

Non-fatal motorcycle crashes on public roads in North Queensland

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Abstract

Between March 2004 and June 2007 The Rural and Remote Road Safety Study recorded 164 non-fatal motorcycle crashes in which a rider was seriously injured (hospitalised for 24 hours or more) on North Queensland public roads or lands. 88 of these riders consented to an interview with research staff during which a questionnaire was administered to gather information on crash experience, demographics, behaviour, vehicle types, experience, and lifestyle factors. Queensland Transport's crash database provides information on those crashes which were officially reported on by police, and allows an analysis of consistency between police and patients' assessment of events surrounding crashes. Attributions of contributing circumstances by police are generally concordant with the versions of events provided by interviewed casualties, with some exceptions.

This paper describes motorcycle crashes on North Queensland public roads and lands, the vehicle types and riders involved, and explores the main factors contributing to crash and injury. While a large majority of crashes occurred on highways, secondary or sealed local roads, over 50% of vehicles were dedicated off-road (enduro) or dual purpose (road/trail) motorcycle types. Cruisers were the highest represented road motorcycle, comprising 17% of all motorcycle types. 12% of riders were unlicensed or inappropriately licensed for the vehicle type and approximately 15% of vehicles were unregistered. Most crashes occurred during late morning or early afternoon and the vast majority of riders were male (94%). The mean age of riders was 35 years, while 28% were aged between 16 and 24. The majority of riders interviewed (59%) indicated recreation (leisure or holiday) as their reason for travel, which together with the data on vehicle types raises interesting questions regarding the overall safety of recreational off-road motorcycling. The data and discussion raise several possibilities for developing tailored interventions targeting this vulnerable group of road users.

Introduction and background

Motorcycle sales in Australia have increased consistently in recent years and indications are that this trend may continue for the foreseeable future [1]. As motorcycling activity has increased, so too has the number of serious and fatal motorcycle crashes, though this is not observed as a simple linear relationship. Measuring fatality rates by numbers of registered vehicles or vehicle kilometres travelled, research suggests that motorcycling in Australia has become safer in the last two decades overall [2], but with no improvement in the last ten years [3]. In any case motorcyclists remain among the most vulnerable of Australian road users along with cyclists and pedestrians. While motorcycles now account for around 3.1% of all registered vehicles in Australia, motorcyclists represent approximately 15% of road user fatalities and an even greater proportion of serious injury cases [4]. Such data should be considered with caution as there are evidently substantial numbers of unregistered motorcycles in use on Australian roads¹, particularly in rural areas [4, 5].

While the historical overrepresentation of motorcyclists in crash and injury data is well documented, until recently there have been few examples of the implementation of motorcycle-specific strategies and interventions in Australia. As noted by Watson et al [4], an overall aim to improve safety for the greatest number of road users has in the past justified a focus on minimising car crashes. Increased emphasis on motorcycle safety is arguably justified given that car crash injuries have reduced substantially relative to use while motorcycle crash injuries have not. Since 1998, Queensland has seen a greater increase in serious

¹ This includes unnamed roads and vehicular tracks on public land.

motorcycle crashes than other states, with an 8.0% increase in fatal crashes over that period compared with the next highest increase of 3.7% in Western Australia [3].

Around one third of motorcycle crashes resulting in serious or fatal injury are single vehicle crashes [4, 6], although statistics vary depending on research settings and methodologies. Most research data are from urban crashes and do not reveal the greater prevalence of single vehicle crashes in rural areas (for example see Johnston *et al* [3]), many of which are unreported [5, 7]. Among the commonly cited risk factors for motorcycle crashes are excessive speed, alcohol and drug use, road conditions, inexperience and unlicensed riding. While the prevalence of these risk factors is generally well accepted, it is more difficult to accurately quantify their contribution to crash causation when multiple factors are present [4, 8]. For example, failure of another vehicle to give way to a motorcycle is a commonly cited factor for motorcycle crashes with other vehicles, but failure of a motorcyclist to respond to such events is sometimes also noted as contributing to crashes [6]. A failure to respond may be associated with excessive motorcycle speed, although this in itself is often difficult to measure accurately [9].

The subject of motorcycling on- and off-road has been addressed previously using RRRSS data, highlighting in particular the contribution of off-road crashes to transport-related hospital admissions [5]. The study provides a summary of motorcycle and all terrain vehicle (ATV) crash characteristics and rider demographics, noting that more information in both qualitative and quantitative domains is needed for a clearer understanding to inform targeted interventions. It has also been noted that no agency has particular responsibility for off-road motorcycle safety and that this situation should be addressed [10]. Among the conclusions were that off-road and on-road motorcyclists represent distinct groups, that relatively little is known about the former, and that commonly cited risk factors were observed in different proportions for each group. Known risk factors such as young age, unfamiliar and/or unregistered vehicle, unlicensed riding and general high risk lifestyle (harmful levels of alcohol consumption, illicit drug use) were more prevalent in the recreational off-road setting [5].

Among the challenges for successful intervention development are that motorcyclists are a heterogeneous group and their crashes are more often underreported than those involving other vehicles (particularly in rural areas), making reliable information difficult to obtain [4, 7]. Previous research has referred to a broad categorisation of motorcyclists which includes 'Outlaws', 'Boy Wonders', 'Dirts', 'Commuters' and 'Weekend Warriors', each with a distinct social profile [4]. However this description has limitations, in a rural context where agricultural workers may arguably warrant their own category, and more generally where there may be considerable crossover between groups (many riders own more than one type of motorcycle, for example). This paper aims to enhance current understanding of these issues by presenting a description of motorcycle crashes in rural and remote North Queensland, building on the work of Steinhardt *et al* [5]. Fatal crashes² have been excluded from the main analysis for the sake of brevity, yet the contribution of non-fatal crashes to the overall costs born by community and government should not be overlooked.

Methods

The data analysed are a subset of that collected between 1 March 2004 and 30 June 2007 for the Rural and Remote Road Safety Study (RRRSS) conducted by Queensland University of Technology's Centre for Accident Research and Road Safety – Queensland (CARRS-Q) and the Rural Health Research Unit at James Cook University. The Study recorded vehicle crashes in North Queensland which resulted in hospitalisation for at least 24 hours of a person aged sixteen years or over at one of four regional hospitals, or death. The Study area of approximately 800,000km² covers the area of Queensland North of Bowen in the east and Boulia in the west, excluding the urban areas of Cairns and Townsville/Thuringowa. RRRSS methodology is fully described elsewhere [10].

² There were 24 deaths from 23 fatal motorcycle crashes on public roads or land in the study period, constituting 12.3 percent of all motorcycle crashes on public roads or land. Eleven (48%) were single vehicle crashes.

For the current analysis we extracted RRRSS data for non-fatal motorcycle crashes which occurred on public roads, including highways, secondary and minor roads, and unnamed roads and tracks, as well as on public lands. Throughout this paper the term 'off-road' refers to anywhere on public lands, including poorly maintained unsealed roads, vehicular tracks and fire trails (including those alongside sealed roads and highways), as well as areas where there may be no actual road or track present. As it was not possible for RRRSS researchers to inspect crash sites or even locate them accurately in some cases, crashes were designated 'off-road' mostly on the basis of information provided by those involved.

The data derive primarily from interviews conducted in hospital with consenting casualties, and from Queensland Transport's crash database. Variables selected for analysis include the number of vehicles involved, motorcycle type, rider age, licence status, vehicle registration, time of day, alcohol and drug use, and activity type. For crashes which were reported to Queensland Transport (QT) the contributing circumstances cited by Queensland Police Service (QPS) and other relevant information were also analysed. SPSS (version 16.0) software was used for frequency analysis and crosstabulation. Combined data were exported for analysis to SPSS from MapInfo (version 8.0), the latter being the software into which it was originally entered.

Classifications of motorcycle types vary considerably depending on the source and there is no universal or widely accepted system for definition of motorcycle types. The system developed here to accommodate the range of motorcycle types observed is loosely adapted from categories used in the USA [11] and in Europe [12]. Vehicle model data were coded for analysis under the following categories:

1. Road – Sport (including 'naked' sport)
2. Road – Sport Touring
3. Road – Cruiser (including 'chopper' and large touring)
4. Road – Commuter (traditional)
5. Dual Purpose (road/trail)
6. Off-road – Enduro
7. Other (Motocross, Agricultural, Postal issue, Scooter/Moped and ATV/Quad)

Results are reported below in two sections. All results preceding 'Contributing factors' were obtained from combined data sources (interviewed casualties, hospital and ambulance records, QT data and also news reports). Results presented under 'Contributing factors' are drawn from police-reported QT records which, where possible, are compared with similarly coded information provided by interviewed casualties. The system used for coding and grouping of contributing circumstances is presented in Appendix 1.

Results

Vehicles involved

There were 156 non-fatal crashes involving a motorcycle registrable for use on Queensland public roads, and 8 additional crashes involving vehicles not registrable (4 ATV and 4 Motocross). Of the total (n=164), 72.6% were single vehicle crashes including 13 'hit animal' crashes (10.9% of all single vehicle crashes). Riders accounted for 97.6% of casualties, while the remaining 2.4% were pillion passengers.

Age, motorcycle type and gender

Approximately 94% of injured motorcyclists were male (gender data are missing for 2 cases). The average motorcyclist age was 35 years (n=161) overall. Younger riders aged 16 to 24 comprised 28% of casualties. Riders aged 30 to 49 comprised 57% of interviewees (n=88), an overrepresentation compared to the 46% of motorcyclists in that age range in the overall sample. Differences in age distribution were observed through crosstabulation of motorcycle type by rider age group (Table 1), though this can only be reported as a trend due to insufficient numbers for valid statistical analysis. Vehicle model data were available for 121 (73.8%) of the total 164 crashes. Off-road motorcycle types were observed most frequently, with 'Enduro' and 'Dual Purpose' vehicles representing 36.6% and 17.4% of all cases respectively. Age distributions were relatively

even in these categories overall, though 'Enduro' riders in the 25 – 34 year age groups are prominent and were more frequently injured than any other motorcyclist. Notably, 61.5% of 'Road – Sport' motorcycle crashes (n=13) involved a rider below 25 years of age, while only 5.9% of 'Cruiser' crashes (n 17) involved a rider in that age group. The 'Cruiser' and 'Dual Purpose' categories were occupied mainly by riders over 35 years of age.

Table 1: Motorcycle type by rider age group crosstabulation

Motorcycle type	Age Group							Total	%
	Under 25	25-34	35-44	45-54	55--64	65-74	75 >		
Road - Sport	8	3	2	0	0	0	0	13	10.7
Road - Sport Tourer	0	0	1	1	1	0	0	3	2.5
Road - Cruiser	1	2	7	3	2	1	1	17	14.0
Road - Commuter	1	1	1	3	2	0	0	8	6.6
Dual Purpose/Road-Trail	2	3	7	5	3	1	0	21	17.3
Off-road - Enduro	11	18	10	4	1	0	0	44	36.4
Other	8	4	0	1	2	0	0	15	12.4
Total	31	31	28	17	11	2	1	121	
Percent	25.6	25.6	23.1	14.0	9.1	1.7	0.8		100

Activity type and time of day

Of the 88 riders interviewed 59% indicated recreation (leisure or holiday) as the reason for travel at the time of their crash. Most but not all recreational riding took place off-road or on minor roads. Approximately 18% of crashes were in some way work-related, including 15 crashes in transit to/from work and 1 agricultural crash on public land. A further 14% occurred in transit to/from another activity, while there is no information on activity type for the remaining 8% of crashes (n=88).

The vast majority of crashes were in daylight hours, with 79.9% (n=164) occurring between the hours of 0600 and 1800. Of the crashes that occurred outside this period 21.2% were 'hit animal' crashes (n=33).

Licence and registration status

Around 12% of riders were unlicensed or inappropriately licensed for the type of motorcycle they were riding and approximately 15% of vehicles were unregistered for use on public roads or tracks. Unlicensed riders and unregistered vehicles were observed more frequently in recreational off-road settings. Only approximate figures are available here due to incomplete data on these two variables, or the unavailability of any official report at all.

Helmets and protective clothing

Reliable data on helmet use was available for 77 of the crashes analysed, indicating that approximately 92% of injured motorcyclists wore helmets. Helmet use data were missing for a large proportion of cases for which there was no QT report, and particularly for those cases for which there was also no interview, but again non-use of helmets was more common among off-road riders. Although a specific question on protective clothing was not included in the RRRSS questionnaire, numerous off-road riders indicated use of such clothing, including boots and body armour.

Contributing factors (QPS-reported crashes)

QPS reports to the QT database were available for 66 crashes. Of these, 44.4% were single motorcycle crashes, while a small majority of 55.6% involved two or more vehicles. Following the QPS designation of 'Unit 1' as the vehicle or operator which was most at fault, motorcyclists were seen as primarily responsible for 63.2% of crashes with other vehicles (n=38). Drivers of other vehicles were designated Unit 1 in 31.6% of cases, while data were missing for another two crashes.

A summary of contributing factors attributed to Unit 1 across all reports is provided in Table 2. The categories are composed of closely related contributing circumstances which were originally cited in QT reports (see Appendix 1). Reports typically list between one and three contributing circumstances for Unit 1 in each crash (seven crashes also had factors attributed to Unit 2). In total there were 105 attributions of a contributing circumstance to Unit 1 across all 66 reports.

A range of behavioural factors account for the vast majority of contributing circumstances cited, most of which are grouped for analysis under the categories 'Care and attention' and 'Violation – other'. Note that the category 'Violation – other' includes 'Dangerous driving', 'Follow too close', 'Fail to keep left', 'Improper overtaking', 'Unsafe lane change' and 'Cross double lines'. Under the 'Care and attention' category, 'Violation – undue care and attention' was cited for Unit 1 in 25 cases, while 'Vehicle entering driveway' was attributed to Unit 2 for three crashes. Alcohol or drugs were a contributing factor in seven crashes (10.9%, n=66) and the motorcycle was designated Unit 1 in six of the seven cases. Speed (excessive for circumstances or posted limit) was cited in 6.1% (4) of reported cases.

Road condition contributed to 28.8% (19) of all QPS-reported crashes and was the leading non-behavioural factor cited in reports (n=66). More specifically, roughly half (9) of these crashes had 'Road – wet/slippery' cited as the first contributing circumstance. For the single motorcycle crashes reported on (n=28), animals were cited as a factor in 28.6% of cases.

In 43 cases the QPS-reported contributing factors could be compared with those mentioned by casualties during interview. Riders' descriptions of events were generally concordant with QPS assessments, with the following exceptions. For multi-vehicle crashes, in 2 cases where QPS attributed fault exclusively to the rider, the rider claimed another vehicle had failed to give way. For single vehicle crashes, 2 riders admitted to travelling at excessive speed, where QPS cited only environmental factors (uncontrolled animal, road surface). Another rider (aged 30 years) noted both inexperience and inattention as factors, where QPS cited only wet/slippery road conditions.

Table 2: Main contributing factors cited by QPS for Unit 1 across 66 cases³

Contributing factor	Frequency			Percent
	Motorcycle	Other vehicle	Total	
Care and attention	15	4	19	28.8
Violation - other	15	4	19	28.8
Road condition	15	-	15	22.7
Driver - inexperience/lack of expertise	10	1	11	16.7
Animal	8	-	8	12.1
Alcohol/drug	6	1	7	10.6
Disobey signal/marker	3	3	6	9.1
Speed related	5	-	5	7.6
Fail to give way	1	3	4	6.1
Driver age (lack of perception/concentration)	1	1	2	3.0

³ Percentages exceed 100 in total as multiple factors were attributed in some cases.

Discussion

Limitations

The QPS attribution of contributing factors is biased toward crashes involving more than one vehicle on sealed or frequently used dirt roads. Further, the attribution of insufficient 'care and attention' as a contributing factor must be viewed with caution as this can sometimes be cited by default in the absence of other evidence. There is a bias toward older riders in the interview data, with those aged 30 to 49 overrepresented by around 10%. There are 55 crashes recorded in RRRSS data for which vehicle type and/or property type (public or private) is unknown and these crashes have been excluded from this analysis.

Crash characteristics and contributing factors

As is the case for RRRSS crashes in general, care and attention and other violations of a behavioural nature constitute the majority of contributing factors overall. This indicates that rider and driver behaviour should remain a focus for motorcycle safety interventions. However, road conditions and animals contributed to around 23% and 12% of reported crashes respectively. These factors may be addressed through a combination of interventions which address both behaviour and engineering issues. Alcohol and drug use appears less prominent in non-fatal than in fatal motorcycle crashes in RRRSS and other Australian data, yet the work by Steinhardt *et al* (2006) indicating high levels of alcohol use in general lifestyle suggests further research in this area for off-road riders may be warranted.

Excessive speed is often cited in the literature as the most frequent contributor to motorcycle crashes, although this does not necessarily mean high speed as average impacts may be less than 50km/h [4, 12, 13]. While the circumstances surrounding fatal crashes are not considered here, the RRRSS data for non-fatal crashes does not demonstrate a particular prominence of speed among contributing factors. However, the relatively low number of crashes reported as speed-related does not necessarily indicate that excessive speed is a minor contributor in crashes overall. Rather, it may indicate that speed and its role in causation is difficult to assess post-crash, as mentioned previously.

Age, motorcycle type and activity type

With the possible exception of 'Outlaws', all groups of motorcyclist previously mentioned are arguably present in the RRRSS data. 'Boy Wonder' best represents young riders on 'Road – Sport' motorcycles, 'Dirts' of a wider age range account for most recreational 'Enduro' and some 'Dual Purpose' riders, while 'Weekend Warriors' are typically older riders of 'Cruiser' motorcycles. 'Commuters' as motorcyclists are more likely spread across the full spectrum of registrable motorcycle types and not just limited to 'Commuter' type motorcycles. In the context of rural and remote Queensland, if not elsewhere, it should be noted that some motorcyclists do not fit neatly into any of these groupings. These would include tourists and agricultural workers in particular. While only one crash analysed here was known to be directly work-related (agricultural), these data merely hint at a much larger problem occurring mainly on private property [10].

It has been noted previously that off-road riders tend to accept a relatively high level of risk as inherent in the activity [4, 5]. Resource allocation demands that there is only very limited enforcement of road safety laws in off-road and remote environments, while engineering solutions are arguably redundant altogether for riders seeking to challenge themselves or their peers. A number of crashes on roads involved dedicated off-road motorcycles. While there is no literature addressing the topic in any detail, the transition from off-road riding in a competitive context to riding on road in transit to or from that activity may present challenges for some riders, who arguably need to be fully conscious of the changing environmental context and adjust their behavior accordingly. Effective interventions may arguably therefore focus on education and training strategies, as well as on promoting greater use of protective clothing. Any such intervention for recreational off-road riders should also target riders on private property, as the crash characteristics and outcomes are similar for public and private properties.

Licence and registration status

Given that around 12% of riders in the study were effectively unlicensed and that this constitutes a known risk factor, greater efforts to increase licence acquisition and retention rates are encouraged. The previous study by Steinhardt *et al* (2006) indicates that off-road riders should be a particular focus for rural areas as they are far more likely to be unlicensed than other riders. There were a number of vehicles in the study not registrable for use on public roads, as well as those which met with ADR (Australian Design Rules) compliance but were not registered. Continued policing and enforcement, and better resourcing if possible, is supported to reduce the number of unregistered vehicles in use on public roads and lands.

Helmet use

From previous analysis of RRRSS data [5], rates of helmet use are noticeably higher on public roads and land than on private property. However, as is the case with car drivers and seatbelts, a small minority of riders on roads and public lands disregard both the legal requirement and the well-publicised injury reduction benefits of helmet use. Greater promotion and enforcement regarding helmet use is advocated.

Conclusion

There are 55 crashes recorded in RRRSS data for which vehicle type (motorcycle or other) and/or property type (public or private) remains unknown and these crashes have been excluded from this analysis. Comparison of the overall RRRSS dataset with the QT reports alone highlights that many serious motorcycle crashes on rural and remote public roads are unreported, in particular single vehicle crashes. Consequently, overall assessments of rural and remote motorcycle safety issues based solely on official records may be not be entirely accurate, reflecting influences of resource and other constraints on accident investigation. Additionally there are no exposure data for off-road motorcycle riding, so crash and injury rates could not be reliably estimated in the event that all crashes were reported.

Motorcyclists in North Queensland are a diverse and heterogeneous group who are unlikely to be entirely captured by broadly oriented interventions. Given the high proportion of recreational riders observed, most of whom ride both off-road and on highways at least occasionally, this may represent the primary target group. As has been suggested previously [10], allocation of responsibility for off-road motorcycle safety to a particular agency may assist in addressing these issues. Behavioural factors account for the majority of contributing circumstances in crashes, yet road conditions and animals represent considerable hazards for North Queensland motorcyclists. Finally, while riders of all ages up to around 60 years are well represented, attention may be paid to which age groups typically ride particular motorcycle types in order to tailor interventions appropriately.

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Appendix 1: Rural and Remote Road Safety Study coding of contributing factors

Original code	QPS-reported contributing circumstance	Sub-category	Major category
1	Miscellaneous	Miscellaneous	Other
2	Driver-Fatigue related by definition	Driver-Fatigue related by definition	Other
3	Violation-Over prescribed concentration of alcohol	Alcohol/drug	Behavioural
4	Excessive speed for circumstances	Speed related	Behavioural
5	Violation-Dangerous driving	Violation – other	Behavioural
6	Road-Wet/slippy	Road condition	Environmental
7	Condition-Under influence of liquor/drug	Alcohol/drug	Behavioural
8	Violation-Undue care and attention	Care and attention	Behavioural
9	Violation-Turn in face of oncoming traffic	Fail to give way	Behavioural
10	Road Conditions-Miscellaneous	Road condition	Environmental
11	Violation-Illegally parked	Violation – other	Behavioural
12	Violation-Fail to give way	Fail to give way	Behavioural
13	Animal Uncontrolled-On road	Animal	Environmental
14	Vehicle-Tyres (Low tread; Puncture/Blowout)	Vehicle related (mechanical failure/defect)	Vehicle-related
15	Violation-Follow too close	Violation – other	Behavioural
16	Driver-Inexperience/Lack of expertise	Driver-Inexperience/Lack of expertise	Other
17	Driver-Fatigue/Fell asleep	Fatigue (fell asleep)	Behavioural
18	Driver-Inattention/Negligence	Care and attention	Behavioural
19	Vehicle-Load shift	Vehicle related (mechanical failure/defect)	Vehicle-related
20	Driver-Medical condition (Heart attack; Epilepsy etc)	Driver condition (medical)	Medical
21	Road-Gravel/Dirt	Road condition	Environmental
22	Driver-Underage (Inexperience)	Driver-Underage (Inexperience)	Other
23	Atmospheric-Dust	Atmospheric condition	Environmental
24	Vehicle defects-Miscellaneous	Vehicle related (mechanical failure/defect)	Vehicle-related
25	Violation-Fail to keep left	Violation – other	Behavioural
26	Road-Narrow	Road condition	Environmental
27	Driver-Taking avoiding action to miss another road user	Avoiding other road user	Behavioural
28	Violation-Fail to give way on pedestrian crossing	Fail to give way	Behavioural
29	Driver-Age (Lack of perception; Power, Concentration)	Driver-Age (Lack perception/concentration)	Other
30	Violation-Improper overtaking	Violation – other	Behavioural
31	Violation-Disobey give way sign	Disobey signal/marker	Behavioural
32	Vehicle entering driveway	Care and attention	Behavioural
33	Driver-Distracted	Care and attention	Behavioural
34	Violation-Exceeding speed limit	Speed related	Behavioural
35	Violation-Unsafe lane change	Violation – other	Behavioural
36	Vehicle-Towing attachment	Vehicle related (mechanical failure/defect)	Vehicle-related
37	Vehicle-Suspension	Vehicle related (mechanical failure/defect)	Vehicle-related
38	Road-Potholes	Road condition	Environmental
39	Violation-Cross double lines	Violation – other	Behavioural
40	Lighting-Sunlight glare (Dawn/Dusk/Reflection)	Lighting condition	Environmental
41	Road-Rough surface	Road condition	Environmental
42	Violation-Disobey red traffic light	Disobey signal/marker	Behavioural
43	Violation-Disobey stop sign	Disobey signal/marker	Behavioural
44	Driver Condition-Miscellaneous	Driver Condition-Miscellaneous	Other
45	Violation-Tested for drugs only	Alcohol/drug	Behavioural
46	Atmospheric-Heavy rain	Atmospheric condition	Environmental
47	Road-Water covering	Road condition	Environmental
48	Road-Temporary object on carriageway	Road condition	Environmental
49	Lighting condition-Miscellaneous	Lighting condition	Environmental
50	Lighting-Wearing dark clothing	Care and attention	Behavioural
51	Lighting-No street lighting	Lighting condition	Environmental
52	Atmospheric-Fog	Atmospheric condition	Environmental
53	Road – Rough shoulders	Road condition	Environmental
54	Violation – Disobey traffic sign	Disobey signal/marker	Behavioural
55	Lighting – Headlights off/no lights on vehicle	Violation – other	Behavioural
56	Road – Crest/dip – view obscured	Road condition	Environmental