010; 7x2011; 1 x 2012; 3 x 2013; 2 x 2014; 2 x 2016). **Post works, no collisions have been recorded.**

The following image illustrates the works at the location:

Figure 20: A947 Plaid © Google 2024

5.4.2.3.   B9025 Bogton

The requests for works here were due to local concerns around junction safety. The recommended works were for improvements to signage and foliage removal. Prior to completion of the works, there were 3 recorded collisions (1 x 2008; 1 x 2011; 1 x 2013). **Post works, no collisions have been recorded.**

The following figure sets out the junction lay out:

Figure 21: B9025 Bogton, image 1 © Google 2024

Prior to the junction there is a warning sign:

Figure 22: B9025 Bogton, image 2 © Google 2024

Followed by a "SLOW" road marking prior to the junction:

Figure 23: B9025 Bogton, image 3 © Google 2024

5.4.3. Moray Council

The following interventions were offered as examples of successful road safety interventions by Moray Council. As with Aberdeen City Council, no definitive collision data could be provided.

5.4.3.1.   B9016 Buckie to Keith

Improvements were made through lining work undertaken on the route, focussing on centre lines and edge lines. An example of the lining work can be seen here in 2014:

Figure 24: B9016 Buckie to Keith. © Google 2024

5.4.3.2.   A940 Forres to Grantown on Spey

Further lining and signing works were undertaken on this route, including the use of "SLOW" markings on the road. An example of enhanced signed and road markings is set out in the following image from 2015:

Figure 25: A940 Forres to Keith, at Edinkillie Church © Google 2024

5.4.3.3.   A940 and A941

Lining and signing work was also undertaken on these routes, with a view to enhancing safety. It was also noted that on the A940 at Bridge of Knockach, the installation of traffic lights had resulted in a corresponding reduction in damage to the bridge, as illustrated in the following image:

Figure 26: Traffic lights at A940 Bridge of Knockach © Google 2024

6.   Discussion & Conclusions

It has been established that the causes of collisions are complex and multifaceted (Section 4). They are dependent on non-vehicular factors such as driver characteristics, driver fatigue, and risk-taking behaviours including speed, and the use of drink and drugs (Sections 4.1, 4.2) alongside the impact of infrastructure design (Section 4.3). Age and transport mode are also relevant factors (Sections 4.4, 4.5, 4.6, 4.7, and 4.10). It is also established that there are several primary (crash avoidance) and secondary (crash protection) measures available in vehicles to reduce risk to occupants, including Electronic Stability Control (ESC), airbags (including curtain airbags), Autonomous Emergency Braking (AEB) and Forward Collision Warning (FCW) systems that have all contributed to casualty reductions (Section 4.9).

This section will further discuss the vehicular and non-vehicular measures discussed in Section 4 with the collection data presented in Section 5, with a view to contextualising the many potential causes of the reduction in road collisions and casualties across North East Scotland between 2011 and 2020.

6.1.   Driver behaviours

Members of the public externalise the risk of being involved in a RTC through the identification of: (i) other road users; (ii) infrastructure; and (iii) a perceived lack of policing and enforcement, as potential collision factors in North East Scotland (Section 5.1). This externalisation of risk is also mirrored in the focus on enforcement & detection, infrastructure improvements, and safety cameras/average speed cameras that were suggested by members of the public as means of reducing RTCs (Section 5.1.4), demonstrating a failure to understand their own role in road safety. However, some participants did acknowledge the role that education could play in RTC reduction Section 5.1.4).

These findings are further reinforced by the observations of professionals with a road safety remit. For example, that members of the public can understand the purpose of safety measures in their own neighbourhoods (e.g., 20mph limits) but are less accepting of measures that are felt to inconvenience their journeys away from their immediate neighbourhoods (Section 5.3.8, Participant A). It was also felt that this externalisation of risk is impacted by the sense that RTCs are an abstract idea for many members of the public and that they are incidents that happen to other people (Section 5.4.8, Participant D). An idea that is further reinforced by the nature of media reporting of RTC events (Section 5.3.8, Participants A & D).

Members of the public also identified speed, errors, lapses of attention, and aggressive driving as being problem behaviours that are predictors of involvement in RTCs (Section 5.1). This aligns with the current understanding of such risk factors within academic literature (Smith 2016; Amos, Davids, & Fosdick 2015; de Winter & Doudou 2010; Section 4.1). Speed was also frequently referenced by professional participants as a relevant contributory factor (Sections 5.3 and 5.4), aligning with their understanding of the role of speed reduction in road safety policy (Section 3).

This is relevant for how future road safety messages are communicated around behaviour change and ensuring that road users are aware of their own agency in road safety measures This is evidenced by the focus of the Road Safety Scotland *"Don't Risk It"* campaign, whereby road users own behaviours are emphasised as being a contributing factor to RTCs (Section 3.2.2). However, more recent research suggests that such campaigns could potentially benefit from a more nuanced approach, as while there is not a there is not a difference between judgment of risk between genders, females exhibit greater concern about the consequences of the risk, i.e., of being involved in an accident, than males (Corellieri et al 2016), which is replicated in the gender balance of RTC statistics (e.g., Section 3.4.4). Similarly, it has been identified that that drug drivers are mainly male and under 35 years of age (Hasan et al 2022), and for drink drivers, the literature is consistent in identifying young adult males, driving at night on dry roads, on rural routes (Owen et al 2019). Based on these findings, **it is recommended that utilising KSI data to understand the role of gender in RTCs could offer a further avenue for behaviour change and educational initiatives (Recommendation 1).**

6.2. Age

Existing research also reinforces the role that age plays in RTC risk, from both the perspective of young drivers and older road users (Sections 4.5 and 4.10). Members of the public surveyed as part of the present research also felt that young drivers were a relevant contributor to RTCs (Section 5.1.3), and this is acknowledged through these representing areas of focus in policy at national, regional, and local level (Sections 3.2, 3.3, and 3.4). From the perspective of professionals with road safety remits who participated in the research, it was felt that these focus areas of young drivers and older road users would continue (Sections 5.2.6 and 5.3.7).

6.2.1. Young drivers

From the perspective of young drivers, it has been identified that it is a combination of factors that include road environment, travelling too fast for the conditions, inexperience, and loss of control, which contribute to single-vehicle collisions involving young drivers (Rolison and Moutari 2020 p. 175). Critically, it is noted that the failure to adapt to conditions and the road environment is identified as being a result of poor anticipation, rather than because of a lack of manoeuvring skills which are falsely thought to be more important than the ability to anticipate (Rolison and Moutari 2020 p. 175). Driver education programmes therefore need to be cognisant of these factors, and while Safe Drive Stay Alive has been noted as potentially beneficial, it was also expressed that areas where it was not utilised have also seen reduction in young driver casualties (Section 5.2.2, Participant 7A).

A suggested solution to further casualty reduction in the young driver group has been telematics. However, caution has been advised around the claimed effectiveness of telematics, partially due to the lack of research, and that it requires users opting into the scheme thereby potential excluding those who choose to engage in risk driving behaviours (Green et al 2020). Therefore, it is suggested that these cannot be solely relied upon as influencing the reduction in young people being killed and seriously injured on roads in North East Scotland, and **it is recommended that young drivers remain**

an area of focus, particularly in relation to their ability to adapt to changing road conditions and/or environment and through enhancement of anticipation skills (Recommendation 2).

6.2.2. Older road users

For older road users, visual, cognitive and mobility impairments along with medication usage have been identified as contributory factors to collisions (Rolison et al 2018). Visual impairments have been identified as relevant in the detection of vulnerable road users (e.g., Ranchet et al 2022) and in offering decreased visual acuity in poor light and contributing to RTC risk as a result (Amin 2020). However, caution also needs to be exercised in treating older road users as a homogenous group, with research demonstrating nuances in hazard perception abilities across older age groups (Folli and Bennet 2023 p.30; Section 4.5).

Therefore, the focus on future "fitness to drive" activities discussed by professional participants (Sections 5.2 and 5.3) offers this more nuanced approach to older road users by focusing on individual capacities and skills, rather than a uniform approach to all older road users. For example, through mandatory re-testing once a certain age is reached, as suggested by one member of the public (Section 5.1.4, Participant 10B).

This more nuanced approach of "fitness to drive" also aligns with the understanding that older road users typically construct risk as an external factor, than can be managed internally (i.e., through skills) (Siren and Kjaer 2011). Consequently, older road users may well self-regulate their own driving because of the behaviours of others rather than because of their own abilities (Siren and Kjaer 2011). It has been identified that training could offer enhanced hazard perception performance for older road users as a potential mechanism for reducing risk (Folli and Bennett 2023 p. 32; Anstey et al 2018). Therefore, **it is recommended that the "fitness to drive" approach for older road users continues to be a focus for road safety management in North East Scotland (Recommendation 3).**

6.3. Transport mode

Both literature and policy inform the understanding that transport mode aligns with risk and severity of injury (Sections 3 & 4). These were not extensively discussed by survey respondents or interview participants. However, it was noted that perception of risk is an important factor in cycle safety (Section 5.2.4, Participant 8A; Section 5.3.5, Participant A)

For pedestrians, the relationship between excess speed and pedestrian fatalities is well established (WHO 2023; Hussain et al 2019) and this relationship has had an impact on road safety policy. When comparing the factors for pedestrian crash risk set out in Table 2 above, the existing policy infrastructure in place in North East Scotland has worked to minimise the risk to pedestrians where possible, and this is reflected in the reduction in pedestrian casualties. It was also observed by one professional participant that when walking and cycling initiatives are planned, there needs to be a

focus on road safety to help media that perception of risk (Section 5.3.5, Participant A). However, while pedestrian fatalities are decreasing in high-income nations such as the UK, it is noted that these nations are also seeing reductions in pedestrian numbers and so the effectiveness of strategies cannot be assumed (Tiwari 2020).

For cyclists, "increasing the age of casualty from 35 years onwards, being hit by a goods vehicle, road speed limit 40mph and over, and the months of May and June were predictors of fatal and severe cycle casualties" (Mason-Jones et al 2022 p. 338). It is also notable that casualties over 70 and older were identified as being almost three times more likely to have a fatal or severe crash outcome, when compared with those aged 16 or younger (Mason-Jones et al 2022 p. 338). Participant D felt that the *"Give me cycle space"* campaign had helped facilitate greater awareness of cycling and cyclist vulnerabilities (Section 5.3.5). Looking ahead to future road safety initiatives, it was also commented that segregated infrastructure could offer improvements to overall cycle casualty rates (Section 5.2.5, Participant 1A and Participant 8A).

As noted previously, motorcyclists will not be considered in depth in this report, as this work formed part of previously commissioned work by Transport Scotland, *Motorcycle Safety Strategies in North East Scotland* (Hood 2021).

6.4. Vehicular measures

As noted above, there are several primary (crash avoidance) and secondary (crash protection) measures available in vehicles to reduce risk to occupants, including Electronic Stability Control (ESC), airbags (including curtain airbags), Autonomous Emergency Braking (AEB) and Forward Collision Warning (FCW) systems that have all contributed to casualty reductions (Section 4.9). Such features were referenced by members of the public as potentially contributing to casualty reduction (Section 5.1.6, Participants 4B, 19B, and 22B), although not discussed in detail by professional participants (Section 5.2.1, Participant 1A).

Section 4.9 above sets out, there inclusion of enhanced safety features has undoubtedly led to reductions in casualties but that there are limits to what these features can offer vehicle occupants.

6.5. Infrastructure

Both professional participants and members of the public discuss infrastructure as being a critical feature of road safety in North East Scotland. For members of the public, the quality of the road network was noted (Section 5.1.3, Participants 14B and 22B), along with the suitability of the network such as the A96 single carriageway section and the impact of slow-moving vehicles (Section 5.1.3, Participant 18B; Section 5.1.4, Participants 1B, 9B, 14B and 18B).

Professional participants note the impact of the AWPR (Section 5.2.1, Participants 1A and 8A) and general road infrastructure improvements such as skid-resistant surfaces (Section 5.2.1, Participants 1A, 4A; Section 5.3.3, Participants B & D). There was also an appetite for future improvements to infrastructure with suggested upgrades to the A90 and A96 mentioned by professional participants (Section 5.2.4, Participants 1A and 6A; Section 5.3.7, Participant C).

Throughout the responses of professional participants, it is evident that engineering interventions are valued and considered to be contributory factors to the reductions in casualties that have been seen (Sections 5.2 and 5.3). This is also replicated in the case studies set out in Section 5.4 that solely focus on engineering interventions through surface treatments (Aberdeen City Council), and improvements to road markings, signage, and bollards (Aberdeenshire Council and Moray Council).

Given that the number of RTCs at a given location ex-ante and ex-post works are readily quantifiable, it is understandable why such interventions are more easily referenced as positively contributing to road safety. However, it is also apparent that simple approaches to road safety such as road markings and signage can achieve casualty reductions. **It is therefore recommended that local authorities consider whether enhancements to road markings and signage at areas of known risk could offer potential casualty reductions (Recommendation 4).**

6.6.   Policy & casualty reduction

From the policy documentation reviewed in Section 3, it is evident that on paper there is a cohesive approach to road safety in North East Scotland, with evidence of appropriate partnership working. During the period under review, it is evident that there was alignment across strategies of road safety objectives across national, regional, and local levels. Reflecting on the national campaigns that support these policies, members of the public were also able to reflect on some specific road safety campaigns (Section 5.1.5, although responses were varied. Professional participants, also mentioned the role that such campaigns can play in the overall package of casualty reduction measures that are offered (Section 5.2.1, 5.2.2. 5.3.5).

Of particular significance when considering the policy environment is the reduction in permitted blood alcohol concentrations from 80mg/100ml of blood to 50mg/100ml of blood[9]. It has been determined that lowering the limit has not facilitated a decrease in RTCs, and when considered in isolation has not improved RTC outcomes in Scotland (Francesconi and James 2021; Cooper, Gehrsitz, and McIntyre 2020; Lewsey et al 2019; Haghpanahan 2018). This lack of impact has been attributed to the unavailability of cheaper transportation modes, and "weak" law enforcement (Francesconi and James 2021). Therefore, the findings from current academic literature contrast with the perceptions of many professional respondents that the change to the drink drive limit has resulted in a cultural change in

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[9] Road Traffic Act 1988 (Prescribed Limit) (Scotland) Regulations 2014

Scotland that has positively impacted road safety (Section 5.2.1, Participants 3A and 8A; Section 5.3.2, Participants A, C, and D).

6.7. Policing and enforcement

Perhaps unsurprisingly, many members of the public felt that policing and enforcement have the potential to significantly impact road safety. This related to active enforcement through a physical police presence (Section 5.1.4, Participants 7B, 15B, 16B, 17B), and more passive enforcement using safety cameras and average speed cameras across the road network (Section 5.1.4, Participants 11B, 20B, 26B, and 29B).

One professional participant commented on the lack of flexibility in relation to mobile speed cameras, and there was a sense that greater flexibility in deployment locations would be appreciated (Section 5.3.1, Participant D). Average speed camera enforcement was also noted by professional participants as contributing towards casualty reduction (Section 5.2.1, Participants 7A, 8A; Section 5.3.1, Participants A, C, D) with some participants noting these could offer further reductions (Section 5.2.4, Participant 6A).

The emphasis on average speed cameras as a road safety intervention is supported through the work of Owen, Ursach, and Allsop (2016) who conclude that "the implementation of ASCs [average speed cameras] in the locations that have been assessed […] has had the effect of reducing injury collisions, especially those of a higher severity" (2016 p. ix). These correspond with a reduction of fatal and serious collisions at the chosen locations of between **25-46%** (Owen, Ursach, and Allsop 2016 p. vii). Moreover, they conclude that "even taking into account other influencing factors, the reductions are large and statistically significant" (Owen, Ursach, and Allsop 2016 p. ix).

6.8. Data & data sharing

A significant point of discussion with interview participants that emerged during the survey responses related to data and data sharing practices. These were in relation to: (i) quality of data available; (ii) consistency of available data; (iii) sharing of data; and (iv) changes to recording of incidents and impact of CRASH (Section 5.2.3 and 5.3.6).

Based on data collected from professional participants with a road safety remit, **it is recommended that improvements in data sharing practices should be considered to enable more rapid understanding of emerging trends at local and regional level (Recommendation 5).**

Furthermore, **it is recommended that that there is consistent recording and reporting of data around road casualties in Scotland, to ensure that accurate and high-quality data is available to practitioners (Recommendation 6).**

Finally, in relation to data, **it is recommended that a mechanism of recording damage only collisions is considered to assist local authorities in identifying common factors and/or areas of risk across their networks (Recommendation 7).**

6.9. Conclusions

The aim of the research was to investigate the potential causes of the reduction in road collisions and casualties across North East Scotland between 2011 and 2020. Taking into consideration the data set out above in this Section 6, **it can be concluded that there is no single contributory factor that can be identified as having resulted in the observed casualty reduction in the North East of Scotland**.

The best explanation that can be offered for the reductions observed between 2011 and 2020 in North East Scotland is that these can be attributed to a combination of education, engineering, engagement, and enforcement strategies. It is also important that these are supported by appropriate evaluation, to understand impacts where possible. This is based on both the current academic literature explored in Section 4, but also from the responses of road safety professionals and the case studies set out in Section 5.4. Furthermore, advances in in-car technologies and safety measures have also undoubtedly impacted on casualty figures (Section 4.9), although it is acknowledged that this is difficult to quantify. Similarly, the improvements to post-crash care discussed in Section 4.8, can equally be considered to have improved outcomes for seriously injured casualties.

Through the preceding analysis, it has been possible to make several recommendations for future areas of focus in road safety for North East Scotland. To summarise, these are:

- It is recommended that utilising KSI data to understand the role of gender in RTCs could offer a further avenue for behaviour change and educational initiatives **(Recommendation 1).**
- It is recommended that young drivers remain an area of focus, particularly in relation to their ability to adapt to changing road conditions and/or environment and through enhancement of anticipation skills **(Recommendation 2).**
- It is recommended that the "fitness to drive" approach for older road users continues to be a focus for road safety management in North East Scotland **(Recommendation 3).**
- It is recommended that local authorities consider whether enhancements to road markings and signage at areas of known risk could offer potential casualty reductions **(Recommendation 4).**
- It is recommended that improvements in data sharing practices should be considered to enable more rapid understanding of emerging trends at local and regional level **(Recommendation 5).**
- It is recommended that that there is consistent recording and reporting of data around road casualties in Scotland, to ensure that accurate and high-quality data is available to practitioners **(Recommendation 6).**

- It is recommended that a mechanism of recording damage only collisions is considered to assist local authorities in identifying common factors and/or areas of risk across their networks **(Recommendation 7).**

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