TRANSPORT

Road safety in Otago and Southland regions: the top priorities for action

Interim report

environment SOUTHLAND

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This is an interim version.
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Executive summary

Road trauma is projected to impose a collective social cost on the Otago and Southland regions of between $224M and $332M each year. This report identifies the main priorities for investment and action that roading authorities, NZ Police and Accident Compensation Corporation need to make in Otago and Southland to reduce this unacceptably high level of road trauma. To identify these priorities, Otago Regional Council, with support and funding assistance from Environment Southland and NZ Transport Agency (NZTA) undertook extensive scientific analyses of road trauma data sets. The report summarises the results of these analyses and describes the methodology and evidence behind the choice of priorities.

The five top priorities for action in Otago and Southland regions are identified as: motorcyclists, pedestrians, cyclists—these can be collectively categorised as vulnerable road users—plus driving under the influence of alcohol and driving on roads where the speed limit is 80kph or higher. These 'Big 5' concerns stood out from the 200-plus factors analysed.

All five concerns are priority matters in Otago. Three—motorcyclists, pedestrians, and driving on high speed roads—are priority matters for Southland region. Of these motorcyclists, high speeds and driving under the influence of alcohol are matters of high concern in S*afer Journeys New Zealand's road safety strategy 2010-2010,* while walking and cycling safety are matters of medium concern in *Safer Journeys*.

This report also analyses whether the types of driving behaviour mentioned in Safer Journeys are a priority for action in Otago and Southland. Of 14 behaviours analysed in five categories, five behaviours stood out as being more serious than the other nine behaviours analysed:

- driving while over the legal BAC limit
- failing to give way to a pedestrian (Otago only, mainly Dunedin).
- travelling too fast for the conditions
- undertaking dangerous manoeuvring
- driving while fatigued

Of these five behaviours only two (driving while over the legal Blood Alcohol Concentration (BAC) limit and failing to give way to a pedestrian) reached statistical significance. There are obvious overlaps between the Big 5 priorities and these driving behaviours identified as priorities for action. Planning interventions to address these five behaviours thus needs to be integrated with planning of interventions to address the 'Big 5' priorities for action.

A second report, *Factors causing serious road trauma in each district of Otago and Southland regions: results of statistical analyses*, to be published mid-2015, summarises analyses of data on fatal and serious injuries for each of the districts in Otago and Southland, by local road and state highways. As well as showing more detail about the Big 5 issues occur, this second report identifies some road trauma issues that are serious in only one district of Otago or Southland (rather than throughout one or both regions).

Identifying these priorities will allow the Otago and Southland Regional Transport Committees to evaluate whether the investment currently being made in road safety is at the right level, being targeted appropriately, and coordinated effectively across agencies.

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1. Introduction

This report identifies the main priorities for investment and action needed in Otago and Southland regions to reduce an unacceptably high level of road trauma. Statistical projections show that road crashes will continue to impose a collective social cost of somewhere between $224M and $332M each year in the two regions — unless we change how we behave on our roads and how we address road trauma[1]. This cost to society equates to approximately 2% of the GDP of each region.

Safer Journeys, NZ's national road safety strategy 2010-20 envisages regional transport committees and regional road safety action plans playing a key part in identifying the actions needed to reduce road trauma in each region to an acceptable level[2]. As a first step towards developing a regional action plan for Otago, and to update the Southland regional road safety strategy action plan, ORC, with support and funding assistance from Environment Southland and NZ Transport Agency (NZTA), employed a statistician to undertake statistical analyses of Otago and Southland data. The statistician (Elle Flinn, one of the two authors of this report) undertook extensive analysis of data, to determine the matters on which to focus in order to substantially reduce serious road trauma.

Rather than rely on national data and priority setting, we examined data from Otago and Southland. This data came from three data sets: hospital records, Accident Compensation Corporation (ACC) and the Crash Analysis System (CAS) operated by NZ Police and NZTA. This is the first time such extensive analyses has been undertaken to identify the matters on which local authorities, NZTA, ACC and NZ Police should focus in Otago and Southland.

This approach (described in the Methodology section, following) proved much more robust and insightful than analysing CAS data only, as has been the practice in Otago and Southland. This report summarises the key results from extensive scientific analyses of road trauma data sets, including the methodology and evidence behind the choice of priorities[3].

The section on methodology describes the data sets used, and the method used to identify which of the many possible topics should be priorities for action. The following section then identifies the five top priorities for action in Otago and Southland: motorcyclists, pedestrians, cyclists—which can be collectively categorised as vulnerable road users—plus driving under the influence of alcohol and driving on high speed roads (i.e. those with a speed limit of 80kph or higher). These 'Big 5' concerns stood out from the 200 or so issues and factors analysed. This section also examines the reasons why each of the 'Big 5' matters should be priorities for action.

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[1] Based on statistical projections of recent crashes (2010-13); analysis available from Otago Regional Council (ORC). Road crashes (and their social cost) include both motorised and non-motorised incidents that occur on the transport network. Examples of the non-motorised incidents include someone tripping on a footpath or roadway, falling down the steps of a bus, or a roadside tree injuring someone on a footpath. Sometimes people refer to these types of incident as being an accident rather than a crash.

[2] P. 44, *Safer Journeys New Zealand's Road Safety Strategy 2010-2020*. National Road Safety Committee and New Zealand Government, n.d., available from http://www.saferjourneys.govt.nz/resources/

[3] Unpublished reports containing detailed analyses are available from ORC.

Driver error is a contributor in most crashes; research suggests that the contribution of driver error to crashes is likely to be up to 90%[4]. This suggests the worthwhileness of analysing driver behaviours when determining the priorities for road safety action. So, in addition, to identifying the key concerns by analysing possible causal and contributory factors in ACC, CAS and hospitalisation data, we also analysed the types of driver behaviour identified in *Safer Journeys* (NZ road safety strategy and action plans). To determine how much of an issue these behaviours are in Otago and Southland, we examined five categories of behaviours:

- Road users suffer or cause serious injuries due to a lack of skills or competence.
- The unpredictability of road users causes fatal or serious injury.
- Drivers do not comply with road rules sufficiently to prevent fatal or serious injuries occurring.
- Drivers are impaired by drugs, alcohol or fatigue to the extent that they drive unsafely.
- Drivers are not alert enough to drive safely.

The appendix contains a summary of the trend in the number of crashes associated with these types of behaviours (divided into 14 sub-categories in total), and of the geographical distribution and severity of these crashes, presented in a series of tables and followed by a detailed analysis for each type of behaviour. Analysis of crash trend, geographical distribution and severity indicates how much emphasis to place on each issue, and thus which desired effects should be prioritised for intervention.

This is one of a pair of reports. The second report, to be published by mid-2015, summarises the results of the analysis of CAS, ACC and hospitalisation data concerning serious road trauma in each of the districts in Otago and Southland; it also differentiates between crashes on local roads and those on state highways. This second report also identifies some issues that are associated with high crash severity in only one of the districts in the two regions (these involve lower numbers of crashes than those of the Big 5 issues).

[4] Treat, JR, Tumbas, NS, McDonald, ST, Shinar, D, Hume, RD, Mayer, RE, Stansifer, RL & Castellan, NJ 1979, *Tri-level study of the causes of traffic accidents: final report: executive summary,* report DOT/HS 805 099, Institute for Research in Public Safety, Indiana University, Bloomington, IN, USA.

2. Methodology

2.1. Data sources

The method used to identify the priorities for action on road safety in Otago and Southland involved statistically analysing data from three different sources, CAS, hospital records and ACC data. Each data set has strengths and weaknesses when used for this purpose, described below, and in Table 1. Because of this, use of all three data sets provides much more insight to what is causing or exacerbating road trauma, than does merely using one of these data sets.

2.1.1. CAS

CAS is the most common data source used by public sector organisations in New Zealand. It is made up of Police' Traffic Crash Reports (TCRs) compiled at the scene of a crash by attending officers. The database is maintained by NZTA.

Strengths:

- Provides a lot of detail about individual crashes (including geographical location)
- Supplies information, assessed by Police, about driver condition at the time of the crash (i.e. whether the driver was speeding, under the influence of illicit substances, fatigued, etc.)
- Gives specific information about what actually happened (e.g. Driver A saw an animal in the road, swerved and hit Driver B, who was trying to overtake a campervan).

Weaknesses:

- Is heavily influenced by under-reporting; some crashes are much more likely to be reported to Police than others (e.g. single-vehicle crashes are less likely to be relative than are multi-vehicle crashes[5])
- Police definition of severity (minor / serious / fatal), which is used by local and central government to prioritise actions and interventions, is very unreliable; for example, research indicates that approximately 15% of those with a 'minor' injury on the police crash report actually possessed an injury with a significant threat to life[6].

2.1.2. Hospital records

Hospitalisation data is rarely used by government authorities, but can be purchased from the Ministry of Health (NZD $200-$300).

Strengths:

- Source of exhaustive records: (almost) everyone who has been involved in a serious incident will end up in hospital at some stage for treatment, so that there will be very little under-reporting

[5] Alsop, J., & Langley, J. (2001). Under-reporting of motor vehicle traffic crash victims in New Zealand. *Accident Analysis & Prevention, 33*, 353-359.

[6] McDonald, G., Davie, G., & Langley, J. (2009). Validity of police-reported information on injury severity for those hospitalized from motor vehicle traffic crashes. *Traffic Injury Prevention, 10,* 184-190.

- Include information on the medical treatment that patients received, and the length of their stay in hospital, thus providing a useful guide as to the sort of medical and surgical care that crash victims require
- Include accurate information on patient's home address, allowing a researcher to easily distinguish between locals, domestic visitors and international visitors
- Provide information on all 'land transport accidents', including incidents that are not typically recorded by the Police, but may be relevant to local authorities' safety programmes (e.g. equestrians falling from their horse, quad bike accidents and cyclists crashing into an object).

Weaknesses:

- No information supplied on the specific details of the crash (e.g. geographical location of the crash, or relevant driver behaviour factors, such as speeding or the influence of alcohol)
- Very difficult to separate out motor vehicle crashes from non-motor-vehicle road accidents (e.g. it is nearly impossible to distinguish between cyclists who have been hit by a motor vehicle and cyclists who hit a rock and fell off their bike; the hospital often only records 'cyclist', with no further details)
- No information supplied about whether the accidents or crashes in question took place on a public road or not: Government authorities are focused on public-road incidents, not private-road incidents, but hospital records do not distinguish between accidents or crashes in these locations.

2.1.3. ACC data

ACC data is rarely used by traffic agencies (e.g. NZTA, Ministry of Transport), but is available for use provided that a successful application is made to the ACC Research Ethics Committee.

Strengths:

- Relatively detailed information available about the crash event (e.g. Client A lost control of their motorcycle and struck a tree)
- Includes detailed information about the amount (in NZD$) that ACC paid to the client, thus providing a highly accurate estimate of the social cost of a crash (with more severe crashes usually resulting in a higher ACC payout, due to more expensive medical procedures and longer rehabilitation time for the client)
- Easy to separate motor vehicle crashes from non-motor-vehicle incidents as ACC has a special funding mechanism for all incidents that involve a moving motor vehicle on a public road, and these crashes can be easily separated from other sorts of on-road incidents (such as a person falling while jogging on the road surface, for example).

Weaknesses:

- Not everyone makes an ACC claim following a crash or accident, and some people are much more likely to make a claim than others[7]
- Very little information available on international tourists, as they tend to make few ACC claims, either because many are unaware of ACC, or they would prefer to make a

[7] See, for example, an ACC review indicating that Māori are much less likely to make an ACC claim than other New Zealand ethnic groups: http://www.acc.co.nz/for-providers/clinical-best-practice/acc-review/WCM2_020303 .

claim using their own travel insurance, which usually covers injuries sustained during their New Zealand visit)

- No information available about the incident's geographical location, or the driver's mental state or behaviour at the time of the crash (e.g. fatigued / under the influence of alcohol / speeding).

The characteristics of the three datasets are summarised in Table 1, following.

Table 1 Characteristics of the data used to set road safety priorities

	Crash Analysis System (CAS) data	Hospital records	ACC data
Level of bias	High	Low	Medium
Detail about individual crash	High (information on geographical location and driver's mental state)	Low (No information on geographical location or details of crash)	Medium (information on some crash details, but no geographical location or indication of driver's mental state)
Accuracy of crash severity estimate	Low (Police and NZTA coders are not trained medical professionals)	High (medical professionals assess crash severity)	High (medical professionals assess crash severity)
Information on medical treatment and post-incident care	None	High	High
Ability to separate motor vehicle crashes from non-motor-vehicle incidents	Yes	No	Yes
Ability to distinguish between locals, domestic tourists and international tourists	Limited (The license type of the driver can be identified, but limited information on domestic local New Zealanders.)	Yes	Partly (Locals and domestic tourists can be differentiated, but very little information on international tourists.)

This report uses data for 2010-2013 inclusive. This period was chosen in order to ensure a reasonably-sized dataset that is relevant to the present day, i.e. to ensure that enforcement and reporting rates remain relatively stable throughout the dataset. The CAS dataset used for Otago contained all reported injury crashes for 2010-2013, but the Southland CAS data was obtained in mid-January 2014 while unfiled Police reports from November and December 2013 were still being processed. This should not have affected the results of the statistical analysis, because data from November and December was available for 2010, 2011 and 2012, and only very few crashes, relative to the size of the total dataset, had been excluded in late-2013.

2.2. Method used to prioritise topics of concern

To choose the topics on which this report focuses, each road safety issue (from a choice of around 200 field on which data is collected) was ranked according to four separate factors. The five topics of concern identified in this document scored highest overall on the four factors listed below: trend, severity, geographical spread and strength of evidence base.

Trend

Are the number of crashes in a particular topic of concern increasing, decreasing or remaining the same?

Severity

How severe do these crashes tend to be, on average?

Geographical spread

Are crashes of this type common throughout Otago and Southland, or do they only feature in a few locations?

Strength of evidence base

Does the topic of concern feature in all three datasets (CAS, hospital records and ACC data), where relevant?

The social cost of crashes for a particular topic of concern is assessed through examination of hospitalisation and ACC datasets, both of which provide accurate information on injury severity and, in ACC's case, the payout to the client (if any).

Using only the number of incidents reported in CAS to prioritise topics for action would be unwise, because under-reporting is substantial for some road-user groups. For example, ACC data indicates that less than 25% of motorcycle injury crashes are reported in Otago and Southland, meaning that the raw number of motorcycle crashes is artificially low in CAS and thus provides a misleading picture of the true situation, even though it appears that CAS has captured the most serious of the motorcycle crashes that have occurred[8].

Consequently, ACC and hospitalisation data has been used in conjunction with CAS data, where possible, to prioritise topics for action.

2.3. Method used to determine driver behaviour priorities for action

Table 2 lists the driver behaviours analysed (identified from the *Safer Journeys* strategy and action plans). Only CAS data may be used to analyse these because ACC and hospitalisation records do not include information on the driver's skill level, degree of alcohol or drug intoxication, or other details of the driver's mental state. This is a potential problem if some types of behaviour are more likely to be identified by police attending crashes as being

[8] For an estimate of the rates of under-reporting by travel mode, see the accompanying report *Factors causing serious road trauma in each district of Otago and Southland regions: results of statistical analyses,* ORC and ES, to be published in mid-2015.

implicated in the crash; this would introduce bias into the results. We were not able to examine the level of bias.

Table 2 Categories of driver behaviour examined

The behaviour examined	The sub-categories of behaviour analysed
Road users suffer or cause serious injuries due to a lack of skills or competence	Inexperience, new driver Inexperience, overseas driver Inexperience, other
The unpredictability of road users causes fatal or serious injury	Travelling too fast for the conditions Undertaken sudden movement Undertaking a dangerous manoeuvre
Drivers do not comply with road rules sufficiently to prevent fatal or serious injuries occurring	Failing to give way Failing to give way to a pedestrian Failing to stop
Drivers are impaired by drugs, alcohol or fatigue to the extent that they drive unsafely	Driving/travelling while over the BAC limit Driving/travelling while fatigued
Drivers are not alert enough to drive safely	Inattention Distraction Distracted by an internal object (e.g. in car)

Appendix 2 lists the particular Police codes for traffic crashes used to identify the occurrence of these behaviours, and groups these codes into 14 sub-categories of behaviour spanning the five behaviours examined.

In order to indicate how much emphasis to place on each issue, and thus which desired effects should be prioritised for intervention, three major analyses were conducted for each driver behaviour issue:

- trend (how the number of crashes involving each issue changed over time)
- district (how the issue is distributed throughout the two regions)
- severity (whether the issue tends to result in particularly severe or fatal crashes).

Although it would be useful to know whether different categories of road user are more prone to certain behaviours than others (for example, whether car occupants are prone to distraction relative to other road-user groups), it is impossible to do this accurately using the CAS data available. Crashes involving some road-user groups are so heavily under-reported that an analysis of road-user type in this way would be meaningless. Until reporting rates improve, an examination of the relationship between road-user type and each of these issues cannot be conducted accurately.

3. Results

3.1. Summary of results

Statistical analyses identified the five main topics of concern in Otago and Southland, in decreasing order of priority, as:

1. motorcyclists
2. pedestrians
3. cyclists
4. driving on roads where the speed limit is high (80 kph or more)
5. driving under the influence of alcohol.

All five are priority matters needing to be addressed in Otago. Of the five, three of them—motorcyclists, pedestrians, and driving on high speed roads—are priority matters for Southland region.

Table 3 ranks these five concerns in order of priority for action, from one to five (based primarily on the four factors listed in the Methodology section) and summarised the evidence for each issue being one on which road safety interventions in Otago and Southland should focus for the next few years. Section 3.2 sets out this evidence more fully.

Table 3 **Priorities for road safety actions in Otago and Southland, with a summary of the evidence**

	Motorcyclists	Pedestrians	Cyclists	High speed areas	Driving under the influence of alcohol
Region in which this is a key issue	Otago Southland	Otago Southland	Otago	Otago Southland	Otago
Trend in recent years	Strongly increasing	Remaining stable	Strongly increasing	Decreasing slightly	Decreasing slightly
Severity	Very high	High	High	High	High
Geographical spread	Throughout urban and rural parts of Otago Southland	Throughout urban and rural parts of Otago and Southland	Throughout some parts of Otago: Dunedin City & Queenstown-Lakes District	Throughout urban parts of Otago, Southland including those in Waitaki District	Throughout rural parts of Otago: Central Otago, Queenstown-Lakes and Waitaki districts
Strength of evidence base	All three datasets show this to be a major issue Very low reporting rate in CAS (25.7% or lower)*	CAS & ACC datasets show this to be a major issue Low reporting rate in CAS (42.5% or lower)*	CAS & hospital datasets show this to be a major issue Low reporting rate in CAS (56.4% or lower)*	Irrelevant: No information in ACC or hospitalisation datasets	Irrelevant: No information in ACC or hospitalisation datasets

* Examination of the cost of ACC claims for each mode suggests that although CAS probably captures most of the serious crashes for each mode and all of the fatal crashes, many minor crashes are not reported to the Police and thus omitted from CAS.

Note that any reference in this report to a district or city refers to all that district or city, both local roads and state highways (not just to the roads managed by a district or city council).

Table 2 lists fourteen types of driver behaviour (identified from the *Safer Journeys* strategy and action plans), which we analysed using the same methodology used to identify the key issues. Tables 4 to 8 summarise the results of this analysis of behaviour showing which of these types of driver behaviour are associated with serious road trauma in the Otago and Southland regions, with more detailed results set out in Appendix 1.

Of 14 behaviours analysed in five categories, five behaviours stood out as being more serious than the other nine behaviours analysed, although only two (driving while over the legal BAC limit and failing to give way to a pedestrian) reached statistical significance. The five behaviours found to be the most serious of those analysed are:

- driving while over the legal BAC limit
- failing to give way to a pedestrian (Otago only, mainly Dunedin)
- driving while fatigued
- travelling too fast for the conditions
- undertaking dangerous manoeuvring.

Table 4 Summary of evidence concerning lack of skills or competence in driving

	Inexperience: New Driver	Inexperience / Unfamiliarity: Overseas Driver	Inexperience / Unfamiliarity: Other
Trend over time in Otago Southland area of crashes with this behaviour reported	Decreased over the past few years	Remained stable over the past few years	Decreased over the past few years
Geographical distribution of these crashes	Otago: Tend to take place in Dunedin City, with Clutha also featuring Southland: Tend to take place in either Invercargill City or Southland District	Otago: Tend to take place in either Queenstown Lakes or Dunedin City Southland: Vast majority tend to take place in Southland District	Otago: Tend to take place in Dunedin City, with Clutha also featuring Southland: Vast majority tend to take place in Southland District
Severity of this type of crash	Throughout Otago and Southland, the majority of reported injury crashes are minor, with fewer serious and fatal crashes.	Throughout Otago and Southland, the majority of reported injury crashes are minor, with fewer serious and fatal crashes.	Throughout Otago and Southland, the majority of reported injury crashes are minor, with fewer serious and fatal crashes.

In Table 4, the category of *Experience / Unfamiliarity: Other* excludes matters in the other two categories (inexperience of a new driver or of a tourist) and covers such matters as driving an unfamiliar vehicle.

During this period, 2010 to 2013 inclusive, legislation governing driving age changed — the minimum driving age increased from 15 to 16 on 1 August 2011 — which may help account for the declining trend in the number of crashes by inexperienced new drivers.

Table 5 Summary of evidence concerning unpredictable driving

	Too fast for conditions	Sudden movement	Dangerous manoeuvre
Trend over time in the Otago Southland area of crashes with this behaviour reported	Decreased over the past few years	Decreased over the past few years	Remained stable over the past few years
Geographical distribution of these crashes	Otago: Tend to take place in Dunedin City, with Clutha District also featuring Southland: Tend to take place in either Invercargill City or Southland District	Otago: Tend to take place in Dunedin City, with Clutha District also featuring Southland: Tend to take place in Southland District, with Invercargill City also featuring	Otago: Tend to take place in Dunedin City, with Queenstown Lakes District also featuring Southland: Tend to take place in either Invercargill City or Southland District
Severity of this type of crash	Shows a relatively high number of serious and fatal crashes, relative to other crash types	Throughout Otago and Southland regions, the majority of reported injury crashes are minor, with fewer serious and fatal crashes	Shows a relatively high number of serious and fatal crashes, relative to other crash types

Table 6 Summary of evidence concerning non-compliance with certain road rules

	Failed to give way	Failed to give way: Pedestrian	Did not stop
Trend over time in the Otago Southland area of crashes with this behaviour reported	Decreased over the past few years	Remained stable over the past few years	Remained stable over the past few years
Geographical distribution of these crashes	Otago: Tend to occur in Dunedin City, with Waitaki District also playing a key role Southland: Vast majority tend to take place in Invercargill City	Otago: Vast majority tend to take place in Dunedin City Southland: Vast majority tend to take place in Invercargill City	Otago: Vast majority tend to take place in Dunedin City Southland: Vast majority tend to take place in Invercargill City
Severity of this type of crash	Throughout Otago and Southland, the majority of reported injury crashes are minor, with fewer serious and fatal crashes.	Otago: Closely associated with serious road trauma, 41% of reported injury crashes resulted in serious injury to at least one road user. Southland: The majority of reported injury crashes are minor, with fewer serious and fatal crashes.	Throughout Otago and Southland, the majority of reported injury crashes are minor, with fewer serious and fatal crashes.

Table 7 Summary of evidence concerning driving while impaired

	Over the BAC limit	Fatigued
Trend over time in crashes with this behaviour reported	Otago: Has decreased over the past few years Southland: Remained stable over the past few years	Remained stable over the past few years throughout the Otago Southland area
Geographical distribution of these crashes	Otago: Tend to occur in Dunedin City, with Queenstown Lakes District also playing a key role Southland: Tend to take place in either Southland District or Invercargill City	Otago: Tend to take place in either Dunedin City or Clutha District, with Waitaki District and other districts playing a lesser role Southland: Vast majority tend to take place in Southland District
Severity of this type of crash	Closely associated with serious road trauma throughout the Otago Southland area (particularly in Otago); in Otago, 36.1% have resulted in a serious injury to at least one road user, while in Southland, 26.9% have resulted in a serious injury to at least one road user	Closely associated with fatal road trauma throughout the Otago Southland area. In Otago, 7.9% have resulted in a fatal injury to at least one road user; in Southland, 5.6% have resulted in a fatal injury to at least one road user.

Table 8 Summary of evidence concerning lack of alertness

	Inattention	Distraction	Distraction: Internal object
Trend over time in the Otago Southland area of crashes with this behaviour reported	Decreased over the past few years	Decreased over the past few years	Remained stable over the past few years
Geographical distribution of these crashes	Otago: Tend to occur in Dunedin City, with Clutha District also playing a key role Southland: Tend to take place in either Southland District or Invercargill City	Otago: Tend to occur in Dunedin City, with Clutha District also playing a key role Southland: Tend to take place in either Southland District or Invercargill City	Otago: Tend to occur in Dunedin City, with Clutha District also playing a key role Southland: Tend to take place in either Southland District or Invercargill City
Severity of this type of crash	Throughout Otago and Southland, the majority of reported injury crashes are minor, with fewer serious and fatal crashes.	Throughout Otago and Southland, the majority of reported injury crashes are minor, with fewer serious and fatal crashes.	Throughout Otago and Southland, the majority of reported injury crashes are minor, with fewer serious and fatal crashes.

Statistical analyses showed these Big 5 issues, and these five types of driver behaviour, to be priorities at a regional level. The analyses also identified some issues that are strongly associated with severe road trauma (high crash severity in only in a single district in Otago or Southland regions. Table 9, below, lists these. These are more minor issues than the Big 5, because they are significant in a single area only. But when they do happen, they tend to cause serious road trauma.

Table 9 **Issues associated with severe road trauma in single districts in Otago or Southland**

District (both local roads and state highways)	Issue strongly associated with severe road trauma in that district
Clutha District	Head on crashes
Dunedin City	Mid-block crashes (note, some involve pedestrians or cyclists) Older drivers (75 years +)
Gore / Southland Districts	Distraction crashes
Invercargill City	Obstruction / visibility crashes
Waitaki District	Vehicle-related issues

3.2. Evidence for each of the Big 5: the major topics of concern

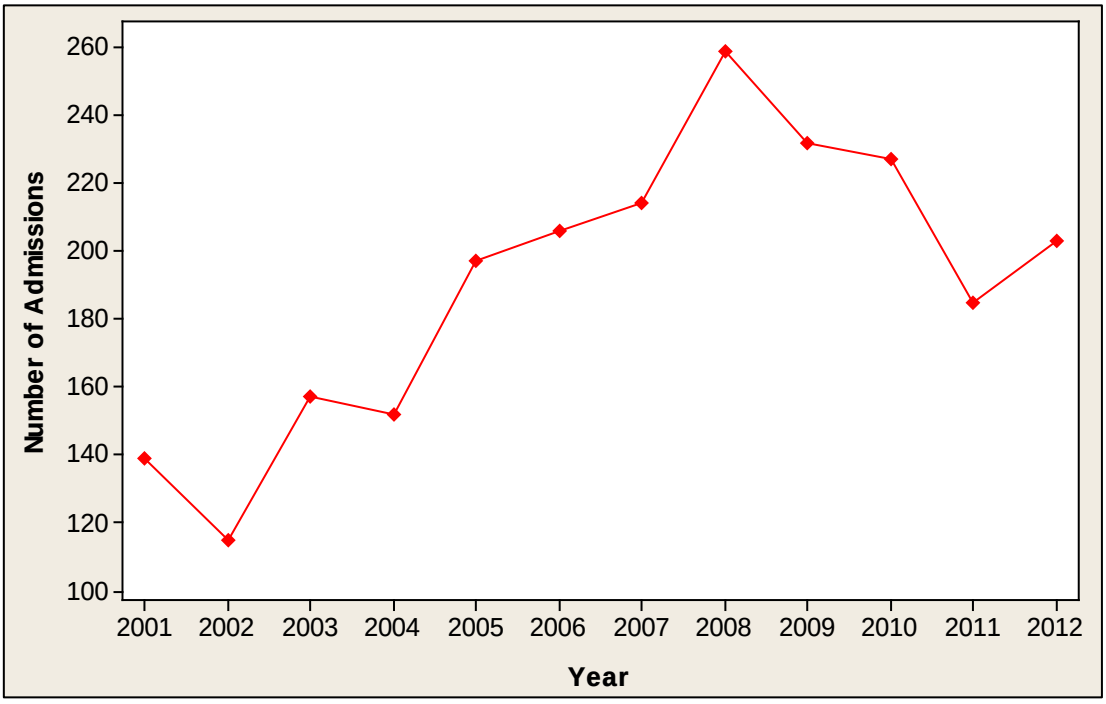
3.2.1. Priority 1: Motorcyclists

In *Safer Journeys, New Zealand's road safety strategy 2010-2012*, improving the safety of motorcyling is an area of high concern. Increasing the safety of motorcycling was a high priority in the first action plan (2010-11) and improvements to motorcycling routes are one of the cross-sector foci in the second action plan 2013-15.

Trend

The number of hospital admissions for motorcyclists in Otago and Southland hospitals has increased over the last decade or so (Figure 1; the data shown is from 2001–2012 and includes occupants of mopeds, motor scooters and motorised bicycles.)

Figure 1 **Number of hospital admissions involving motorcyclists injured in a land transport crash, 2001-2012**



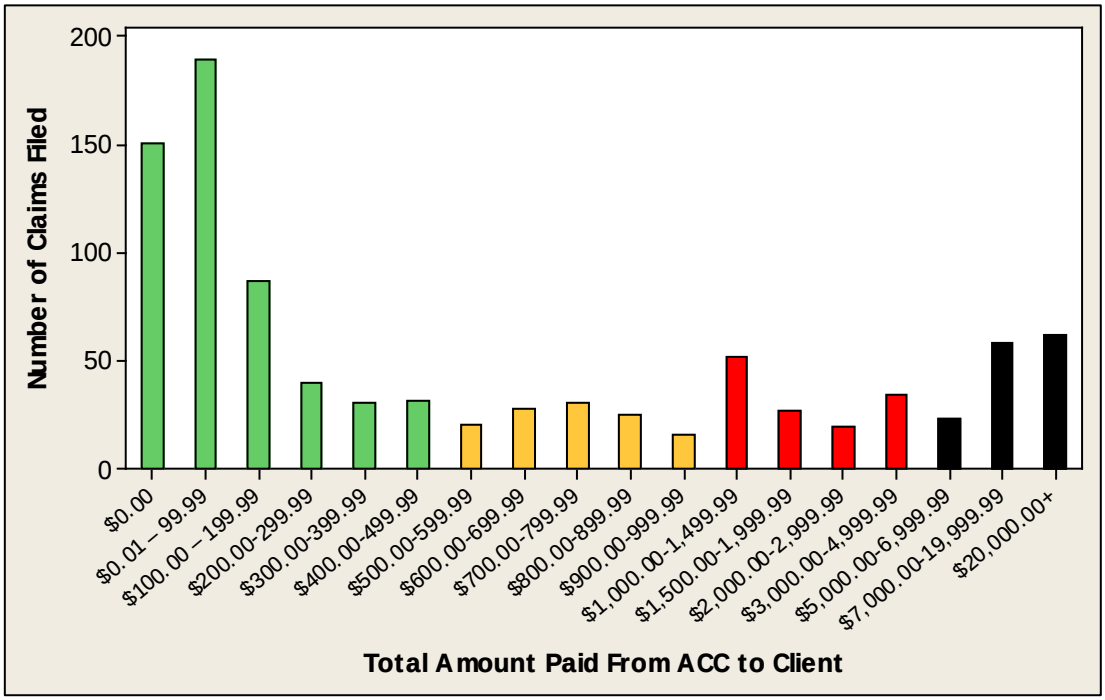
Following a peak in 2008, the number of admissions of motorcyclists has dropped by 30%, but is still highly elevated compared to the 2001 levels, and may be rising again. It is unclear whether it will continue to increase, but the rapid rise in hospital admissions of motorcyclists over the past decade is alarming.

Severity

Motorcycle crashes tend to be severe compared to crashes involving other road users.

Note the high percentage of very expensive motorcycle claims (coloured red and black) in the Figure 2 below. (Note, too, that the total amount paid from ACC to client excludes GST.) In general, the more expensive the claim, the more severe the client's injuries are likely to be (due to requiring more complicated and extensive medical procedures, as well as compensation for spending a longer time recovering and unable to work).

Figure 2 **ACC claims involving motor vehicle crashes in Otago and Southland (2010-13) that were filed by motorcyclists**



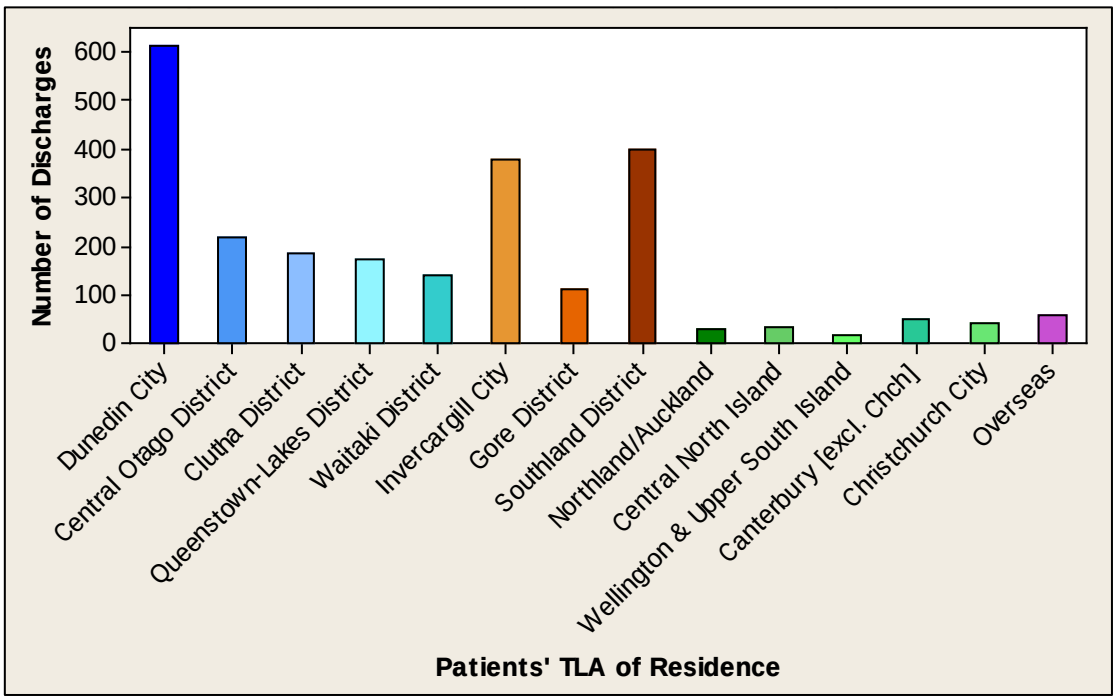
29.9% of claims filed by motorcyclists who suffered a crash in Otago and Southland involve moderate or high payouts of $1,000.00 or more. This is a much higher proportion of high-cost claims than any other road-user group.

Geographical spread

Motorcyclist crashes are an issue throughout major sections of Otago and Southland, including both urban and rural areas. CAS figures indicate that motorcyclists seem to have severe crashes in Central Otago, Clutha, Dunedin, Gore and Southland districts.

Motorcyclists from Dunedin, Invercargill or Southland District make up the majority of hospitalised motorcyclists in Otago and Southland. Hospital records (seen in Figure 3 below, and including occupants of mopeds, motor scooters and motorised bicycles) indicate that most motorcyclists hospitalised in Otago and Southland reside in Dunedin, Invercargill or Southland District, but that motorcyclists from other parts of the Otago and Southland regions are also hospitalised frequently.

Figure 3 **Number of hospital discharges involving motorcyclists injured in a land transport accident, 2000-2013**



Strength of evidence base

Motorcyclist crashes are flagged as a major issue in all three datasets.

- CAS tells us that motorcycle crashes are statistically associated with high crash severity (as determined by Police) in a number of districts throughout Otago and Southland.
- Hospital data tells us that motorcycle crashes have been increasing dramatically over the 2001-2012 period.
- ACC data tells us that claims made by motorcyclists following a crash tend to result in higher payouts to the client than claims made by any other road-user group, suggesting that their injuries tend to be more severe and require more complicated medical procedures and a more extensive recovery period.

There is very strong evidence of under-reporting of motorcycle crashes in CAS. ACC data indicates that 717 claims were filed by clients who were riding a motorcycle at the time of their crash (on a public road in Otago or Southland), for crashes taking place between 1st January 2010 and 31st December 2012. However, CAS reports only 184 injury crashes involving a motorcyclist in the key-vehicle or second-vehicle position in Otago or Southland, between 1st January 2010 and 31st December 2012.

These data not only represent a huge discrepancy, but they also suggest that only 25.7% of motorcyclist injury crashes are ever reported to Police (fatalities are reported in CAS as are many of the serious crashes but minor crashes are likely to account for most of the under-reporting). This estimate of the magnitude of under-reporting is likely to be conservative since some motorcyclists will have suffered a crash, but not made a claim under ACC, which means that the figure of 717 motorcyclist claims also underestimates the true crash rate.

(It is possible for two motorcyclists to strike each other during a crash, in which case the event would be recorded as a single injury crash but might involve two ACC claims, if both motorcyclists claim with ACC. This is likely to be rare, however, and does not explain the discrepancy between ACC and CAS figures shown above.)

3.2.2. Priority 2: Pedestrians

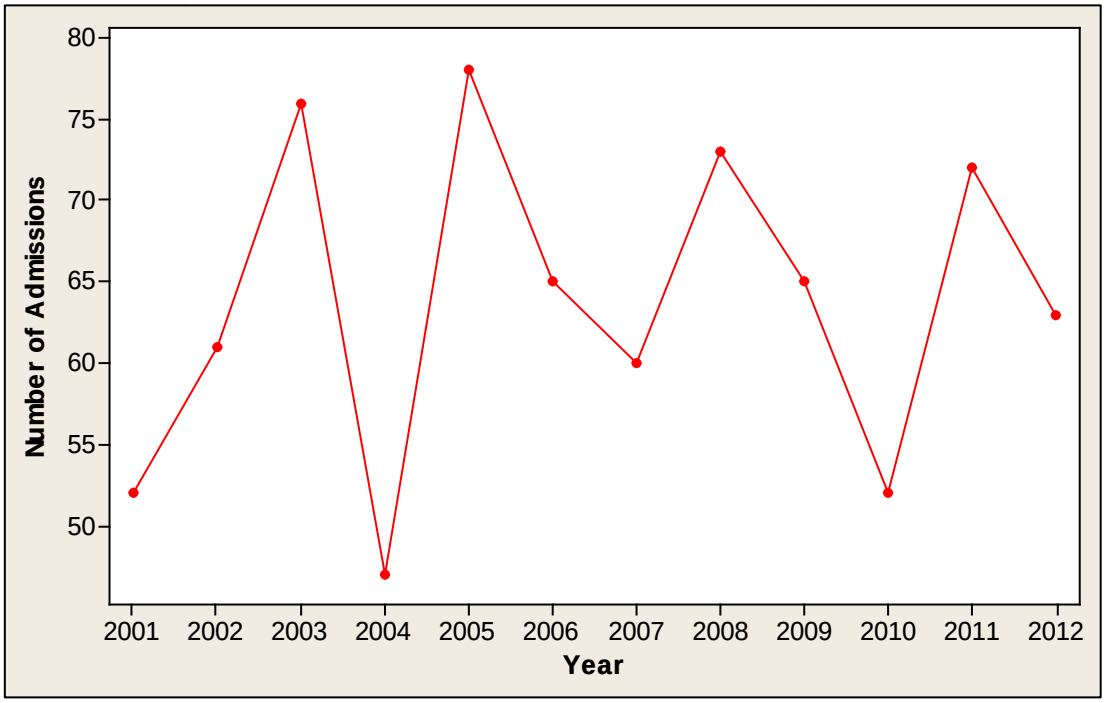
In *Safer Journeys, New Zealand's road safety strategy 2010-2012*, safe walking is an area of medium concern.

Trend

The number of admissions for pedestrians involved in a land transport crash or accident in Otago or Southland hospitals has remained stable over the last decade or so (Figure 4; the data are from 2001-2012 and include skateboarders, mobility scooters and other methods of travel without the use of an animal, pedal cycle or motor vehicle, e.g. using skis or ice skates).

There is marked variability in the number of hospital admissions for pedestrians involved in a land transport crash or accident from year to year in Otago or Southland. Note, 'pedestrian land transport accidents' do not involve falls or slips, and refer to pedestrians injured in a collision with another road user (the latter typically a motor vehicle, but possibly a cyclist, equestrians, or user of an alternative mode of travel).

Figure 4 **Number of hospital admissions involving pedestrains Injured in a land transport accident, 2001-2012**



Following a low in 2004 and a peak in 2005, the number of pedestrian admissions to hospital has remained relatively stable over the past decade.

Severity

Pedestrian crashes tend to be severe, relative to other crash types.

According to CAS, pedestrian crashes are statistically associated with high crash severity (as determined by the Police) in Dunedin City and Invercargill City.

Figures 5 and 6 for Dunedin City, below, compare the raw number of fatal and serious crashes associated with different crash types with the raw number of minor crashes associated with different crash types. Note the relatively high number of fatal and serious crashes associated with pedestrians walking across a road (shown as 'PedXng' on the graph), second only to cornering-related crashes (shown as 'Cornering' on the graph).

Figure 5 Fatal and serious crashes in Dunedin City, 2010-2013

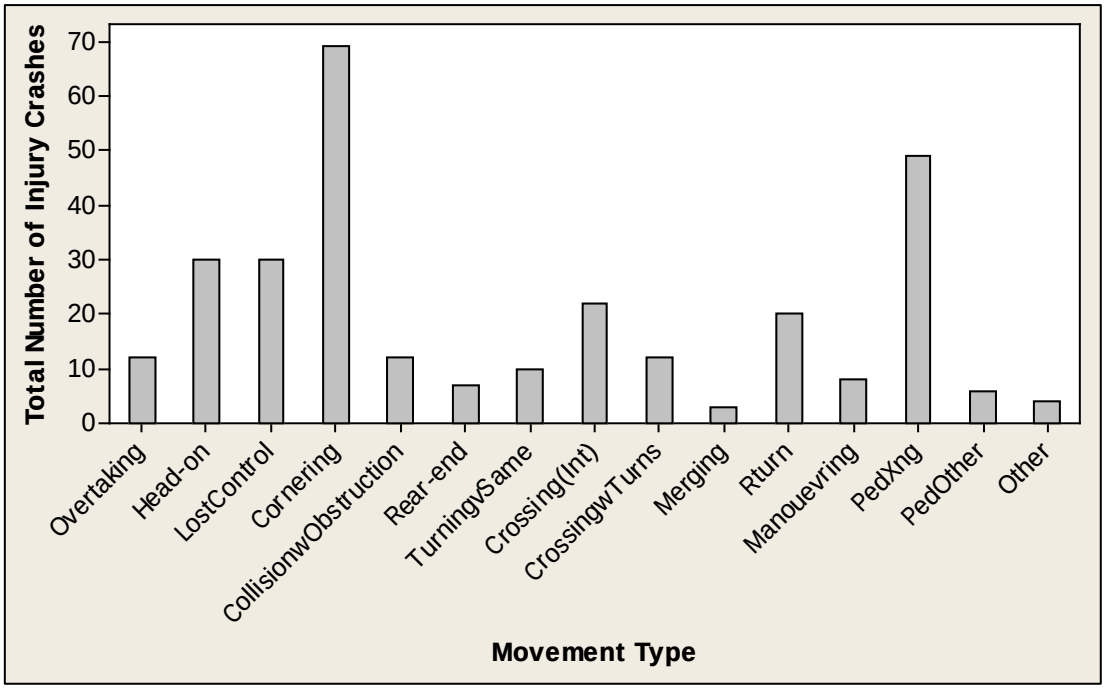
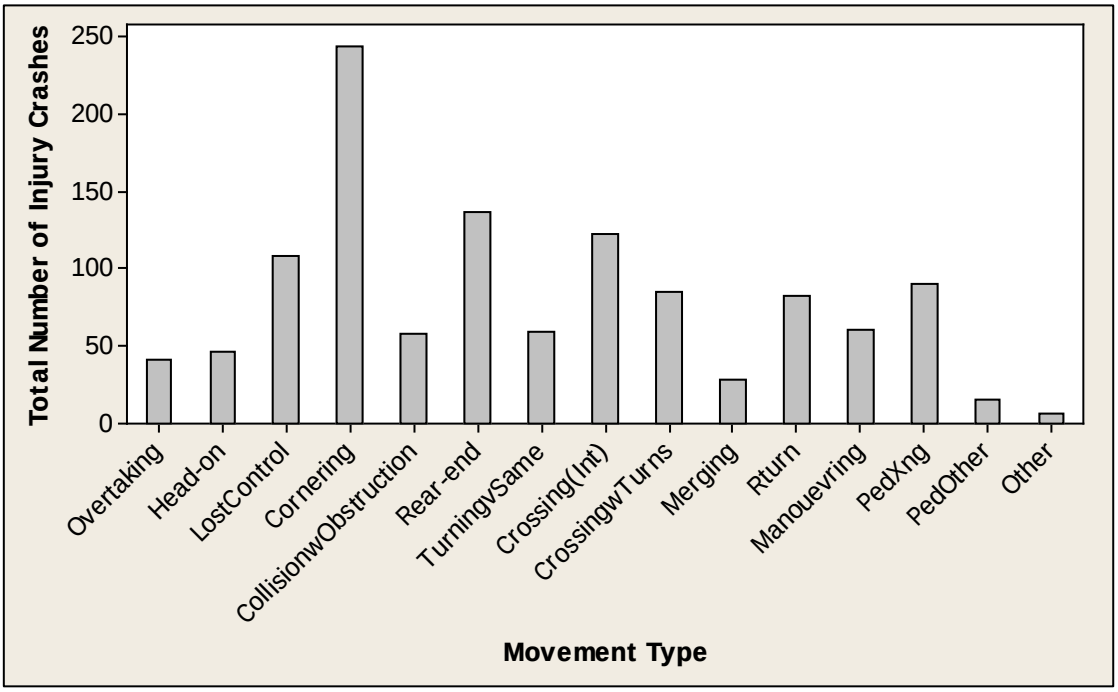


Figure 6 Minor crashes in Dunedin City, 2010-13



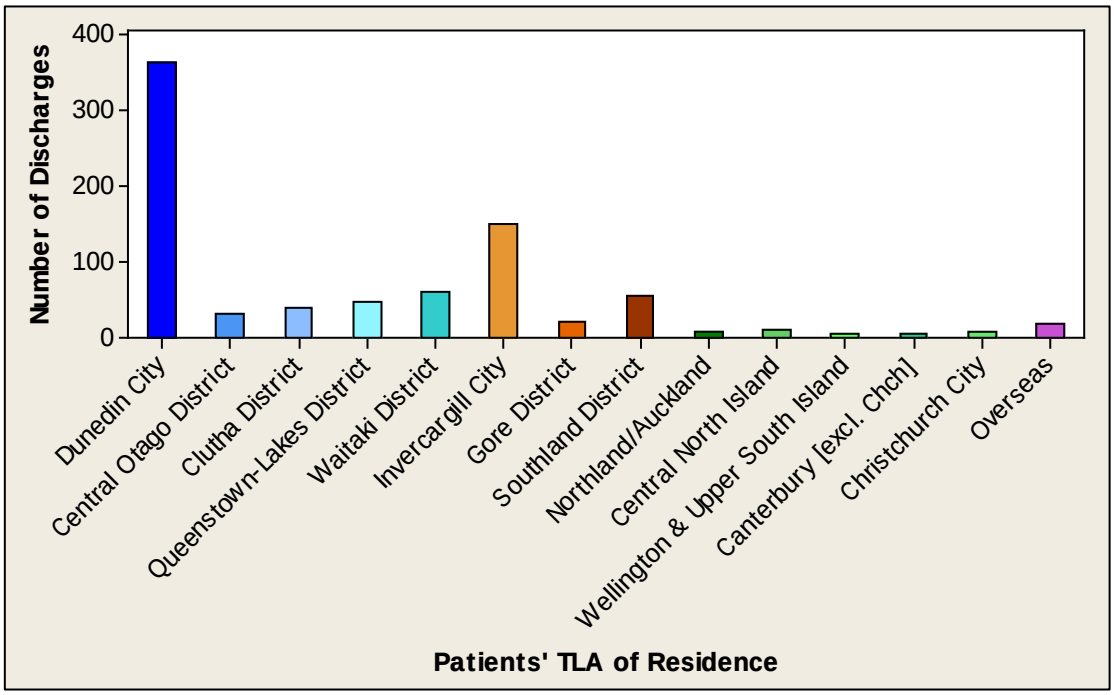
Note how much more prominent 'PedXng' is in the 'fatal / serious' graph, relative to the minor graph, which indicates that injury crashes involving pedestrians are much more likely to be fatal or serious than other crash types in Dunedin and Invercargill cities – and in Dunedin, this degree of severity is associated with pedestrians crossing the road.

Geographical spread

Pedestrian crashes are an issue in urban parts of the Otago and Southland regions. As mentioned in the 'Severity' section, pedestrian crashes are statistically associated with high crash severity (as determined by Police) in Dunedin City and Invercargill City.

Figure 7 below (from ACC data) shows that pedestrians hospitalised in Otago or Southland following a land transport accident tend to be from Dunedin or Invercargill, indicating that many of the fatal and serious crashes reported in CAS are likely being experienced by locals.

Figure 7 **Number of hospital discharges involving pedestrians injured in a land transport accident, 2000-2013**



Thus, injury crashes involving pedestrians are a major issue in urban parts of Otago or Southland, specifically in Dunedin and Invercargill cities.

Strength of evidence base

Pedestrians are flagged as a major issue in the CAS and ACC datasets, although do not feature as prominently in hospital records.

- CAS tells us that pedestrian crashes are strongly associated with high crash severity in Otago and Southland's two major urban centres (Dunedin and Invercargill cities). Furthermore, CAS indicates that pedestrians crossing the road are particularly at risk in Dunedin; this degree of severity is associated both with crashes at designated crossing points (where motorists are legally required to give way to pedestrians), and with crashes involving pedestrians who are jaywalking or otherwise engaging in risky behaviour.
- Hospital records tell us that the annual number of pedestrian crashes has been remaining stable over the past decade, and that pedestrians tend not to stay longer in hospital than other road-user groups (meaning that injury severity, as measured by the length of the hospital stay, is no worse for pedestrians than for other groups).

- ACC data tell us that pedestrians tend to have a high rate of relatively expensive claims: 24.0% of claims filed by pedestrians who suffered a crash in Otago or Southland involve moderate or high payouts of $1,000.00 or more. This is one of the highest proportions of expensive claims, second only to motorcyclists.

There is moderate evidence of under-reporting of crashes involving a motor vehicle-pedestrian collision in CAS. ACC data indicates that 468 claims were filed by clients who were a pedestrian at the time of their crash (when they were struck by a moving motor vehicle on a public road in Otago or Southland), for crashes taking place between 1st January 2010 and 31st December 2012. However, CAS reports only 199 injury crashes involving a pedestrian in the key-vehicle or second-vehicle position in Otago or Southland, between 1st January 2010 and 31st December 2012.

This represents a large discrepancy, and suggests that only 42.5% of pedestrian injury crashes are ever reported to Police (fatalities are reported in CAS as are many of the serious crashes but minor crashes are likely to account for most of the under-reporting). This estimate of the magnitude of under-reporting is likely to be conservative (some pedestrians will have suffered a crash, but not made a claim under ACC, meaning that the figure of 468 pedestrian claims also underestimates the true crash rate).

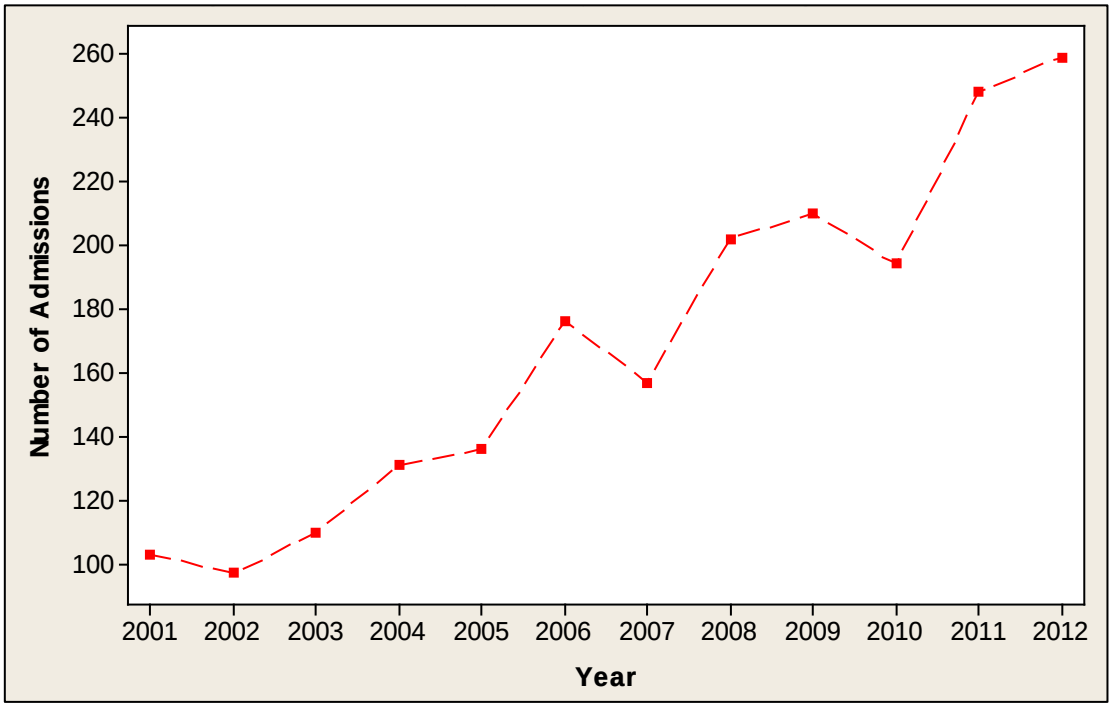
3.2.3. Priority 3: Cyclists

In *Safer Journeys, New Zealand's road safety strategy 2010-2012*, safe cycling is an area of medium concern.

Trend

The number of hospital admissions for cyclists in Otago and Southland hospitals has increased markedly over the last decade or so (Figure 8; data is from 2001-2012, and includes non-motor-vehicle accidents).

Figure 8 **Number of hospital admissions involving cyclists injured in a land transport accident, 2001-2012**

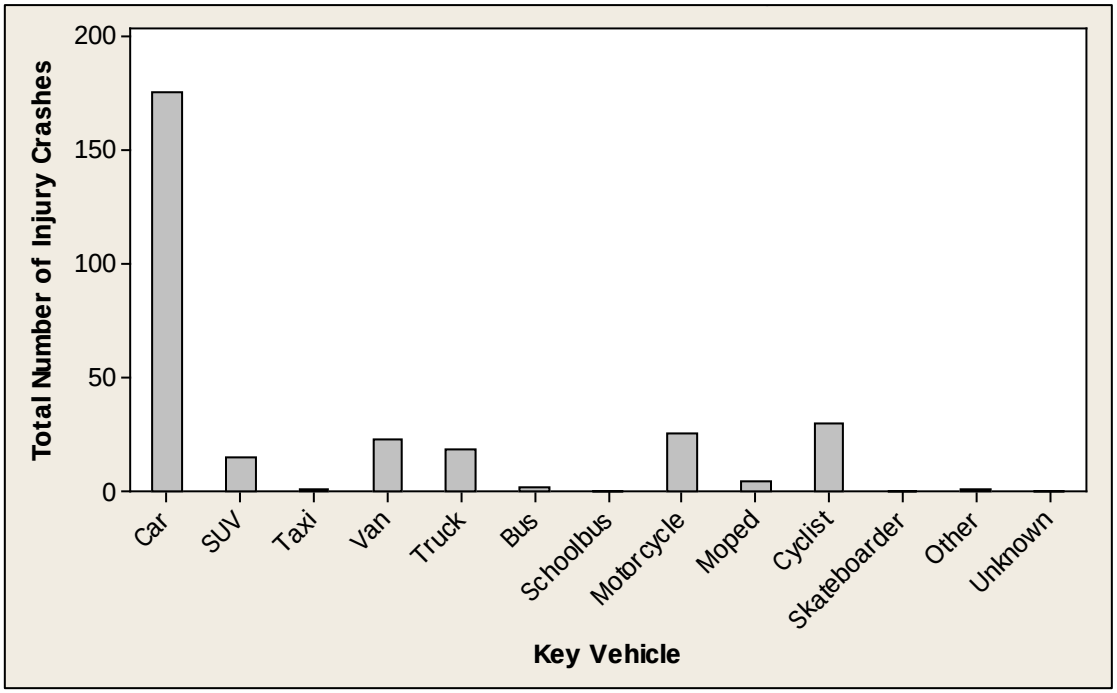


This increase in hospital admissions is higher than for any other road-user group. The number of cyclists admitted to hospital in Otago or Southland has more than doubled over the past decade, from 103 in 2001 to 259 in 2012. These numbers include both on-road and off-road cycling, although it is not clear, as yet, what part of the increase is due to the rising popularity of off-road cycling, including cycle trails. It should be remembered, however, that often the same people ride both on and off road.

Severity

Injury crashes in Dunedin City and Queenstown Lakes District involving cyclists are much more likely to be fatal or serious (as reported by Police) than they are likely to be minor in severity. To illustrate this, Figure 9 shows the raw number of fatal and serious crashes in Dunedin City associated with different road-user groups in the key-vehicle role. Note the relatively high number of cyclists who have experienced a fatal or serious crash – was second highest (after cars) of all the vehicle types examined – higher than motorcyclists, trucks, vans or SUVs.

Figure 9 Fatal and serious crashes in Dunedin City, 2010-2013



Geographical spread

Crashes involving cyclists are a major issue in some parts of Otago. Cyclists do not feature prominently in Southland's severe and fatal crashes, however.

As the 'Severity' section demonstrates, according to CAS, cyclist crashes are statistically associated with high crash severity (as determined by Police) in Dunedin City and Queenstown Lakes District.

Figure 10 below, based on hospital records, shows the TLA of residence of cyclists who have been admitted to hospital following a land transport accident. This graph includes cycle-only crashes and other non-motor-vehicle accidents.

Figure 10 **Number of hospital discharges involving cyclists injured in a land transport accident, 2000 - 2013**

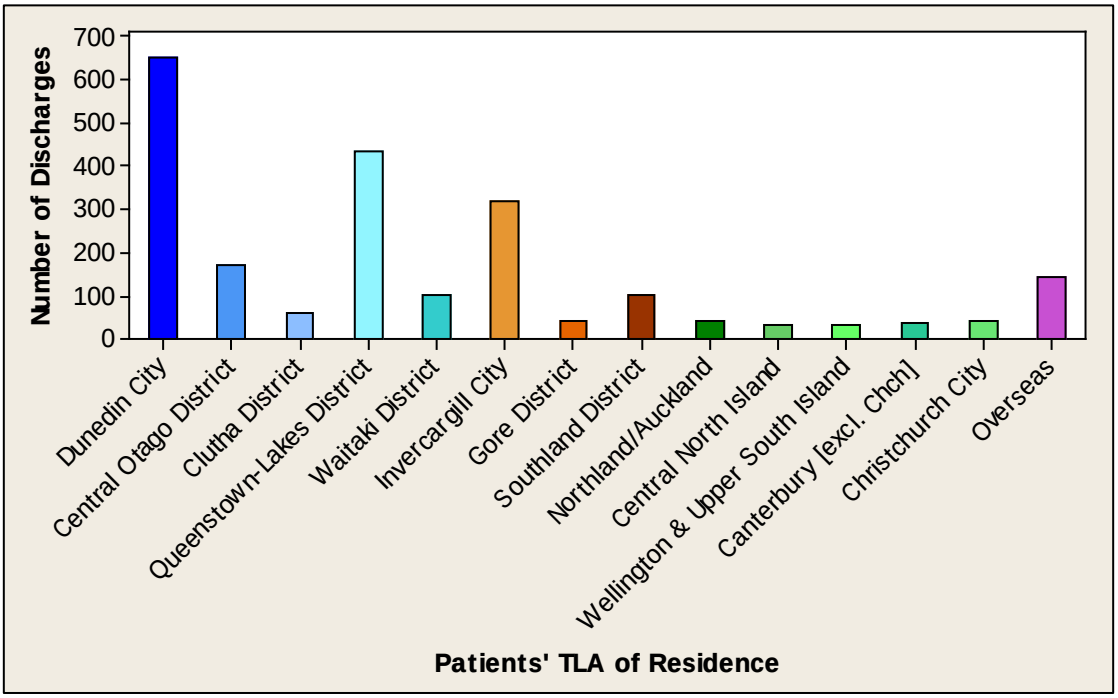


Figure 10 indicates that the majority of cyclists admitted to hospital in Otago or Southland regions are resident in Dunedin, Queenstown Lakes or Invercargill (the x-axis on the graph shows place of residence, categorised by territorial authority).

This suggests that many of the cyclists who suffer the fatal and serious crashes reported in CAS are locals to the area, with the exception of Invercargill City (since cyclists' serious trauma crashes in Otago and Southland are statistically associated with high crash severity only in Dunedin City and Queenstown Lakes District, not in Invercargill or other districts of the two regions).

Further investigation would be needed to find the reason(s) for this discrepancy; three possibilities are:

- many serious cyclist-motor vehicle crashes in Invercargill are not reported to the Police and thus not captured in CAS, or
- a high number of cycle-only crashes in Invercargill, which do not get recorded in CAS and thus do not show up in the CAS analysis, or
- many of the cyclists suffering fatal and serious crashes in Dunedin and Queenstown Lakes are visiting from Invercargill City.

Strength of evidence base

Cyclists are flagged as a major issue in the CAS and hospitalisation datasets, although do not feature as prominently in ACC data; the number of ACC claims involving cyclists has remained stable in the period from 2010 to 2013 inclusive, and the majority of ACC claims filed by cyclists are very low cost, with most payouts of $999.99 or less.

- CAS tells us that cyclist crashes are strongly associated with high crash severity in Dunedin City and Queenstown Lakes District.
- Hospitalisation records tell us that cyclist admissions to hospital have been increasing dramatically over the past decade.
- ACC data does not indicate a serious issue, however. The number of claims associated with cyclists who have suffered a motor vehicle crash on a public road in Otago or Southland has remained stable over the period from 2010 to 2013 inclusive, and many cyclist claims are relatively low cost. Specifically, 80.9% of ACC motor-vehicle crash claims filed by cyclists involve relatively low payouts of $999.99 or less – one of the highest rates of low-cost claims among all road-user groups.

There is moderate evidence of under-reporting of cyclist crashes in CAS. ACC data indicates that 282 claims were filed by clients who were a cyclist at the time of their crash (when they were struck by a moving motor vehicle on a public road in Otago or Southland), for crashes taking place between 1st January 2010 and 31st December 2012. However, CAS reports only 159 injury crashes involving a cyclist in the key-vehicle or second-vehicle position in Otago or Southland, between 1st January 2010 and 31st December 2012.

This discrepancy suggests that only 56.4% of cyclist injury crashes are ever reported to Police. This estimate of the magnitude of under-reporting is likely to be conservative (since some cyclists will have suffered a crash, but not made a claim under ACC, meaning that the figure of 282 cyclist claims also underestimates the true crash rate).

3.2.4. Priority 4: High-speed areas

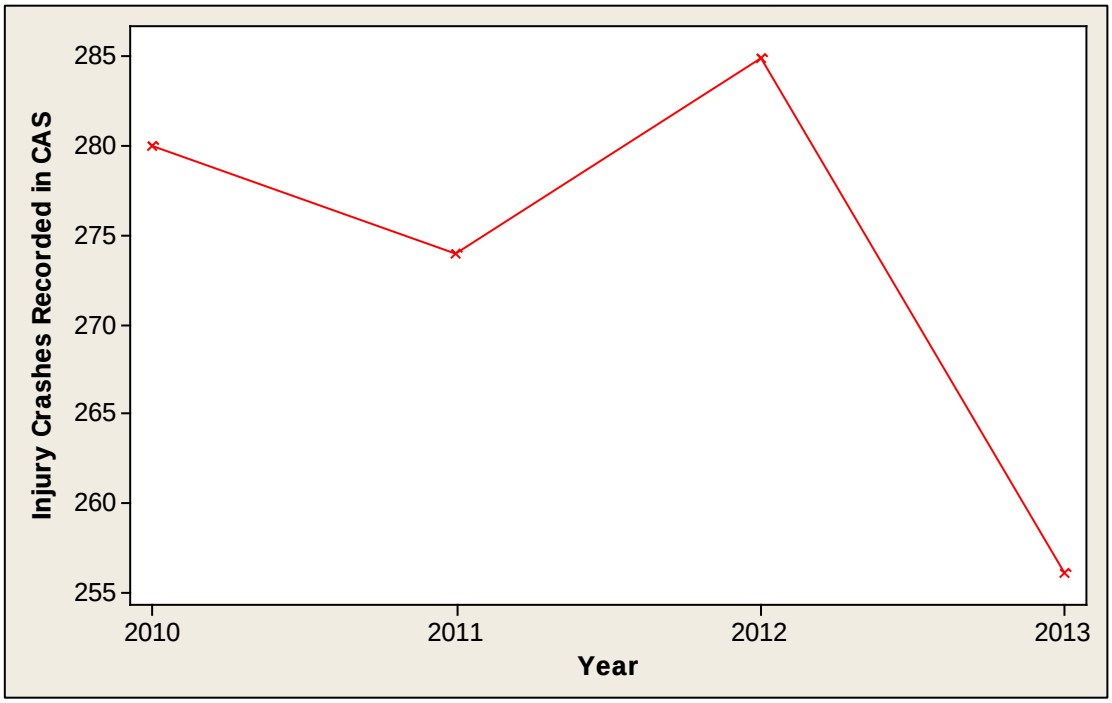
In *Safer Journeys, New Zealand's road safety strategy 2010-2012*, safe speeds are an area of high concern.

Trend

The number of reported injury crashes on high-speed roads (80 km/h speed limit or higher) has decreased slightly for Otago in 2013 (Figure 11). The decline is small, however, and seems unique to 2013. Further analysis would be needed to confirm whether this reflects a drop in Police reporting of high-speed-area crashes or whether it is simply be a minor statistical fluctuation that is not indicative of a long-term drop in high-speed-area crash numbers.

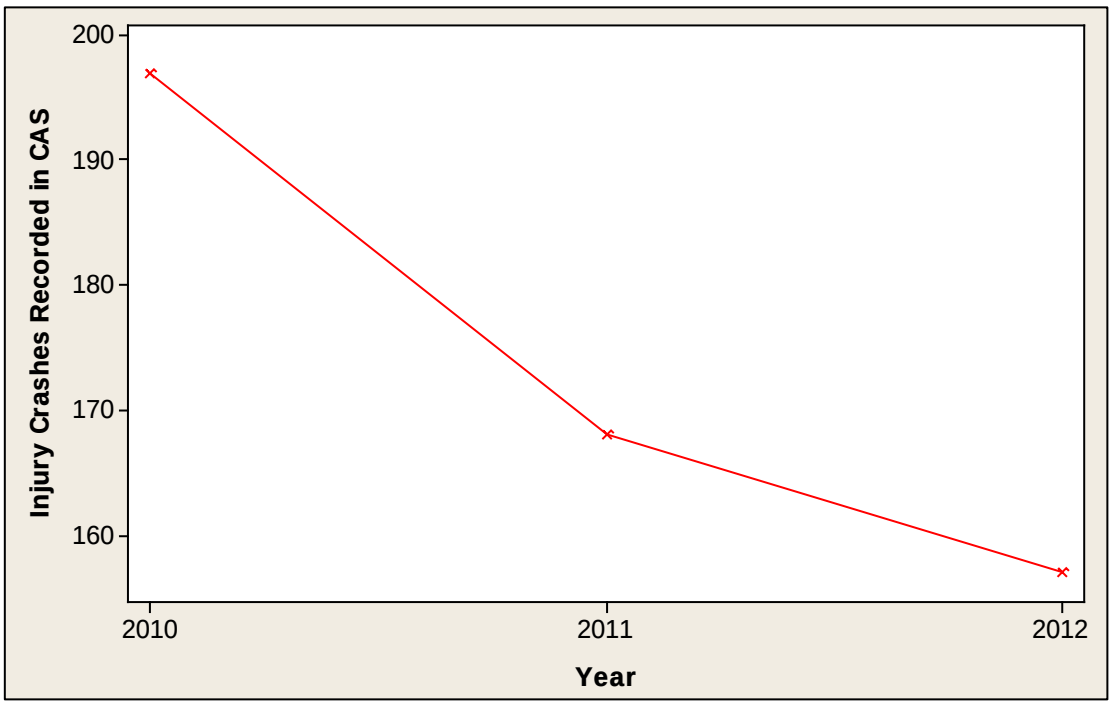
Note that, due to the very rough data used here (with only four data points), it is inadvisable to project future trends based on this graph. It is useful primarily for examining how the number of crashes in this category has varied in the past, not for estimating the number of crashes in this category in the future.

Figure 11 **Injury crashes in Otago that took place on high-speed roads (80km/h speed limit or higher), 2010-2013**



The Southland region also shows a moderate decline (figure 12, note, 2013 has not been included on the graph since data for the last 3 months was not available – see page 5).

Figure 12 **Injury crashes in Southland that took place on high-speed roads (80km/h speed limit or higher), 2010-2012**



To conclude, the number of injury crashes associated with high-speed areas (80 km/h speed limit or higher) is declining in both the Otago and Southland regions. However, the decline in both regions is small, and may be attributable to a decline in Police-reporting rates rather than a true decline in the number of high-speed-area crashes.

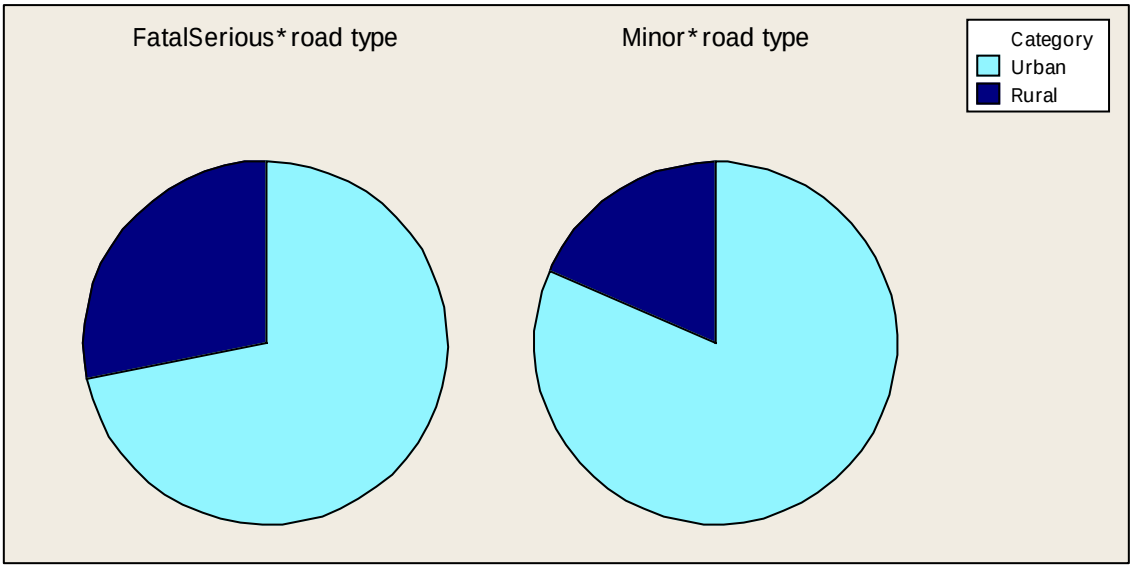
Severity

Crashes associated with high-speed areas tend to be more severe, on average, than other crashes.

According to CAS, high-speed-area crashes are statistically associated with high crash severity (as determined by Police) in Dunedin City, Waitaki District and Invercargill City. Illustrating this for Dunedin City, Figure 13 shows that high-speed-area crashes are over-represented in the serious-road-trauma pie chart (on the left) compared to the minor-road-trauma chart (on the right).

(Figure 13 covers all injury crashes; 'speed' is measured through the urban/rural categorisation. 'Urban' refers to all crashes taking place on a 70 kph road (or one of lower speed), while 'rural' refers to crashes taking place on an 80kph (or greater) road.)

Figure 13 Injury crashes in Dunedin City, 2010-2013



Thus, when an injury crash takes place on a high-speed road (80 km/h speed limit or higher) in Dunedin City (as well as in Waitaki District and Invercargill City), it is more likely to be serious or fatal than a crash taking place on a lower-speed road (70 km/h speed limit or lower) in those same areas.

Geographical spread

Crashes in high-speed areas are significantly more likely to be serious or fatal in urban parts of Otago and Southland, and in the Waitaki District. As the 'Severity' section demonstrates, according to CAS, high-speed-area crashes are statistically associated with high crash severity (as determined by Police) in Dunedin City, Waitaki District and Invercargill City.

Strength of evidence base

This section does not apply to this topic of concern, since ACC and hospitalisation datasets do not record information on the location of each crash (i.e. whether it took place on a high-speed road or not). However, CAS certainly indicates that high-speed-area crashes are heavily over-represented among serious and fatal crashes in Dunedin City, Waitaki District and Invercargill City.

If the collection method for ACC and hospitalisation data was amended to include, as a separate, searchable data field) the location of the crash, this would add considerable value to these data by improving our understanding of the relative priority of different issues (additionally, it would enabling better estimates to be made of the number of serious and minor crashes in different localities).

3.2.5. Priority 5: Driving under the influence of alcohol

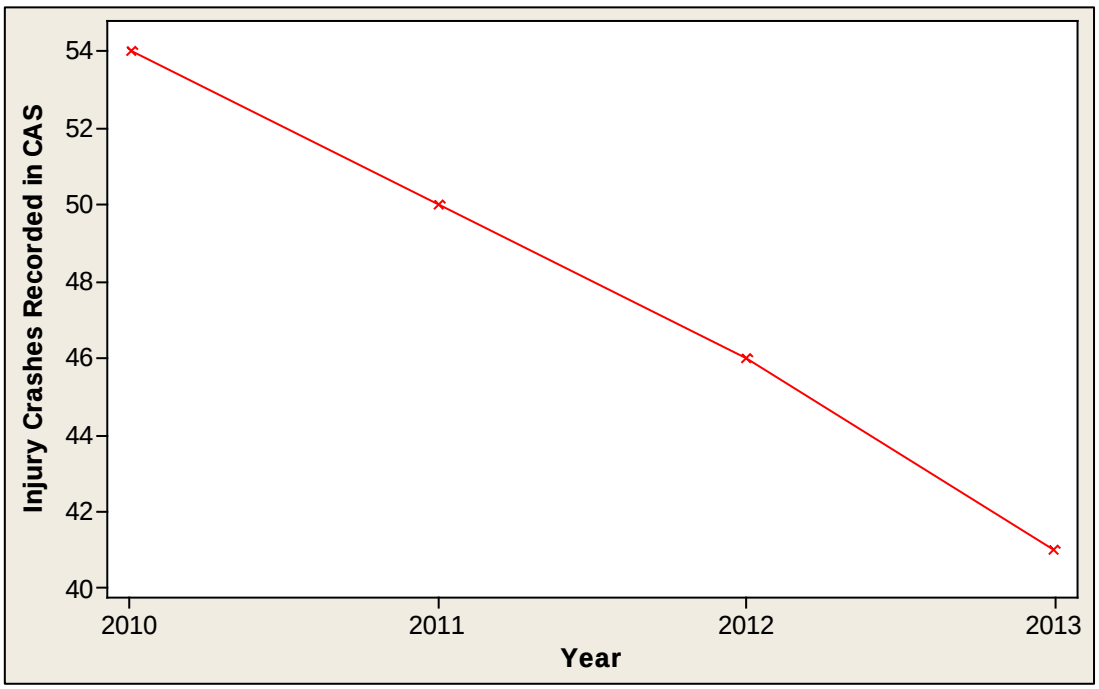
In *Safer Journeys, New Zealand's road safety strategy 2010-2012*, reducing alcohol-impaired driving is an area of high concern.

Trend

Figure 14 shows how the number of reported injury crashes involving at least one motorist over the legal BAC limit is decreasing in Otago (although the decline is small, and may possibly reflect a change in Police reporting rate rather than a decline in actual drink-driving rates).

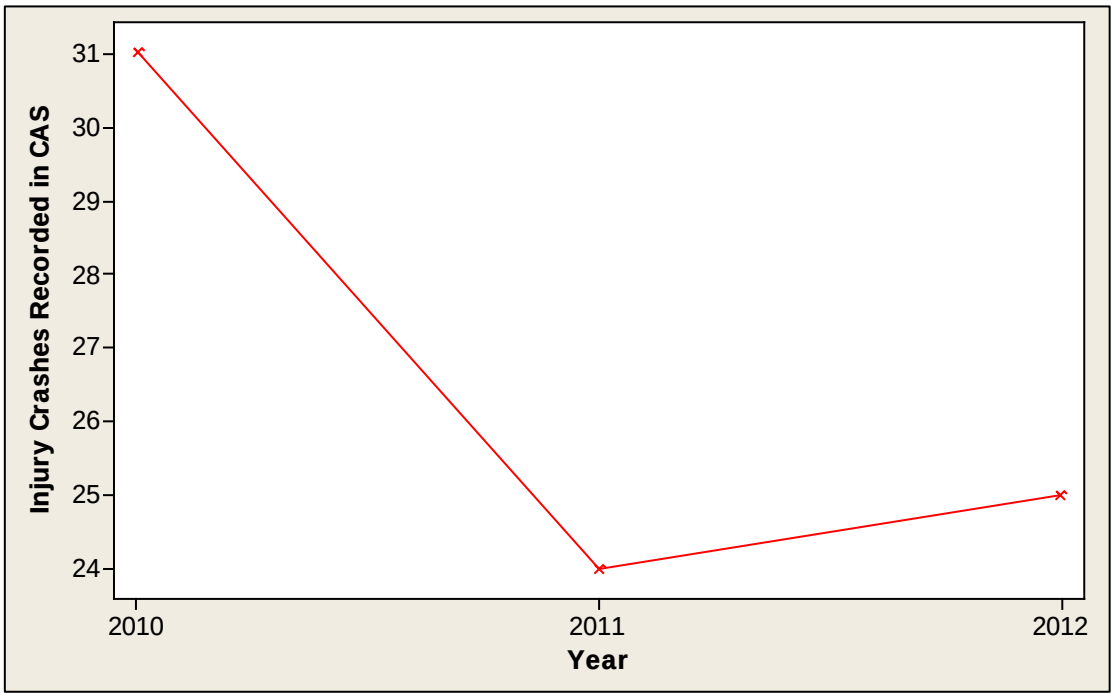
Note that, due to the rough data used here (with only four data points), it is inadvisable to project future trends based on this graph. It is useful primarily for examining how the number of crashes in this category has varied in the past, not for estimating the number of crashes in this category in the future.

Figure 14 **Injury crashes in Otago involving at least one motorist over legal BAC limit (2010-2013)**



The Southland region also shows a slight decline (Figure 15).

Figure 15 **Injury crashes in Southland involving at least one motorist over legal BAC limit (2010-2012)**



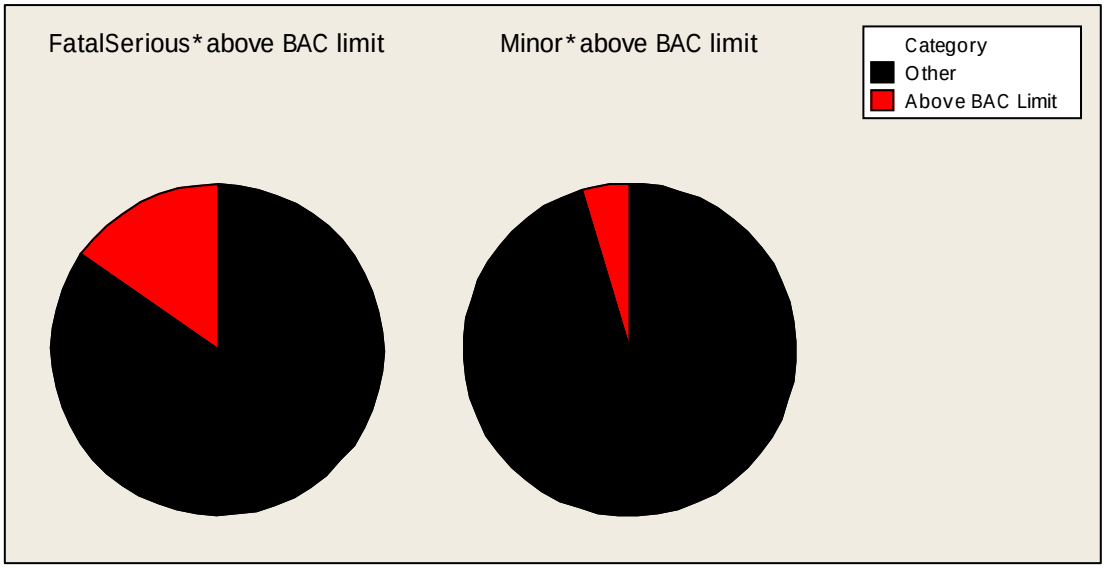
To conclude, the number of injury crashes associated with motorists over the BAC limit is declining in both the Otago and Southland regions. However, the decline in both regions is small, and may be a true decline in the number of drink-driving crashes.

Severity

Crashes associated with a motorist over the legal BAC limit tend to be more severe, on average, than other crashes. According to CAS, drink-driving crashes are statistically associated with high crash severity (as determined by Police) in Central Otago, Queenstown Lakes and Waitaki districts.

Using Central Otago District as an example, Figure 16 shows that motorists over the BAC limit are heavily over-represented in the serious-road-trauma pie chart, relative to the minor-road-trauma chart.

Figure 16 Injury crashes in Central Otago District, 2010-2013



Overall, 15.3% of fatal and serious crashes in the Central Otago District involved one or more parties in the crash recording an alcohol level over the legal limit; by contrast, 4.7% of minor crashes in Central Otago District involved one or more parties in the crash recording an alcohol level over the legal limit. The same pattern is obvious for Queenstown Lakes and Waitaki districts.

Geographical Spread

Crashes involving motorists over the blood alcohol limit is a major issue throughout Otago. Motorists over the blood alcohol limit do not feature prominently in Southland's severe and fatal crashes.

As the 'Severity' section demonstrates, according to CAS, drink-driving crashes are statistically associated with high crash severity (as determined by Police) in Central Otago, Queenstown Lakes and Waitaki districts.

Strength of evidence base

This section does not apply to this topic of concern, as ACC and hospitalisation datasets do not record information on the driver's mental state or level of incapacitation due to alcohol or drugs.

As noted above, If the collection method for ACC and hospitalisation data was amended to include, as a separate, searchable data field) the location of the crash, this would add considerable value to these data by improving our understanding of the relative priority of different issues. Additionally, it would enabling better estimates to be made of the number of serious and minor crashes in different localities.

CAS certainly indicates that motorists over the blood alcohol limit are heavily over-represented among serious and fatal crashes in Central Otago, Queenstown Lakes and Waitaki districts.

4. Conclusion

4.1. The top priorities for action

Safer Journeys 2020 identifies a number of areas of high concern to address, including alcohol and drug driving, young drivers, safe roads and roadsides, safe speeds and motorcycle safety. Areas of medium concern in *Safer Journeys* include safe walking and cycling, reducing the impact of fatigue and addressing distraction and high risk drivers. The Government Policy Statement on Land Transport 2015/16-2024/25 confirms the *Safer Journeys* action plans and seeks better reporting of the effectiveness of safety-related road investment, with a view to improving future funding allocations for road safety.

To ensure road safety investment in the Otago and Southland regions is targeted to the highest priority areas of concern within the regions, and to address those high and medium concern issues from *Safer Journeys* relevant to the two regions, ORC and ES undertook a project to analyse CAS, ACC and hospitalisation data, with the support the NZTA.

Statistical analyses of ACC, hospitalisation and CAS data has identified the matters on which road safety efforts need to focus if we are to substantively reduce the level of serious road trauma suffered in Otago and Southland regions. The analyses has highlighted that vulnerable users (motorcyclists, pedestrians and cyclists) are at particular risk in southern NZ and should be a prime focus.

These vulnerable users are not equally at risk in all districts. The accompanying report — *Factors causing serious road trauma in each district of Otago and Southland regions: results of statistical analyses* and due for publication mid-2015 — shows these variations in the patterns of crashes (characteristics, severity and causes) amongst districts in further detail.

The analyses summarised here have identified three levels of priority (with some overlap between the first two levels) for addressing serious and fatal road injuries. These priorities are listed below, along with a note of the level of concern each issue in given in *Safer Journeys, New Zealand's road safety strategy 2010-2020*.

1. The Big 5 issues

- vulnerable road users:
  - motorcylists — area of high concern in the national strategy
  - pedestrians — area of medium concern in the national strategy
  - cyclists — area of medium concern in the national strategy
- crashes in high speed areas — area of high concern in the national strategy
- driving under the influence of alcohol — area of high concern in the national strategy.

2. Driver behaviour issues that stand out as being priorities for intervention in Otago and Southland

- driving a vehicle while impaired:
  - **driving** while over the BAC limit (particularly in Otago) — area of high concern in the national strategy
  - driving while fatigued — area of medium concern in the national strategy
- unpredictable behaviour:
  - travelling too fast for the conditions — area of high concern in the national strategy
  - making a dangerous manoeuvre
- non-compliance with road rules
  - **failing to give way to a pedestrian** (severe only in Otago) — part of an area of medium concern in the national strategy.

3. Some single district issues with lower numbers of crashes but a likelihood of severe trauma (listed in Table 9).

Additionally, safe travel for overseas and domestic visitors needs to be considered a road safety priority because of the potential economic ramifications of either a poor road safety record or a downturn in visitor numbers due to unwelcoming attitudes expressed towards visitors to our region.

This identification of priorities for investment and action now allows the Otago and Southland regional transport committees to evaluate whether the investment currently being made in road safety is at the right level, being targeted appropriately, and coordinated effectively across agencies for maximum effect.

As one would expect, there are overlaps between the Big 5 priorities and these driving behaviours identified as priorities for action. Planning of interventions to address these five behaviours thus needs to be integrated with planning of interventions to address the 'Big 5' priorities for action on road safety in Otago and Southland regions.

4.2. Recommendations regarding data collection and the data sets used

This study demonstrated clearly the benefits of using all available sets of data to determine what matters that efforts to reduce road safety trauma should focus on. The use of not just CAS data (as is the usual approach) but also ACC and hospitalisation data proved insightful. Use of CAS data alone fails to properly evaluate evidence of serious injuries suffered by vulnerable road users (motorcyclists, pedestrians and cyclists) and over-emphasises crashes involving cars, trucks and similar vehicles.

At the moment it is not possible to cross-reference records of a single crash across these three data sets. This makes it difficult to understand the full impact of any single crash or accident. Also ACC and hospitalisation data does not contains a field to collect data on the location of a crash or accident (ACC forms contain this data but not in a searchable format). This means that, in studying crashes and accidents occurring at particular parts of the roading network, those recorded only in hospital and ACC data sets, but not in CAS, are not

visible. Again this distorts evaluation of what interventions may be needed to reduce the incidence of serious trauma in the region.

The combined Otago Southland Regional Advisory Group (transport staff advising the Regional Transport Committees) has recommended:

- a project be undertaken to investigate ways of aligning CAS, ACC and hospitalisation data
- further assessment of information contained with the ACC and hospitalisation data sets, to strengthen the robustness of future road safety priority setting.
- development of further tool to assess root causes, to complement statistical analyses.

Appendix 1

Results of analyses of the evidence for types of driver behaviour being a cause of serious road trauma in Otago and Southland

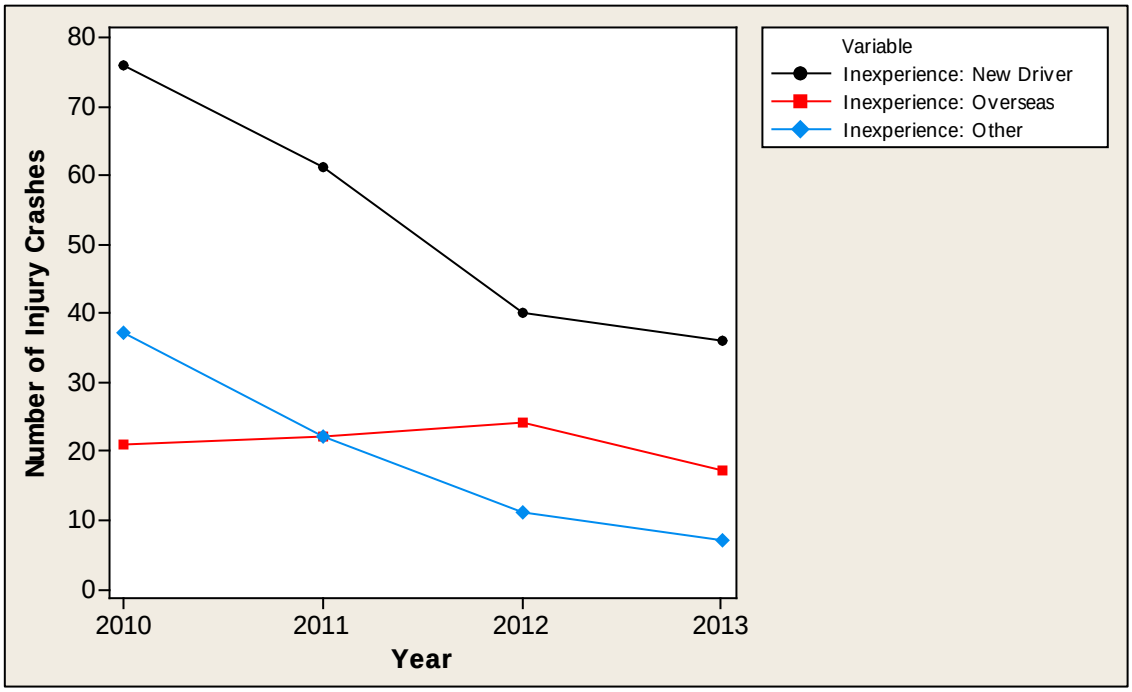
This Appendix summarises the statistical evidence about whether or not the five types of behaviour, listed in Table 2 in the main body of the report, are a priority for action in Otago and Southland. The appendix examines the following matters for each category of behaviour: trend over time for crashes in which this behaviour is implicated (as determined from Police traffic crash reports and recorded in CAS) and the geographical location and severity of those crashes. The results are summarised in tables 4 to 8 in the main body of the report.

Appendix 2 lists the Police codes for traffic crashes used to identify the occurrence of these behaviours, and groups these codes into 14 sub-categories of behaviour spanning the five behaviours examined in this analysis, as shown in Table 2.

Road users suffer or cause serious injuries due to a lack of skills or competence

Trend over time: Otago

Figure 17 **Reported injury crashes in CAS involving inexperience in the Otago region, 2010-2013**



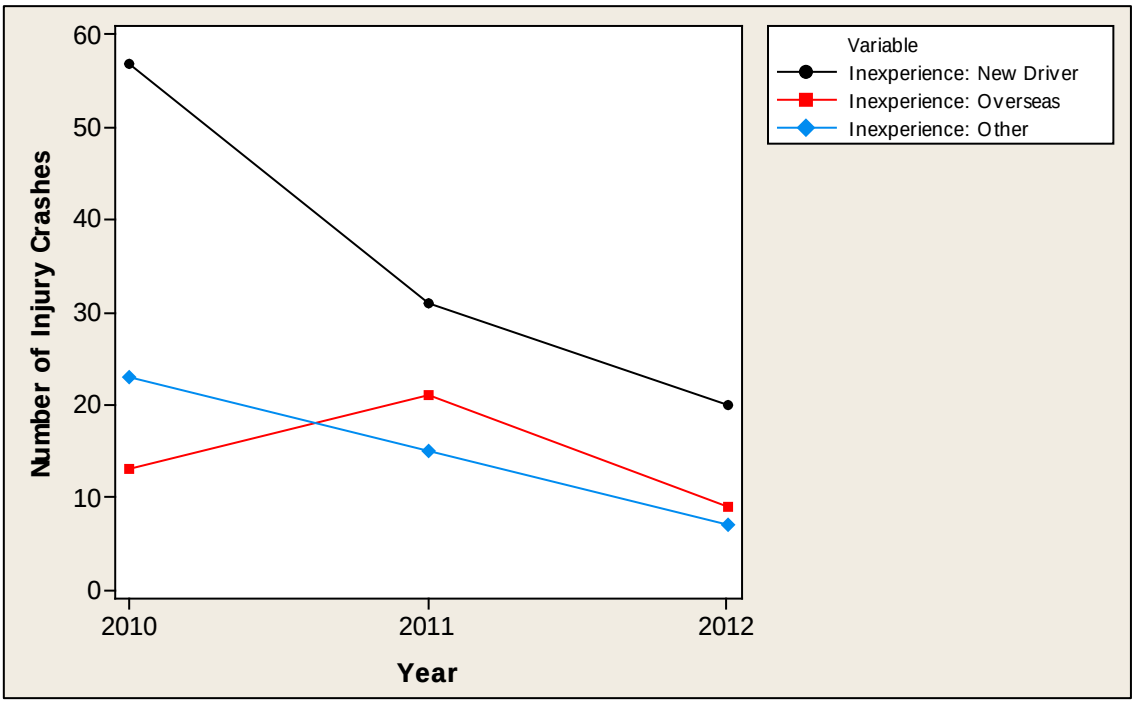
The number of reported injury crashes that were caused partly by a new driver's inexperience, as well as by inexperience in 'other' situations (e.g. driving an unfamiliar vehicle, etc.), decreased between 2010 and 2013.

The number of reported injury crashes that were caused partly by an overseas or migrant driver's inexperience or inability to adjust to New Zealand road rules and road conditions has remained stable from 2010 to 2013 inclusive.

Trend over time: Southland

Note: 2013 data is excluded for Southland from this graph, as the dataset is missing some crashes in late 2013 - see page 5.

Figure 18 **Reported injury crashes in CAS involving inexperience in the Southland region, 2010-2012**

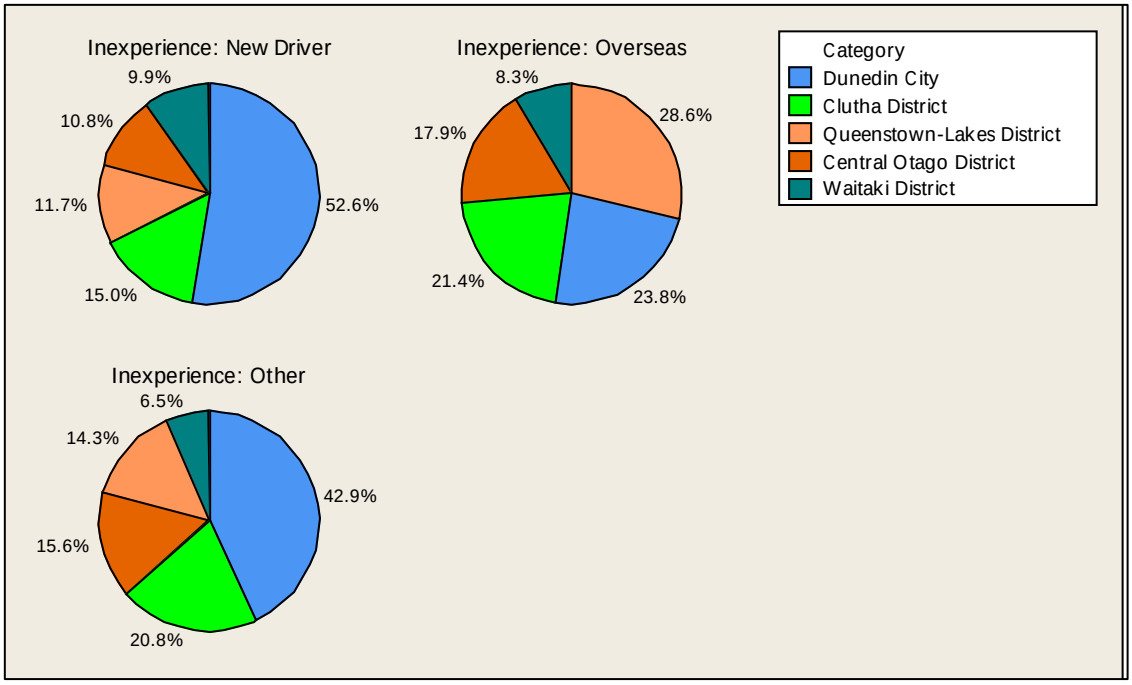


The number of reported injury crashes that were caused partly by a new driver's inexperience, as well as by inexperience in 'other' situations (e.g. driving an unfamiliar vehicle, etc.), has decreased over the past few years (2010-12).

The number of reported injury crashes that were caused partly by an overseas or migrant driver's inexperience or inability to adjust to New Zealand road rules and road conditions has remained stable over the past few years (2010-12).

Location of inexperience-related crashes: Otago

Figure 19 **Reported injury crashes in CAS involving inexperience in the Otago region, 2010-2013, showing percentage of each behaviour in each district**



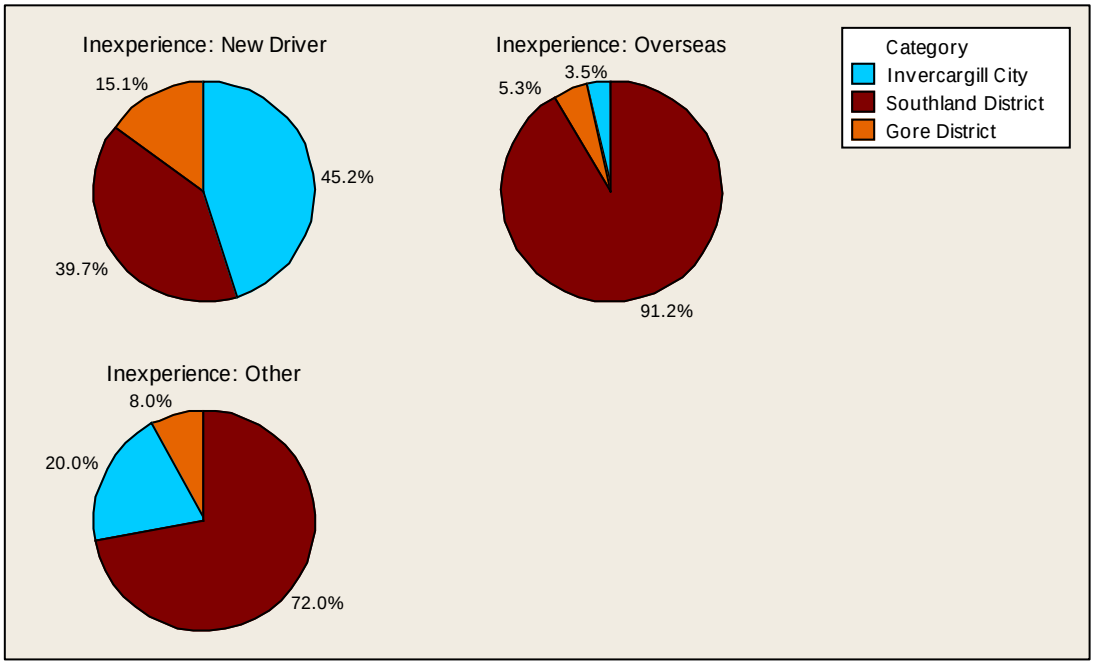
In general, a high proportion of the reported injury crashes in Otago region that were caused partly by a new driver's inexperience, as well as by inexperience in 'other' situations (e.g. driving an unfamiliar vehicle, etc.), tend to take place in Dunedin City, with Clutha District also featuring.

The majority of reported injury crashes that were caused partly by an overseas or migrant driver's inexperience or inability to adjust to New Zealand road rules and road conditions tend to take place in either Queenstown Lakes District or Dunedin City, with Clutha and the other Otago districts playing a lesser role.

Location of inexperience-related crashes: Southland

See page 5 regarding 2013 crashes included in this dataset.

Figure 20 **Reported injury crashes in CAS involving inexperience in the Southland region, 2010-2013, showing percentage of each behaviour in each district**

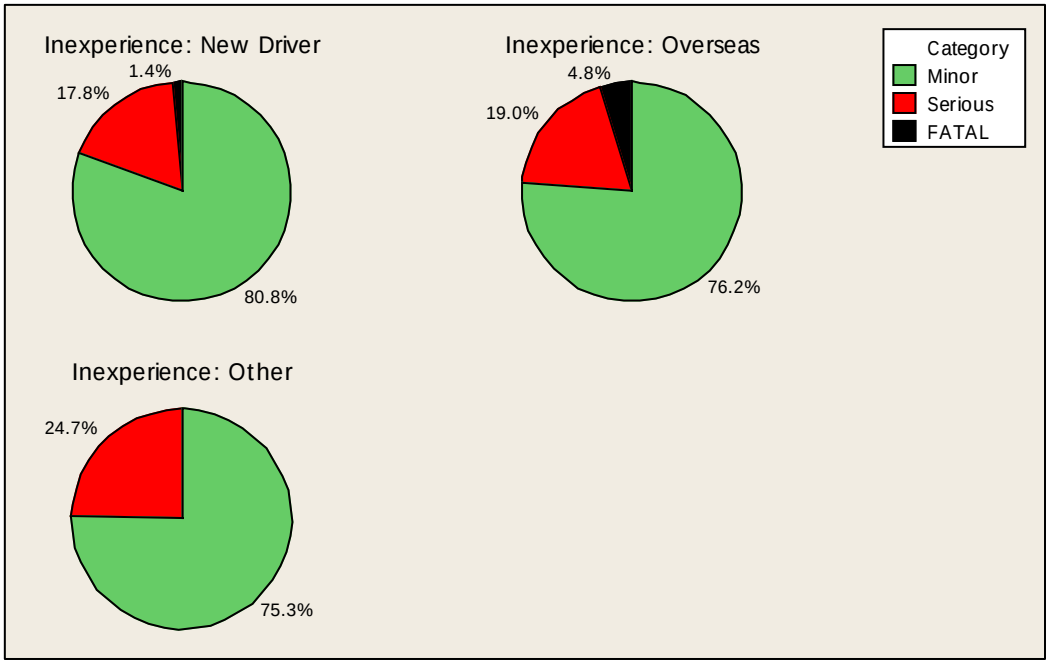


The majority of reported injury crashes that were caused partly by a new driver's inexperience tend to take place in either Invercargill City or Southland District, with Gore District playing a lesser role.

However, the vast majority of reported injury crashes that were caused partly by an overseas or migrant driver's inexperience or inability to adjust to New Zealand road rules and road conditions, as well as injury crashes caused by 'other' sorts of inexperience (e.g. over-reacting in the event of a crash), tend to take place in Southland District. Invercargill and Gore barely feature.

Severity of inexperience-related crashes: Otago

Figure 21 **Severity of reported injury crashes in CAS involving inexperience in the Otago region, 2010-2013**



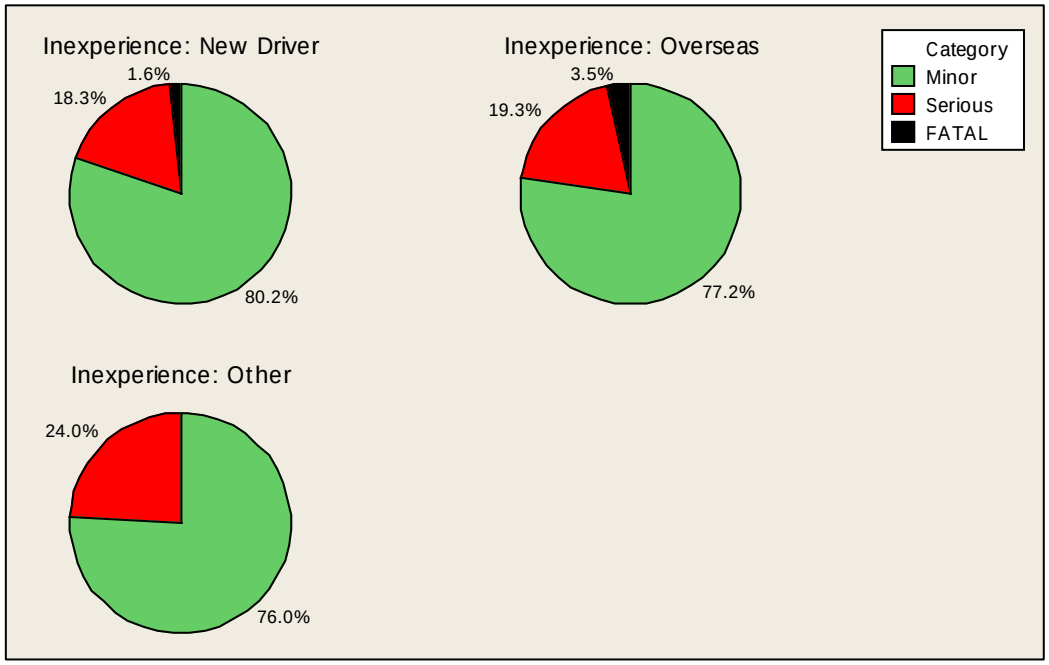
All three inexperience-related categories show the same pattern: The majority of reported injury crashes are minor, with fewer serious and fatal crashes.

Although it seems as though overseas or migrant inexperience is associated with fatal crashes, it is important to remember that sample sizes are relatively small and that the apparently large black sector of the pie only represents four crashes. It is thus difficult to conclude whether there is a true statistical association or not without further testing and analysis.

Severity of inexperience-related crashes: Southland

See page 5 regarding 2013 crashes included in this dataset.

Figure 22 **Severity of reported injury crashes in CAS involving inexperience in the Southland region, 2010-2013**



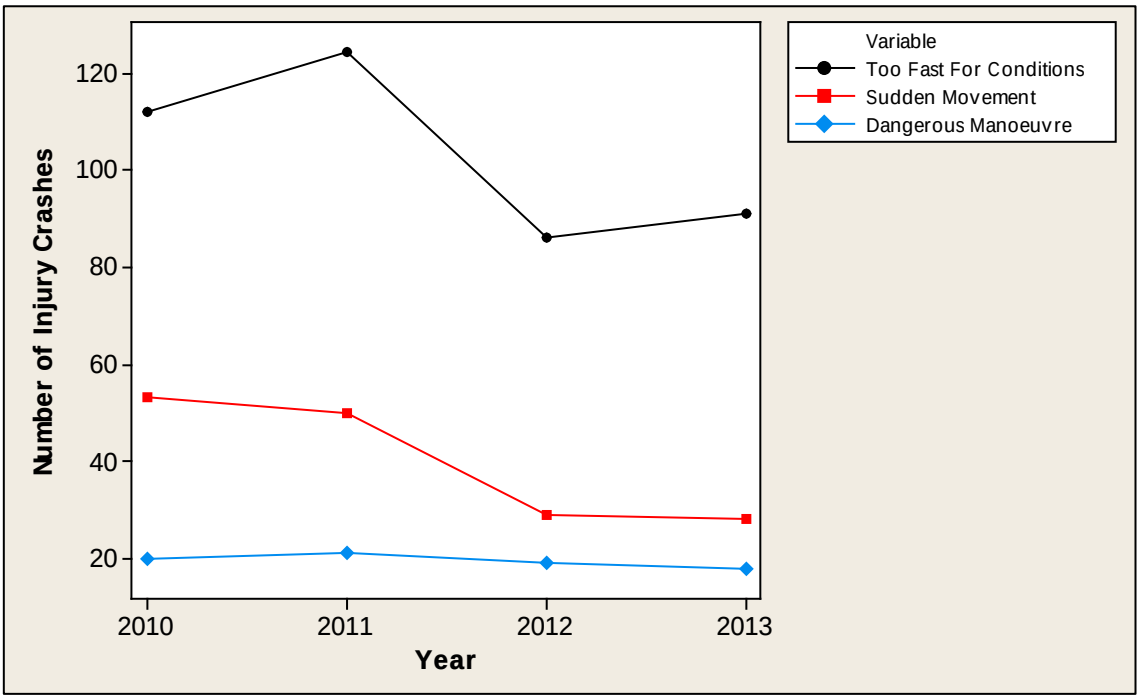
All three inexperience-related categories show the same pattern: the majority of reported injury crashes are minor, with fewer serious and fatal crashes.

Although it seems as though overseas or migrant inexperience is associated with fatal crashes, it is important to remember that sample sizes are relatively small and that the apparently large black sector of the pie only represents two crashes. It is thus difficult to conclude whether there is a true statistical association or not without further testing and analysis.

The unpredictability of road users causes fatal or serious injury

Trend over time: Otago

Figure 23 **Reported injury crashes in CAS involving unpredictability in the Otago region, 2010-2013**



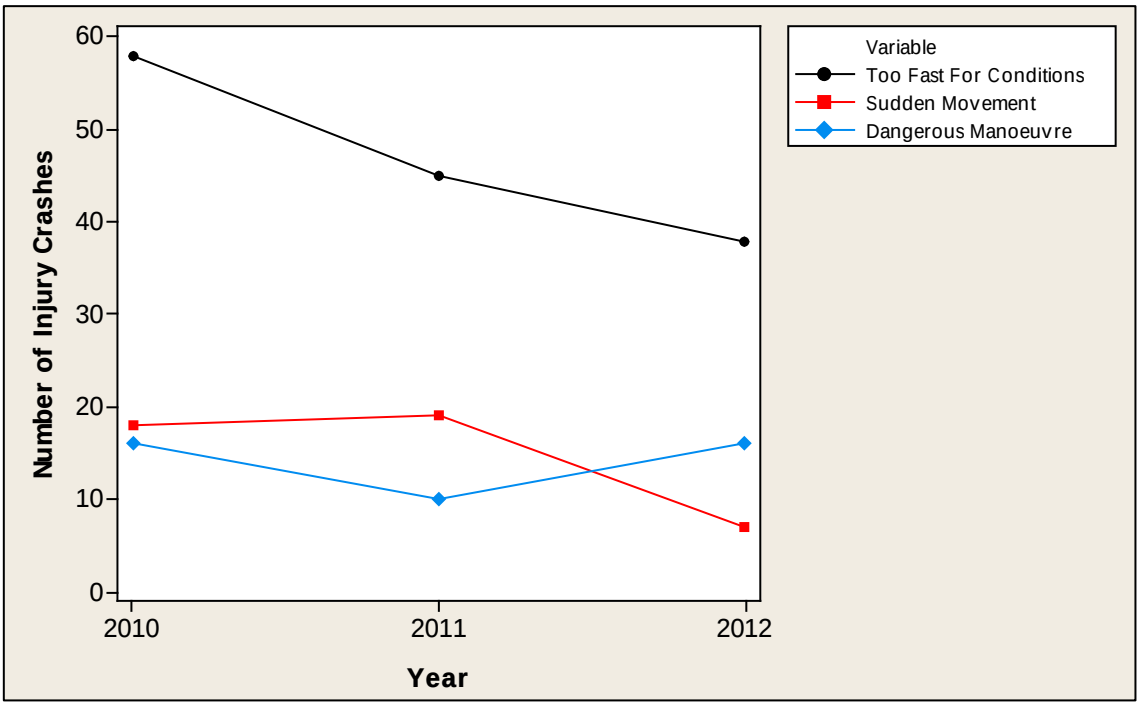
The number of reported injury crashes involving excess speed, as well as the number of reported injury crashes involving a sudden movement (e.g. braking, turning or swerving suddenly), has decreased between 2010 and 2013.

The number of reported injury crashes involving a dangerous manoeuvre (i.e. overtaking in an inappropriate location, engaging in an illegal movement, racing, etc.) has remained stable over the past few years (2010-12).

Trend over time: Southland

Note: 2013 data is excluded for Southland from this graph, as the dataset is missing some crashes in late 2013 - see page 5.

Figure 24 **Reported injury crashes in CAS involving unpredictablity in the Southland region, 2010-2012**

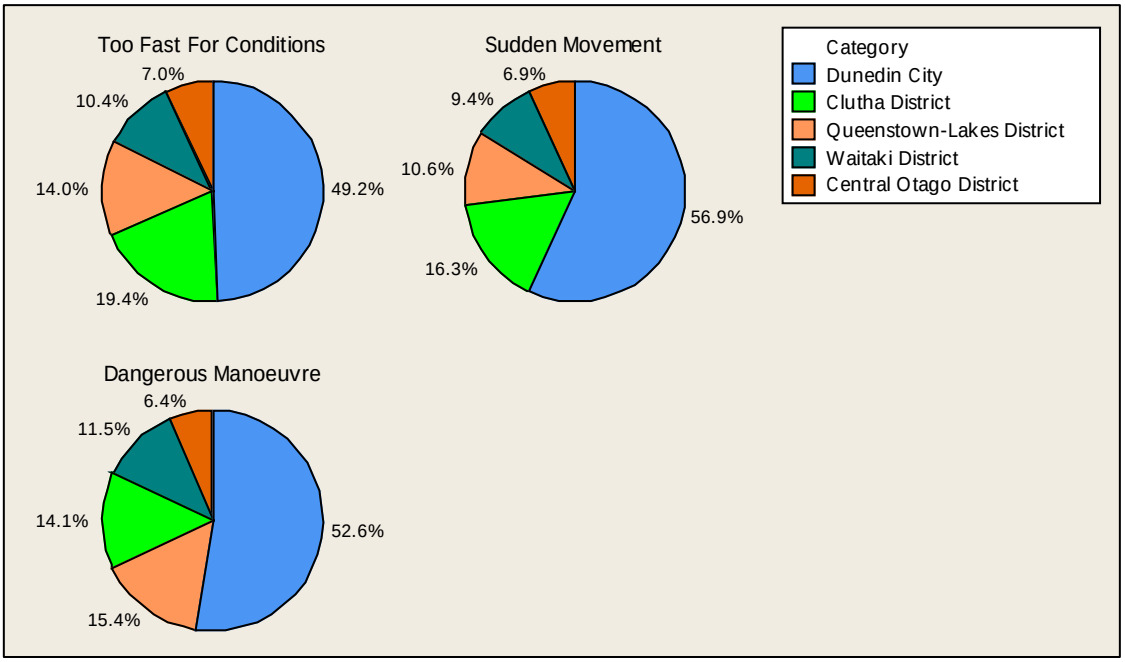


The number of reported injury crashes involving excess speed, as well as the number of reported injury crashes involving a sudden movement (e.g. braking, turning or swerving suddenly), has decreased over the past few years (2010-12).

The number of reported injury crashes involving a dangerous manoeuvre (i.e. overtaking in an inappropriate location, engaging in an illegal movement, racing, etc.) has remained stable over the past few years (2010-12).

Location of unpredictability-related crashes: Otago

Figure 25 **Reported injury crashes in CAS involving unpredictability in the Otago region, 2010-2013, showing percentage of each behaviour found in each district**



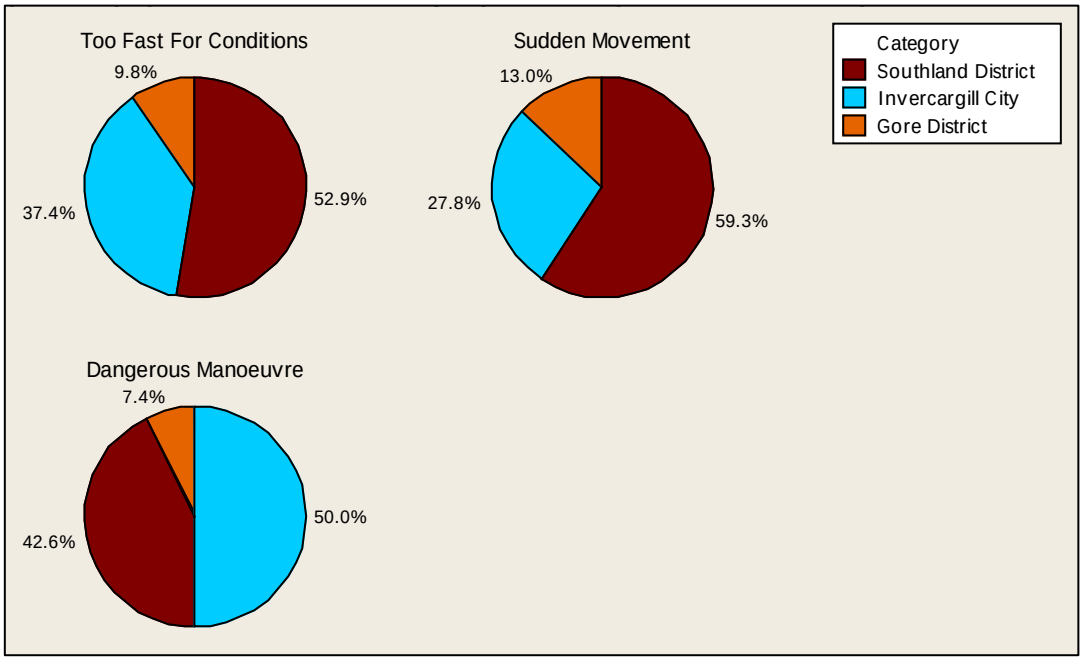
In general, a high proportion of reported injury crashes that were caused partly by excess speed, and those that were caused partly by a sudden movement of some kind, tend to take place in Dunedin City, with Clutha District also featuring.

In addition, a high proportion of reported injury crashes that were caused partly by at least one road user taking part in a dangerous manoeuvre of some kind (e.g. overtaking inappropriately, racing, etc.) tend to take place in Dunedin City, with Queenstown Lakes District also featuring.

Location of unpredictability-related crashes: Southland

See page 5 regarding 2013 crashes included in this dataset.

Figure 26 **Reported injury crashes in CAS involving unpredictability in the Southland region, 2010-2013, showing percentage of each behaviour found in each district**

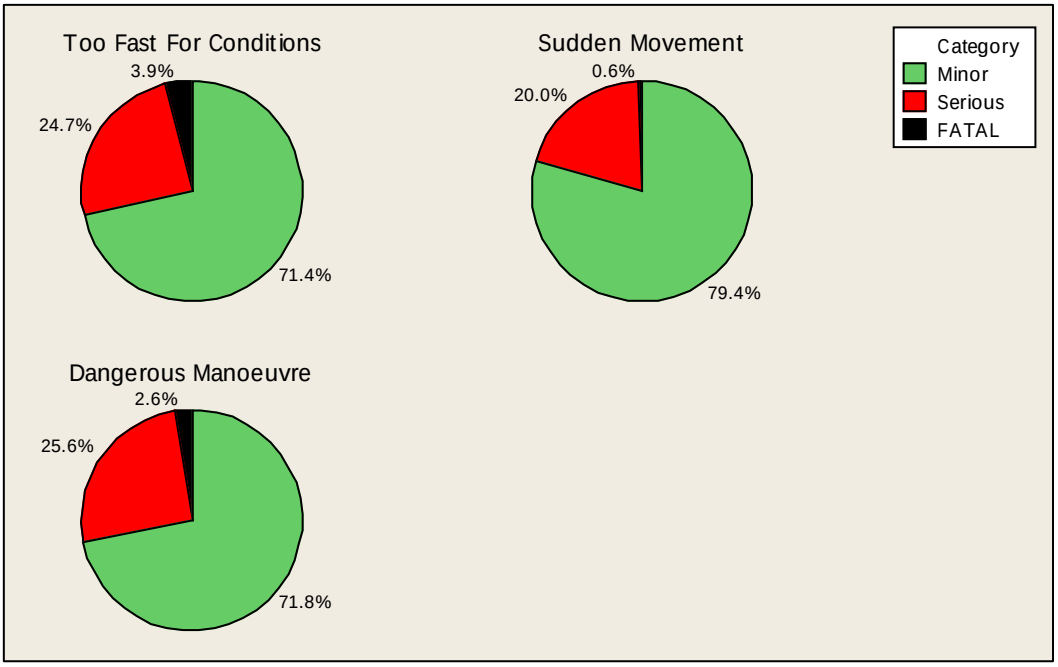


The majority of reported injury crashes that were caused partly by excess speed, and those that were caused by a dangerous manoeuvre (e.g. overtaking inappropriately, racing, etc.), tend to take place in either Invercargill City or Southland District, with Gore District playing a lesser role.

In general, a high proportion of reported injury crashes that were caused partly by a sudden movement tend to take place in Southland District, with Invercargill City also featuring.

Severity of unpredictability-related crashes: Otago

Figure 27 **Severity of reported injury crashes in CAS involving unpredictability in the Otago region, 2010-2013**



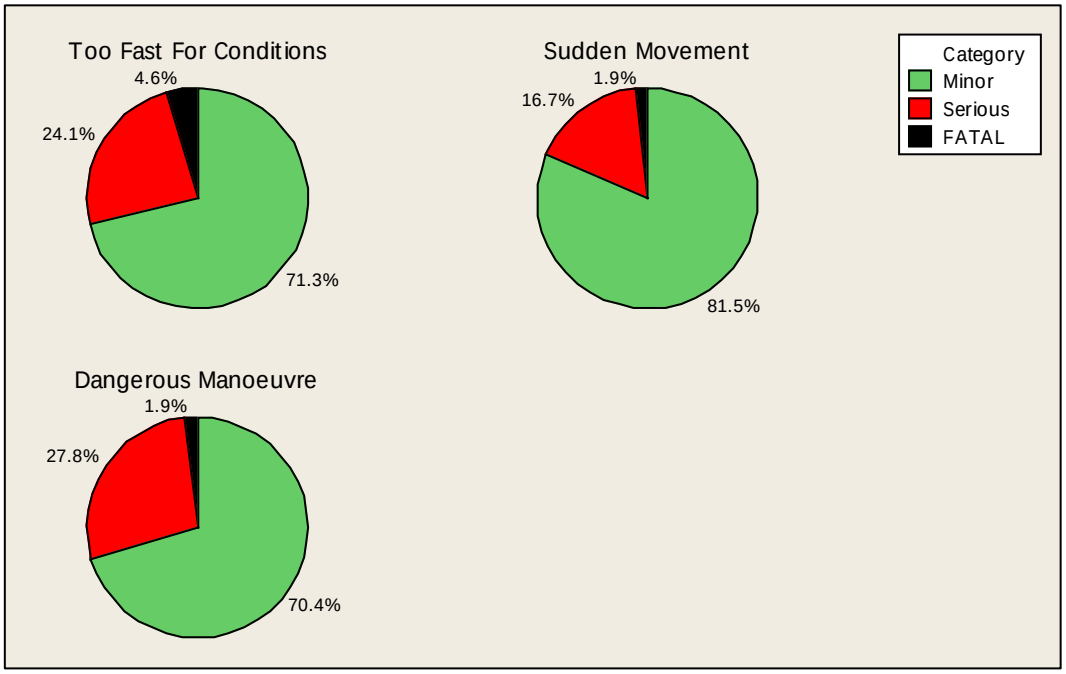
Although it is difficult to confirm without further statistical testing, injury crashes involving at least one road user travelling too fast for conditions, as well as those involving a dangerous manoeuvre (e.g. overtaking inappropriately, racing, etc.), seem closely associated with severe road trauma, with over a quarter of all recorded crashes of this type in Otago classed as 'fatal' or 'serious'.

With respect to injury crashes involving sudden movements, on the other hand, most reported injury crashes are minor, with fewer serious and fatal crashes.

Severity of unpredictability-related crashes: Southland

See page 5 regarding 2013 crashes included in this dataset.

Figure 28 **Severity of reported injury crashes in CAS involving unpredictability in the Southland region, 2010-2013**



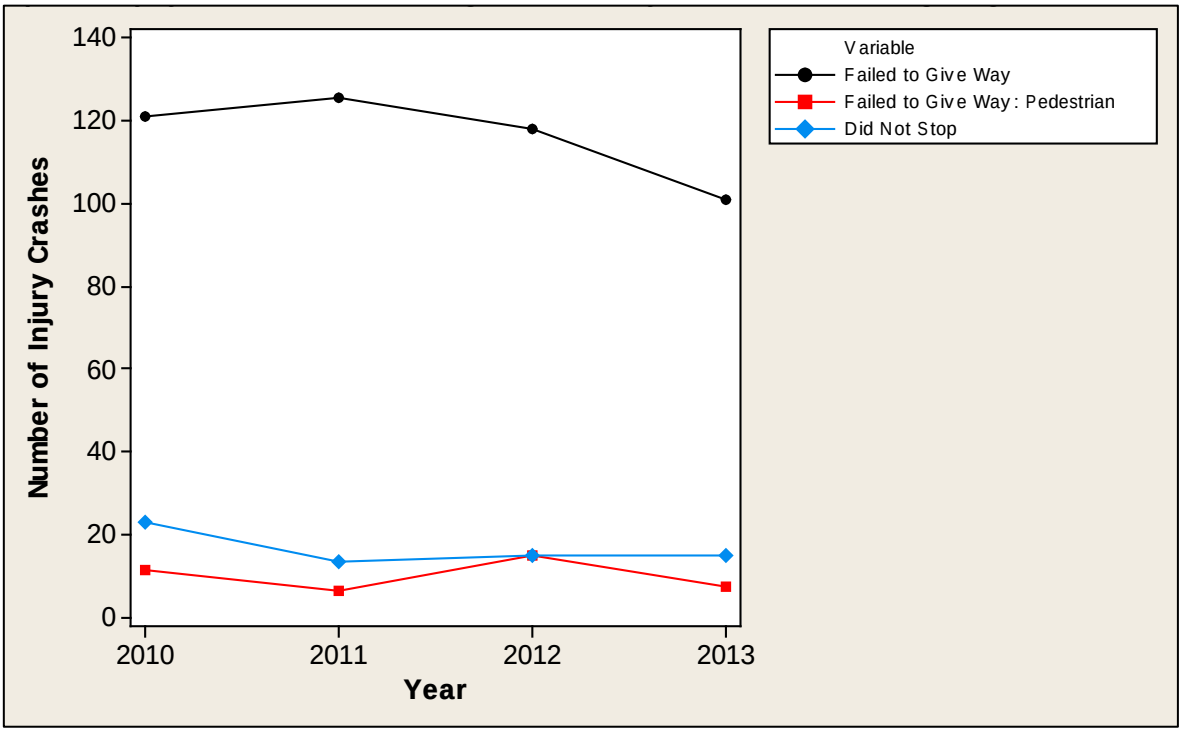
Although it is difficult to confirm without further statistical testing, injury crashes involving at least one road user travelling too fast for conditions, as well as those involving a dangerous manoeuvre (e.g. overtaking inappropriately, racing, etc.), seem closely associated with severe road trauma, with over a quarter of all recorded crashes of this type in Southland classed as 'fatal' or 'serious'.

With respect to injury crashes involving sudden movements, on the other hand, the majority of reported injury crashes are minor, with fewer serious and fatal crashes.

Drivers fail to comply with road rules sufficiently to prevent fatal and serious injuries occurring

Trend over time: Otago

Figure 29 **Reported injury crashes in CAS involving failure to obey certain road rules in the Otago region, 2010-2013**



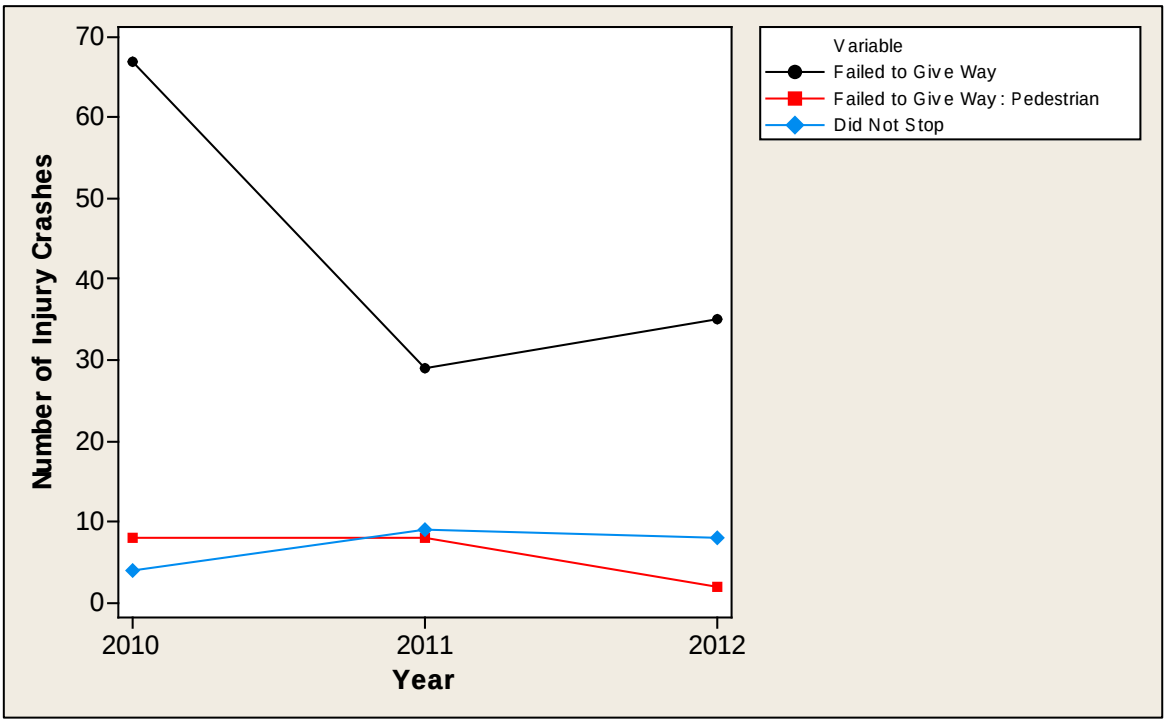
The number of reported injury crashes involving at least one road user failing to give way has decreased between 2010 and 2013.

The number of reported injury crashes involving at least one road user failing to give way to a pedestrian, as well as failing to stop when appropriate (e.g. at red light or at Stop sign), has remained stable from 2010 to 2013 inclusive.

Trend over time: Southland

Note: 2013 data is excluded for Southland from this graph, as the dataset is missing some crashes in late 2013 - see page 5.

Figure 30 **Reported injury crashes in CAS involving failure to obey certain road rules in the Southland region, 2010-12**

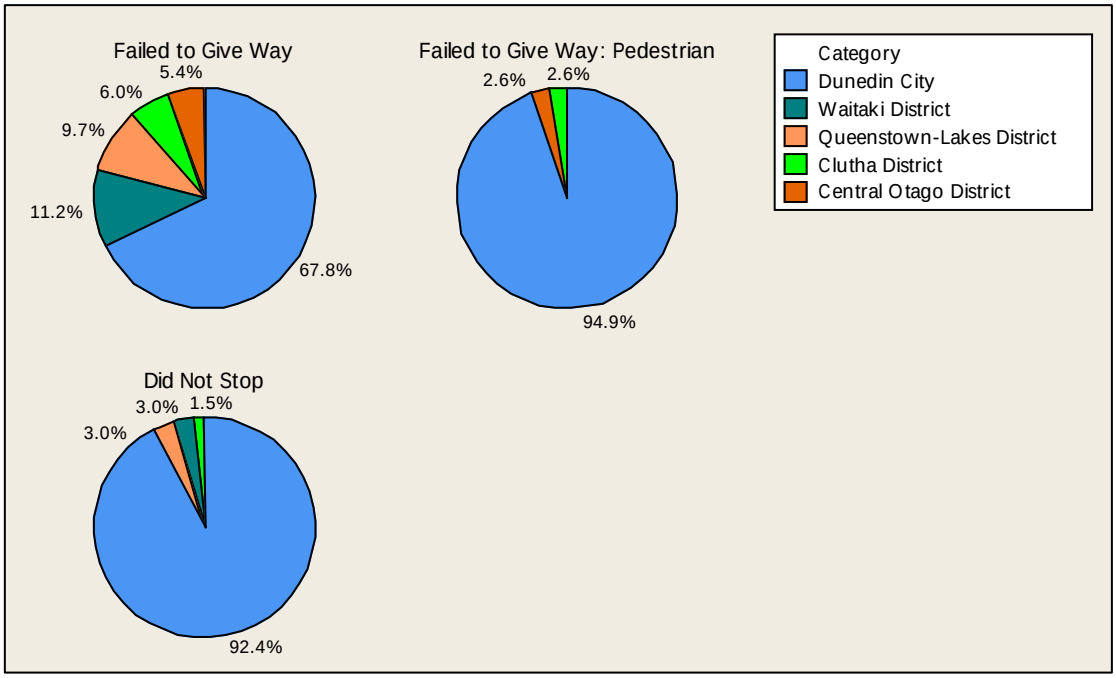


The number of reported injury crashes involving at least one road user failing to give way decreased between 2010 and 2013.

The number of reported injury crashes involving at least one road user failing to give way to a pedestrian, as well as failing to stop when appropriate (e.g. at red light or at Stop sign), has remained stable from 2010 to 2013 inclusive.

Location of road rule-related crashes: Otago

Figure 31 **Reported injury crashes in CAS involving failure to obey road rules in the Otago region, 2010-2013, showing percentage of each behaviour found in each district**



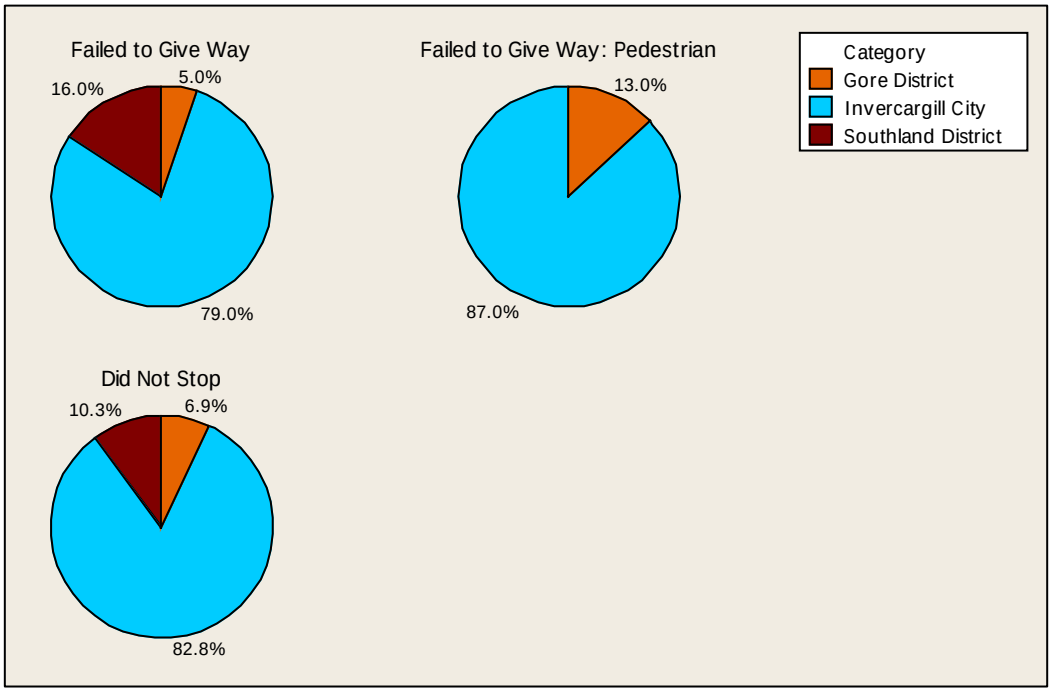
The majority of reported injury crashes involving at least one road user failing to give way tend to occur in Dunedin City, with Waitaki District also playing a key role.

By contrast, the majority of reported injury crashes involving at least one road user failing to give way to a pedestrian, as well as failing to stop when appropriate (e.g. at red light or at Stop sign), occur in Dunedin City. The other Otago districts barely play a role.

Location of road rule-related crashes: Southland

See page 5 regarding 2013 crashes included in this dataset.

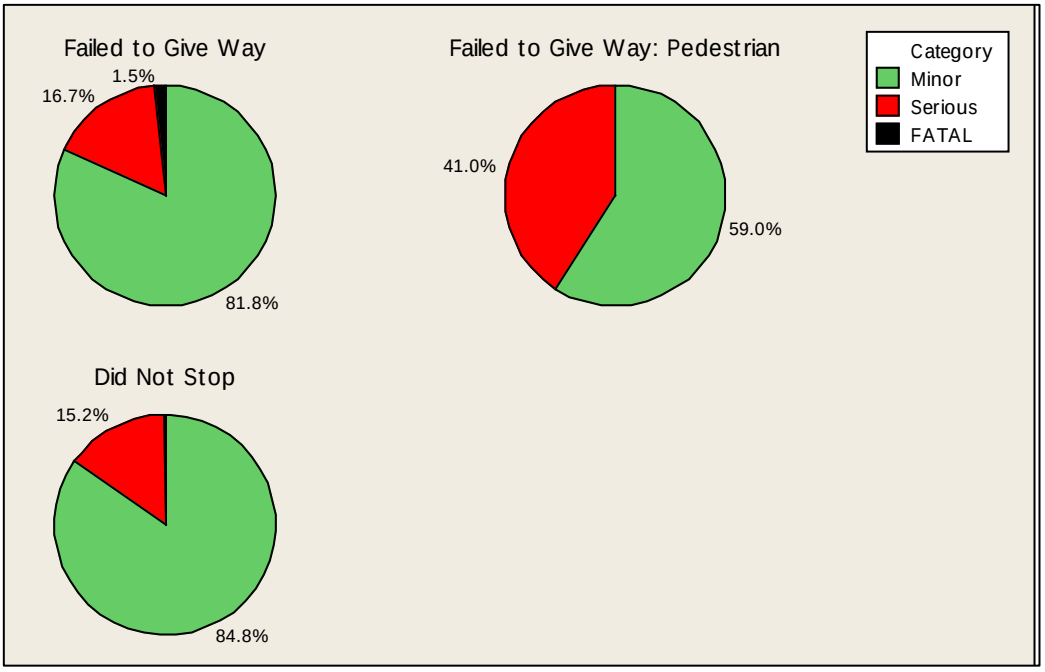
Figure 32 **Reported injury crashes in CAS involving failure to obey road rules in the Southland region, 2010-2013, showing percentage of each behaviour found in each district**



The majority of reported injury crashes involving a failure to obey road rules (including a failure to give way to pedestrians and to other road users, as well as a failure to stop when appropriate) have taken place in Invercargill City. The other Southland districts barely play a role.

Severity of road rule-related crashes: Otago

Figure 33 **Severity of reported injury crashes in CAS involving failure to obey road rules in the Otago Region, 2010-2013**



With respect to reported injury crashes involving a failure to give way or stop appropriately when required (e.g. at Stop sign or steady red light), the majority of reported injury crashes are minor, with fewer serious and fatal crashes.

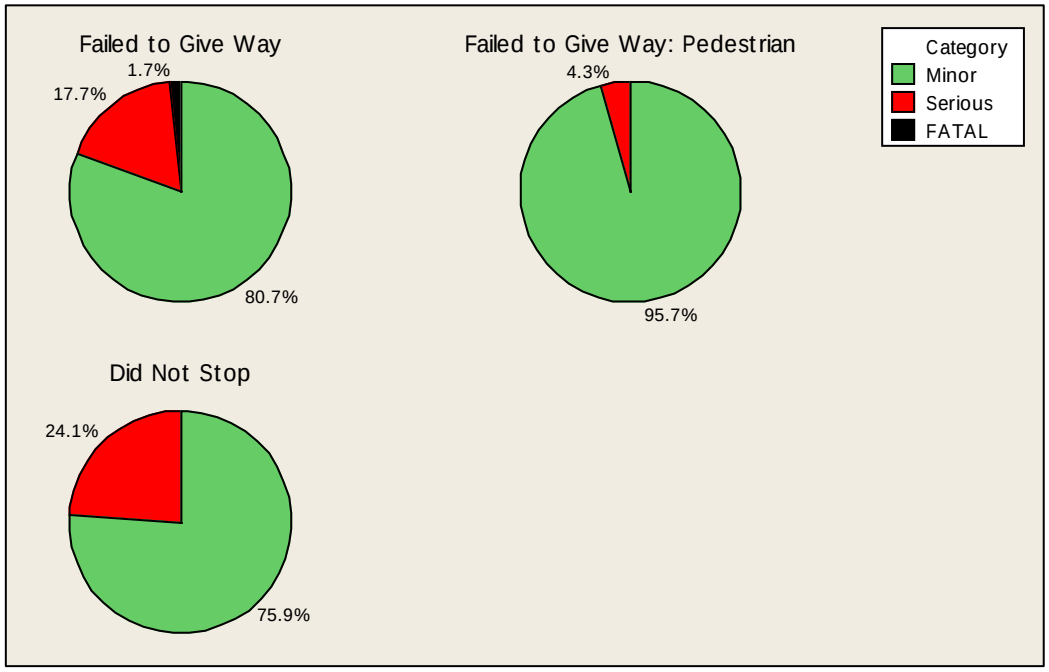
By contrast, with respect to reported injury crashes involving a failure to give way to a pedestrian (on a zebra crossing or at a signalised crossing), a large proportion is serious.

41.0% of reported injury crashes that have involved a failure to give way to a pedestrian (on a zebra crossing or at a signalised crossing) have resulted in a serious injury to at least one road user in the crash; generally, it is the pedestrian.

Severity of road rule-related crashes: Southland

See page 5 regarding 2013 crashes included in this dataset.

Figure 34 **Severity of reported injury crashes in CAS involving failure to obey road rules in the Southland region, 2010-2013**

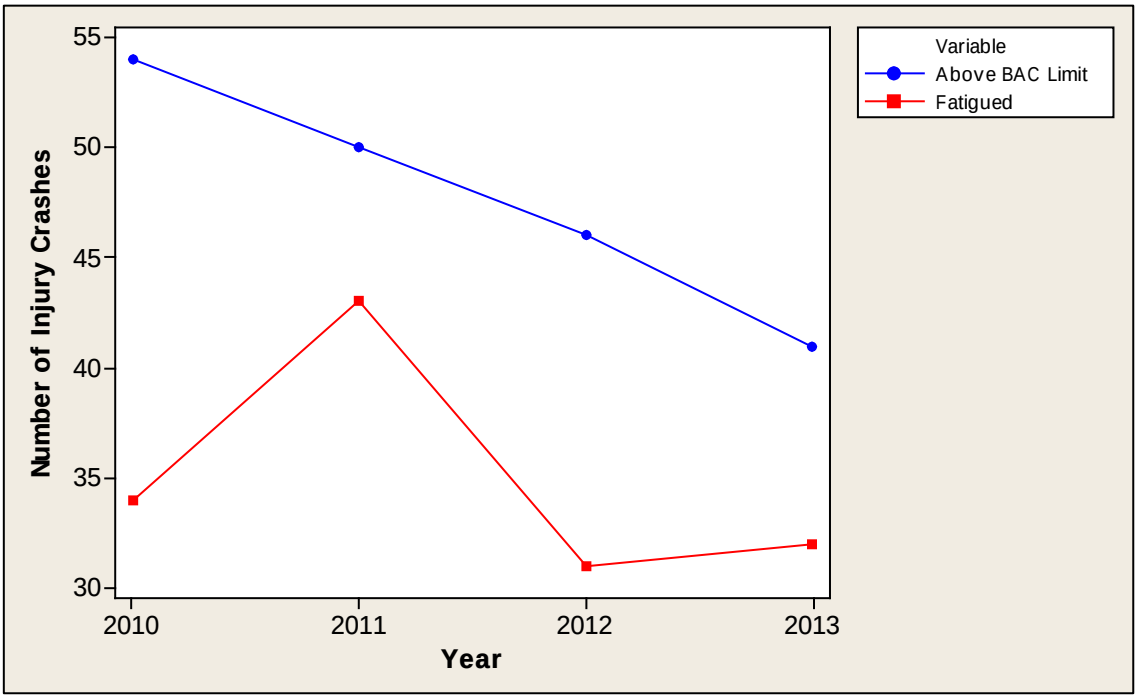


The majority of reported injury crashes involving a failure to obey road rules (including a failure to give way, to pedestrians and to other road users, as well as a failure to stop when appropriate) are minor, with fewer serious and fatal crashes.

Drivers are impaired by drugs, alcohol or fatigue to the extent that they drive unsafely

Trend over time: Otago

Figure 35 **Reported injury crashes in CAS involving impairment in the Otago region, 2010-2013**



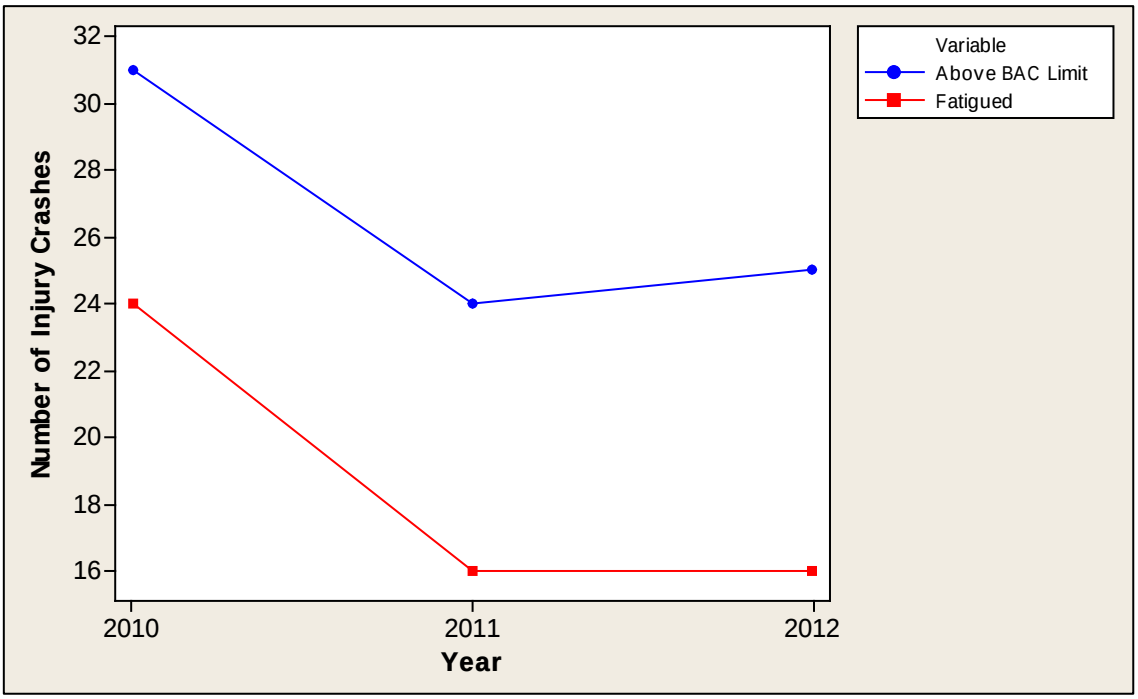
The number of reported injury crashes involving at least one road user over the BAC limit has decreased between 2010 and 2013.

The number of reported injury crashes involving at least one road user being fatigued at the time of the crash remained stable in 2010 to 2013.

Trend over time: Southland

Note: 2013 data is excluded for Southland from this graph, as the dataset is missing some crashes in late 2013 - see page 5.

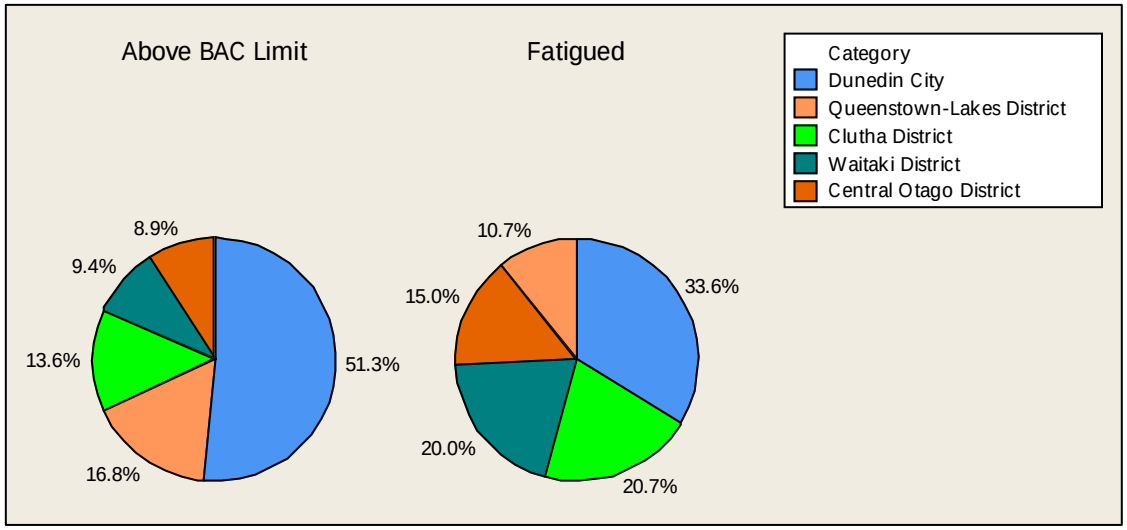
Figure 36 **Reported injury crashes in CAS involving impairment in the Southland region, 2010-2012**



The number of reported injury crashes involving at least one road user being impaired (either through excess alcohol consumption, or fatigue) at the time of the crash has remained stable from 2010 to 2013.

Location of impairment-related crashes: Otago

Figure 37 **Reported injury crashes in CAS involving impairment in the Otago region, 2010-2013, showing percentage of each behaviour found in each district**



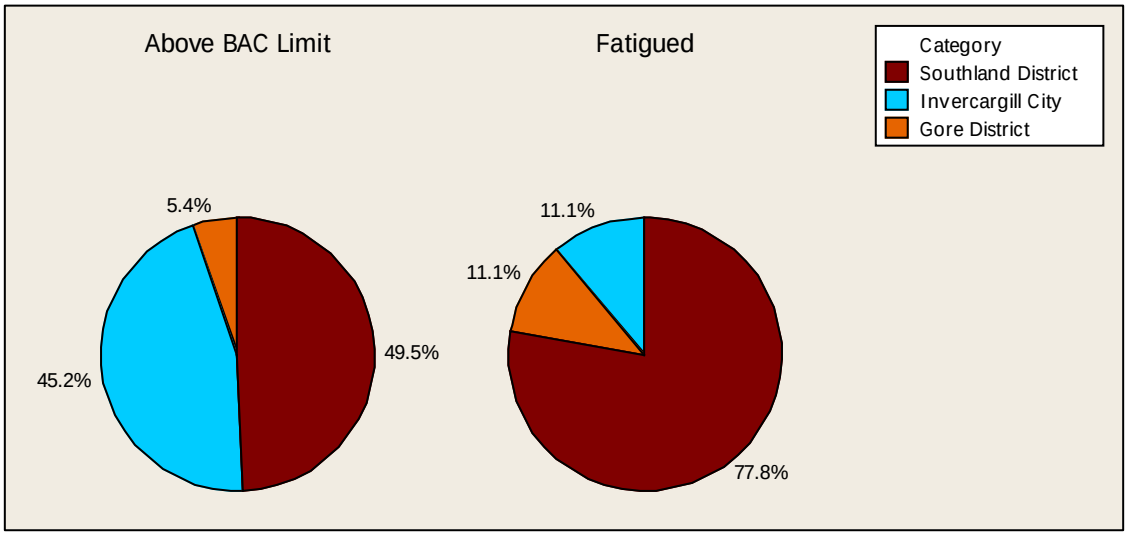
The majority of reported injury crashes involving at least one road user over the BAC limit tend to occur in Dunedin City, with Queenstown Lakes District also playing a key role.

Reported injury crashes involving at least one road user feeling fatigued tend to take place in either Dunedin City or Clutha District, with Waitaki District and the other Otago districts playing a lesser role.

Location of impairment-related crashes: Southland

See page 5 regarding 2013 crashes included in this dataset.

Figure 38 **Reported injury crashes in CAS involving impairment in the Southland region, 2010-2013, showing percentage of each behaviour found in each district**

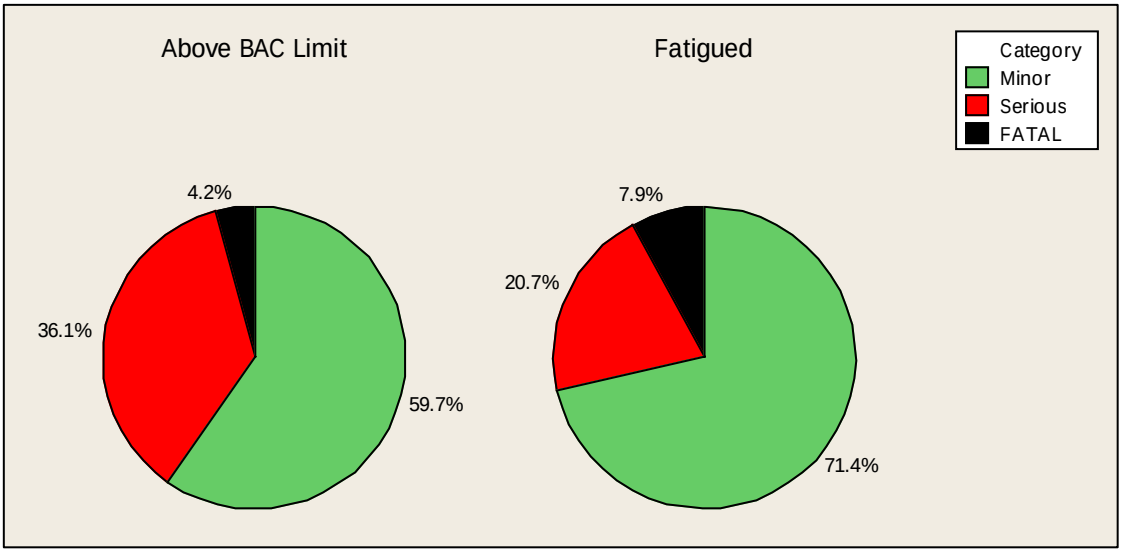


Reported injury crashes involving at least one road user over the BAC limit tend to take place in either Southland District or Invercargill City, with Gore District playing a lesser role.

The majority of reported injury crashes involving at least one fatigued road user have taken place in Southland District. The other districts in the Southland Region barely play a role.

Severity of impairment-related crashes: Otago

Figure 39 **Severity of reported injury crashes in CAS involving impairment in the Otago region, 2010-2013**



With respect to reported injury crashes involving at least one road user over the BAC limit, a large proportion is serious.

36.1% of reported injury crashes involving at least one road user over the BAC limit have resulted in serious injury to at least one road user.

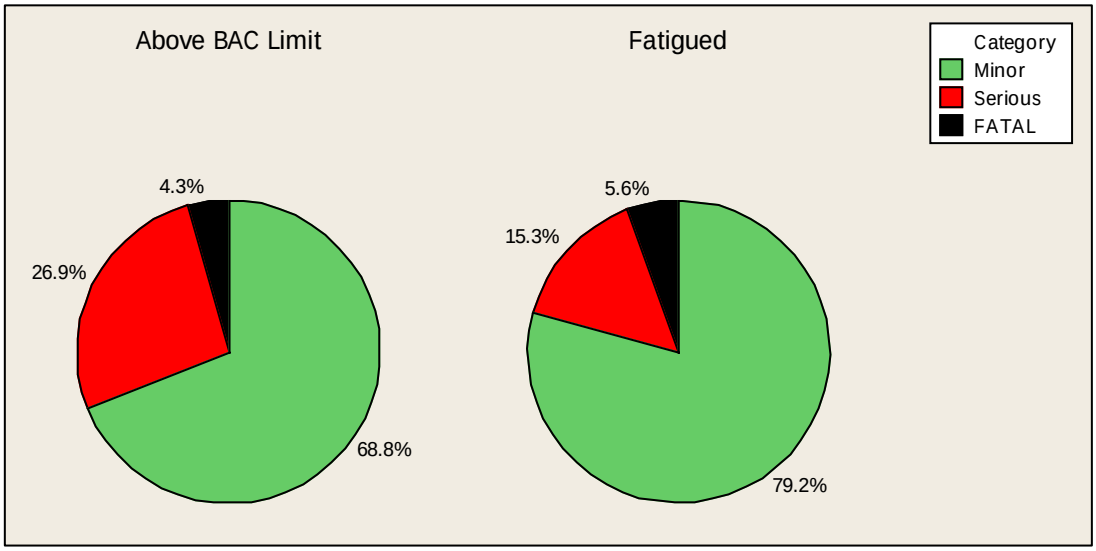
With respect to reported injury crashes involving at least one road user reporting fatigue, a large proportion is fatal.

7.9% of reported injury crashes involving at least one fatigued road user have resulted in a fatal injury to at least one road user.

Severity of impairment-related crashes: Southland

See page 5 regarding 2013 crashes included in this dataset.

Figure 40 **Sevrity of reported injury crashes in CAS involving impairment in the Southland region, 2010-2013**



With respect to reported injury crashes involving at least one road user over the BAC limit, a large proportion is serious (although the proportion is much smaller than for Otago).

26.9% of reported injury crashes involving at least one road user over the BAC limit have resulted in serious injury to at least one road user.

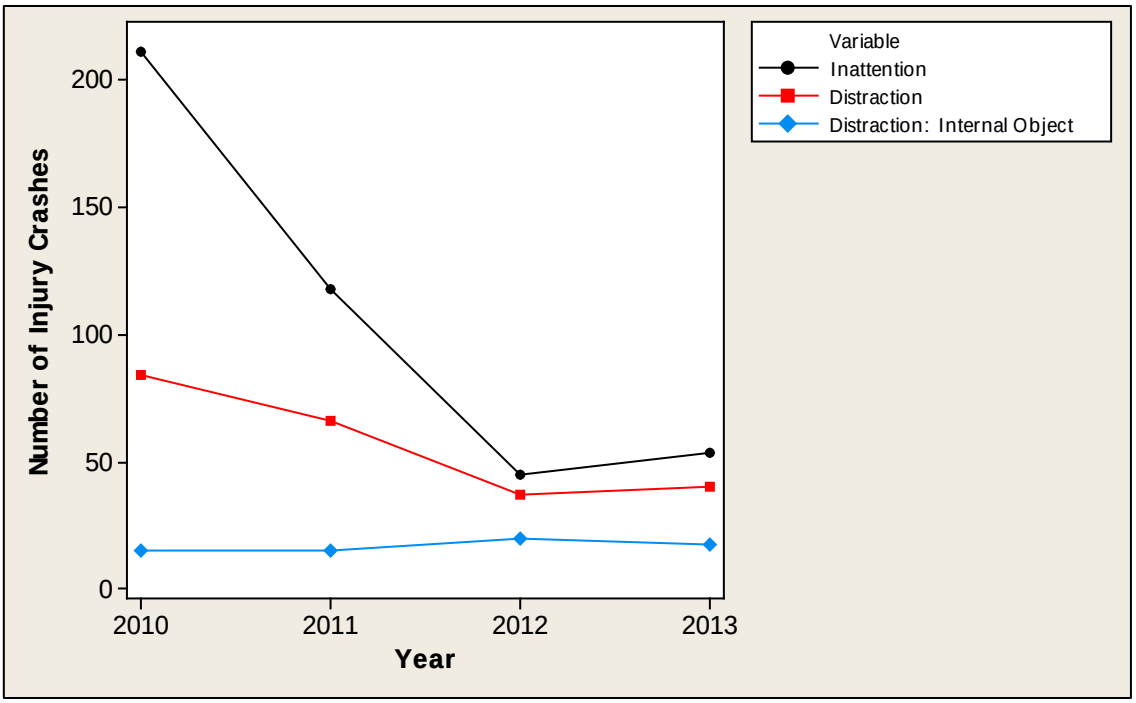
With respect to reported injury crashes involving at least one road user reporting fatigue, a large proportion is fatal.

5.6% of reported injury crashes involving at least one fatigued road user have resulted in a fatal injury to at least one road user.

Drivers are not alert enough to drive safely

Trend over time: Otago

Figure 41 Reported injury crashes in CAS involving lack of alertness in the



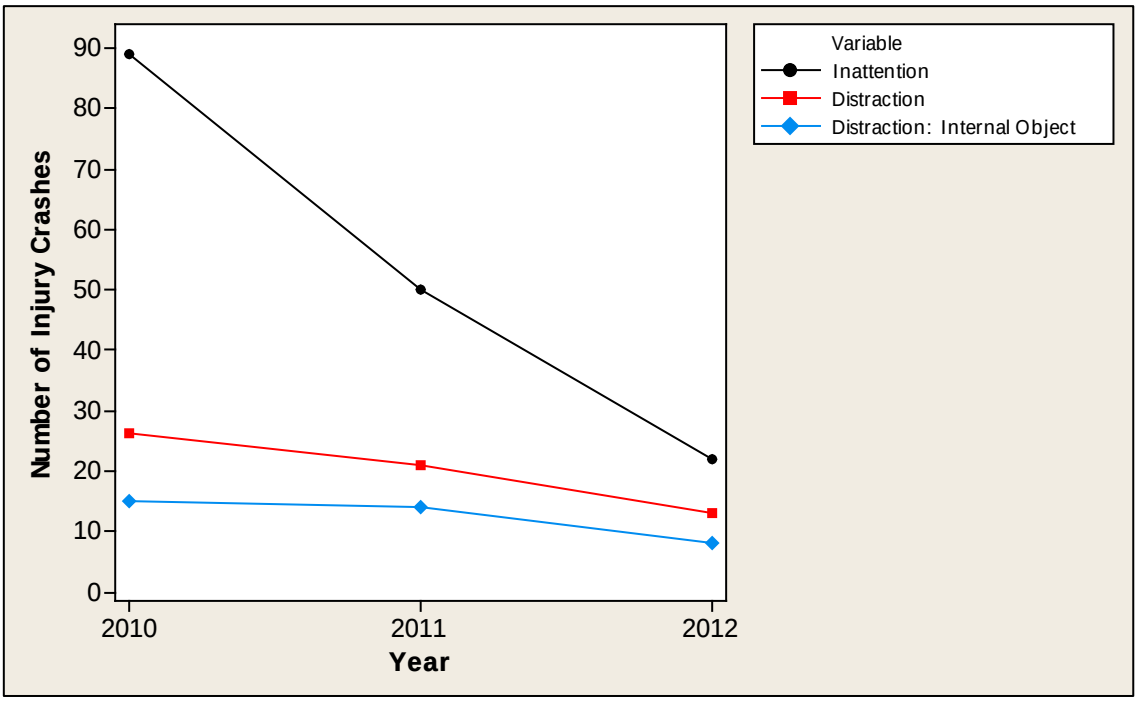
The number of reported injury crashes involving inattention or distraction has decreased between 2010 and 2013.

However, the number of reported injury crashes involving distraction attributable to an internal object (e.g. cell phone, radio, air conditioning, etc.) has remained stable from 2010 to 2013 inclusive.

Trend over time: Southland

Note: 2013 data is excluded for Southland from this graph, as the dataset is missing some crashes in late 2013 - see page 5.

Figure 42 **Reported injury crashes in CAS involving lack of alertness in the Southland region, 2010-2012**

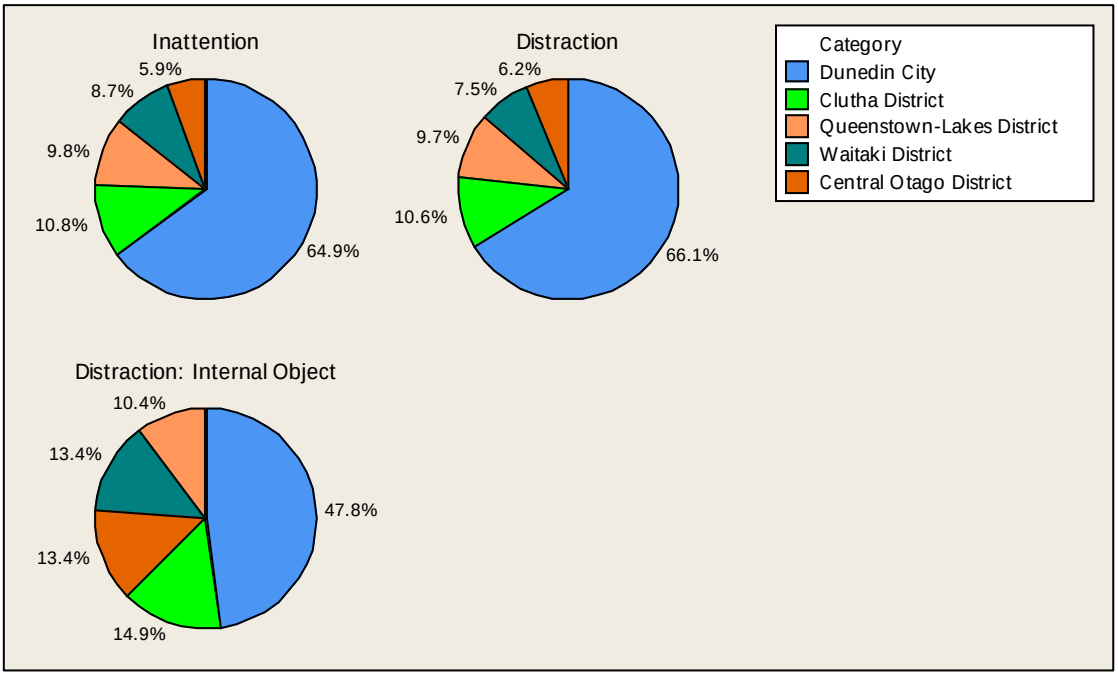


The number of reported injury crashes involving inattention or distraction has decreased from 2010 to 2013 inclusive.

The number of reported injury crashes involving distraction attributable to an internal object (e.g. cell phone, radio, air conditioning, etc.) has remained stable from 2010 to 2013, however.

Location of impairment-related crashes: Otago

Figure 43 **Reported injury crashes in CAS involving lack of alertness in the Otago region, 2010-2013, showing percentage of each behaviour found in each district**

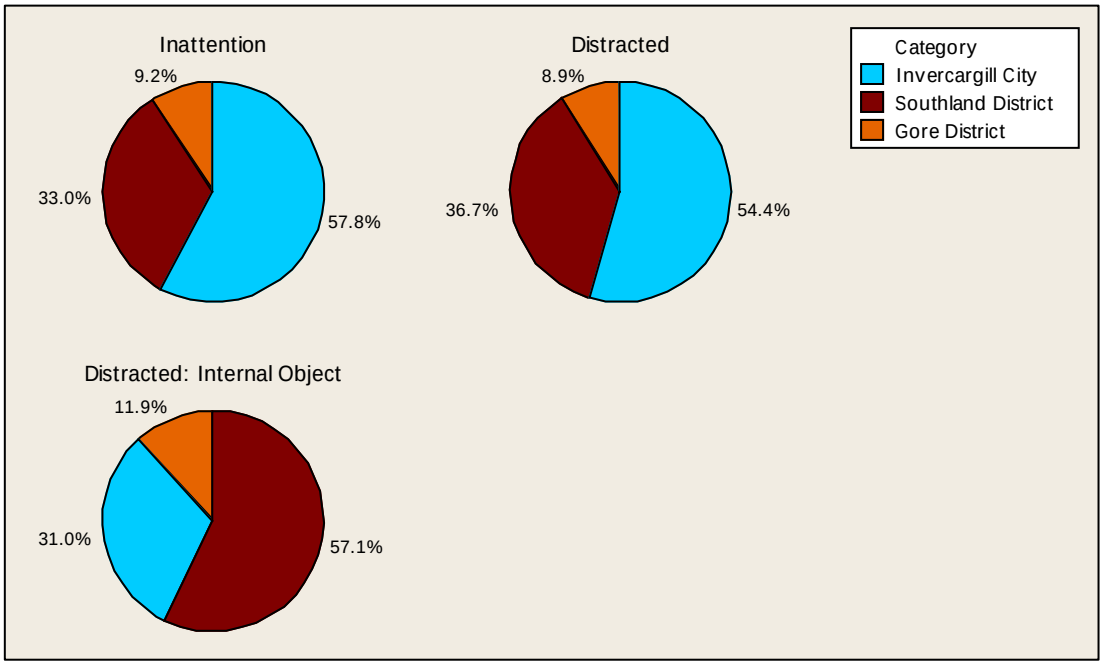


A high proportion of reported injury crashes involving inattention or distraction (of any kind, including distraction due to an internal object) tend to occur in Dunedin City, with Clutha District also playing a role.

Location of impairment-related crashes: Southland

See page 5 regarding 2013 crashes included in this dataset.

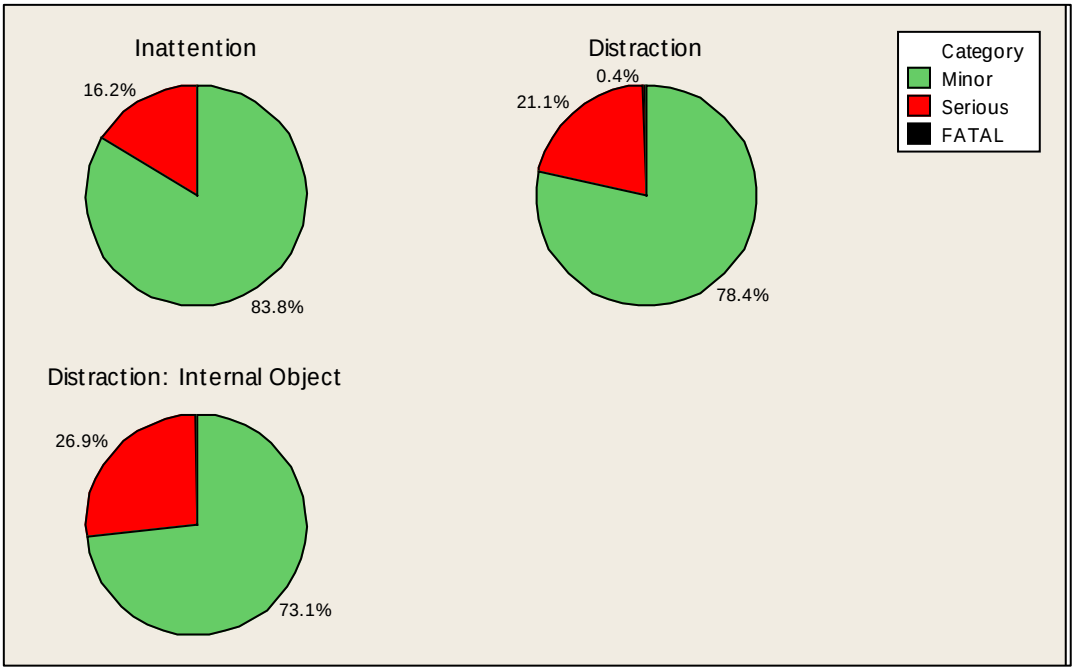
Figure 44 **Reported injury crashes in CAS involving lack of alertness in the Southland region, 2010-2013, showing percentage of each behaviour found in each district**



Reported injury crashes involving inattention or distraction (of any kind, including distraction due to an internal object) tend to take place in either Southland District or Invercargill City, with Gore District playing a lesser role.

Severity of impairment-related crashes: Otago

Figure 45 **Severity of reported injury crashes in CAS involving lack of alertness in the Otago region, 2010-2013**

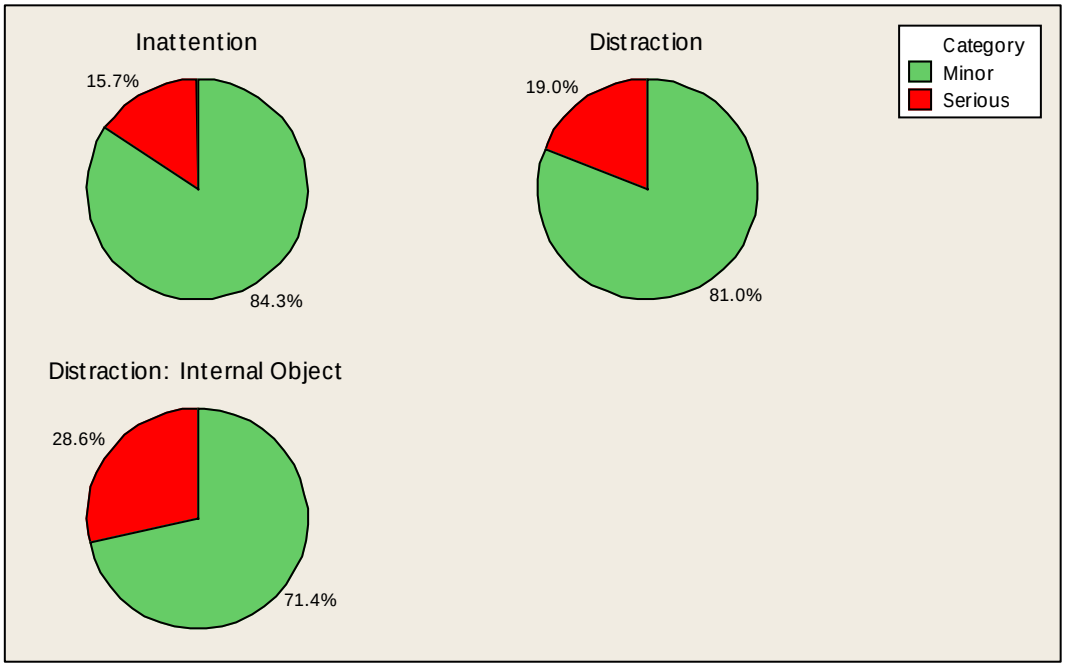


The majority of reported injury crashes involving inattention or distraction (of any kind, including distraction due to an internal object) are minor, with fewer serious and fatal crashes.

Severity of impairment-related crashes: Southland

See page 5 regarding 2013 crashes included in this dataset.

Figure 46 **Severity of reported injury crashes in CAS involving lack of alertness in the Southland region, 2010-2013**



The majority of reported injury crashes involving inattention or distraction (of any kind, including distraction due to an internal object) are minor, with fewer serious and fatal crashes.

Appendix 2

Police codes used to identify and group types of behaviour

Lack of skills or competence

The most useful way to measure a lack of skills or competence comes via the following Police codes:

- 400: Inexperience [unspecified]
- 401: Inexperience in driving in fast, complex or heavy traffic
- 402: New driver showed inexperience
- 403: Driving unfamiliar vehicle
- 404: Overseas / migrant driver fails to adjust to NZ road rules and road conditions
- 405: Driver under instruction
- 406: Inexperience at towing trailer / other vehicle
- 407: Driver over-reacted
- 408: Unsupervised cyclist.

In Otago and Southland, these codes cluster naturally into three groups, described below:

- Inexperience, new driver. At least one road user in the crash showed inexperience due to being a new driver.
- Inexperience, overseas driver. At least one migrant or overseas driver in the crash failed to adjust to New Zealand road rules and road conditions.
- Inexperience, other. At least one road user in the crash showed inexperience in some other way, for example, through over-reacting, driving an unfamiliar vehicle, or being unfamiliar with towing a trailer or other vehicle Note that due to some quirks of the Police coding record in Southland, one crash is double counted in this category; this single crash does not affect the overall pattern.

Unpredictable driving behaviour

The most useful way to measure road users' unpredictability comes via the following Police codes:

- 110: Too fast for conditions [unspecified]
- 111: Too fast for conditions while cornering
- 112: Too fast for conditions while on straight section
- 113: Too fast for conditions to give way at intersection
- 114: Too fast for conditions when approaching railway crossing
- 115: Too fast for conditions when passing stationary school bus
- 116: Too fast for conditions at temporary speed limit
- 117: Too fast for conditions at crash or emergency
- 150: Overtaking [unspecified]

- 151: Overtaking line of traffic or queue
- 152: Overtaking deliberately in the face of oncoming traffic
- 153: Overtaking while failing to notice oncoming traffic
- 154: Overtaking while misjudging speed or distance of oncoming traffic
- 155: Overtaking at no-passing line
- 156: Overtaking with insufficient visibility
- 157: Overtaking at an intersection without due care
- 158: Overtaking on left without due care
- 159: Cut in after overtaking
- 160: Overtaking a vehicle signalling a right turn
- 161: Overtaking without care at a pedestrian crossing
- 190: Sudden action [unspecified]
- 191: Sudden braking action
- 192: Sudden turn left
- 193: Sudden turn right
- 194: Sudden swerve to avoid pedestrians
- 195: Sudden swerve to avoid animal
- 196: Sudden swerve to avoid crash or broken-down vehicle
- 197: Sudden swerve to avoid vehicle
- 198: Sudden swerve to avoid object or for unknown reason
- 199: Sudden action to avoid approaching emergency vehicle
- 200: Forbidden movements [unspecified]
- 201: Wrong way in one-way street, motorway or roundabout
- 202: Forbidden movement when turning, or U-turning, contrary to a sign
- 203: Forbidden movement contrary to ‘in’ or ‘out’ only driveway sign
- 204: Driving or riding on footpath
- 205: Forbidden movement on incorrect side of road, island or median
- 206: Forbidden movement contrary to no-entry sign
- 207: Forbidden movement in car park
- 208: Motor vehicle in cycle lane
- 209: Forbidden movement in bus / transit lane
- 210: Cyclist riding on pedestrian crossing or signals
- 430: Showing off [unspecified]
- 431: Racing
- 432: ‘Playing chicken’
- 433: Wheel spins / wheelies / doughnuts / drifting

- 434: Intimidating driving.

In Otago and Southland, these codes cluster naturally into three groups, described below:

- Too fast for conditions: At least one road user was travelling too fast for conditions just before the crash.
- Sudden movement: At least one road user performed a sudden action of some kind.
- Dangerous manoeuvre: At least one road user performed a dangerous manoeuvre just before the crash, such as overtaking inappropriately, engaging in an illegal movement (e.g. travelling the wrong way up a one-way street), or showing off, through racing or intimidating driving. Note that, due to a slightly different data structure, Southland's 'dangerous manoeuvre' category also includes some crashes with codes 512 (intentional or criminal: intentional collision), 514 (intentional or criminal: evading enforcement) and 517 (intentional or criminal: using a stolen vehicle).

Non-compliance with road rules

The most useful Police measures for failing to comply with road rules are the following crash codes:

- 300: Failed to give way [unspecified]
- 301: Failed to give way at Stop sign
- 302: Failed to give way at Give Way sign
- 303: Failed to give way when turning to non-turning traffic
- 304: Failed to give way when deemed turning by markings, not geometry
- 305: Failed to give way when turning left, to opposing right-turning traffic (prior to law change at 5 am, 25th March 2012)
- 306: Failed to give way to pedestrian on a crossing
- 307: Failed to give way when turning at signals to pedestrian
- 308: Failed to give way when entering roadway from driveway
- 309: Failed to give way to traffic approaching or crossing from the right
- 310: Failed to give way at one-lane bridge or road
- 311: Failed to give way to pedestrian on footpath or verge
- 312: Failed to give way when entering roadway [not from driveway or intersection]
- 313: Failed to give way to emergency vehicle
- 314: Failed to give way when driver waved through
- 315: Failed to give way when turning right to opposing left-turning traffic (after law change at 5 am, 25th March 2012)
- 316: Failed to give way to traffic approaching or crossing from the left (after law change at 5 am, 25th March 2012)
- 320: Did not stop [unspecified]
- 321: Did not stop at Stop sign
- 322: Did not stop at steady red light
- 323: Did not stop at steady red arrow

- 324: Did not stop at steady amber light
- 325: Did not stop at steady amber arrow
- 326: Did not stop at flashing red lights (rail crossing, fire station, etc.)
- 327: Did not stop for police or flag-person
- 328: Did not stop for school patrol / kea crossing.

In Otago and Southland, these codes cluster naturally into three groups, described below:

- Failed to give way. At least one road user involved in the crash failed to give way appropriately (except to a pedestrian crossing the road – covered in the next sub-category).
- Failed to give way to pedestrian. At least one road user involved in the crash failed to give way appropriately to pedestrian on a crossing, or when turning at signals to a pedestrian. Note that in Southland, due to a quirk of the coding system, this category is also combined with a small number of crashes involving other sorts of failure to give way (e.g. failure to give way when entering roadway from driveway).
- Did not stop. At least one road user involved in the crash failed to stop appropriately (e.g. at a steady red light, Stop sign, etc.).

Impairment

Notably, very few crashes have been suspected or proven to be the result of drugs: 11 in Otago (2010-13), and 6 in Southland (2010-13, with some late 2013 crashes missing from data). For this reason, the involvement of drugs in crashes in Otago and Southland cannot be examined in further detail.

With respect to alcohol and fatigue, the following Police codes are most useful:

- 103: Alcohol test above limit or test refused. According to the New Zealand Police, the number of drivers refusing to be tested is rare; the majority of 103-coded crashes involve road users who were above the legal alcohol limit.[9]
- 410: Fatigued (drowsy, tired, fell asleep) [unspecified reasons]
- 411: Fatigued due to a long trip
- 412: Fatigued due to a lack of sleep
- 413: Fatigued due to exhaust fumes
- 414: Fatigued due to working long hours before driving
- 415: Fatigued due to exceeding driving hours.

In Otago and Southland, these codes cluster naturally into two groups, described below:

- Driving under the influence. At least one road user in the crash was over the blood alcohol limit.
- Fatigued. At least one road user in the crash was fatigued.

Lack of alertness

With respect to alertness, the following Police codes are most useful:

[9] *Pers. comm.*, Steve Larking, Acting Road Policing Manager for the Southern District. 13th Nov., 2013.

- 330: Inattentive: failed to notice [unspecified]
- 331: Inattentive: failed to notice vehicle slowing, stopping or stationary in front
- 332: Inattentive: failed to notice bend in road
- 333: Inattentive: failed to notice indication of vehicle in front
- 334: Inattentive: failed to notice traffic lights
- 335: Inattentive: failed to notice intersection or its Stop / Give Way control
- 336: Inattentive: failed to notice other regulatory signs / markings
- 337: Inattentive: failed to notice warning sign
- 338: Inattentive: failed to notice direction, information signs / markings
- 339: Inattentive: failed to notice roadwork signs
- 340: Inattentive: failed to notice lane use arrows / markings
- 341: Inattentive: failed to notice obstructions on the roadway
- 350: Attention diverted [unspecified]
- 351: Attention diverted by passengers
- 352: Attention diverted by scenery or persons outside the vehicle
- 353: Attention diverted by other traffic
- 354: Attention diverted by animal or insect in vehicle
- 355: Attention diverted by trying to find intersection, house number, destination
- 356: Attention diverted by advertising or signs
- 357: Attention diverted due to being emotionally upset / road rage
- 358: Attention diverted due to cigarette, radio, heater, air conditioning, glove box, object under driver's feet / pedals, etc.
- 359: Attention diverted by cell phone
- 361: Attention diverted by navigation device
- 362: Attention diverted by Citizen Band radio / non-cell communication device
- 363: Attention diverted, as driver was dazzled by sun.

In Otago and Southland, these codes cluster naturally into two groups, described below:

- Inattention. At least one road user was inattentive just before the crash.
- Distracted. At least one road user was distracted just before the crash. (See below for internal objects (codes 358 and 359; e.g. cell phone, radio, etc.))
- Distracted by internal object. At least one road user was distracted just before the crash, due to an internal object (codes 358 and 359: e.g. cigarette, radio, heater, air conditioning, cell phone, etc.).