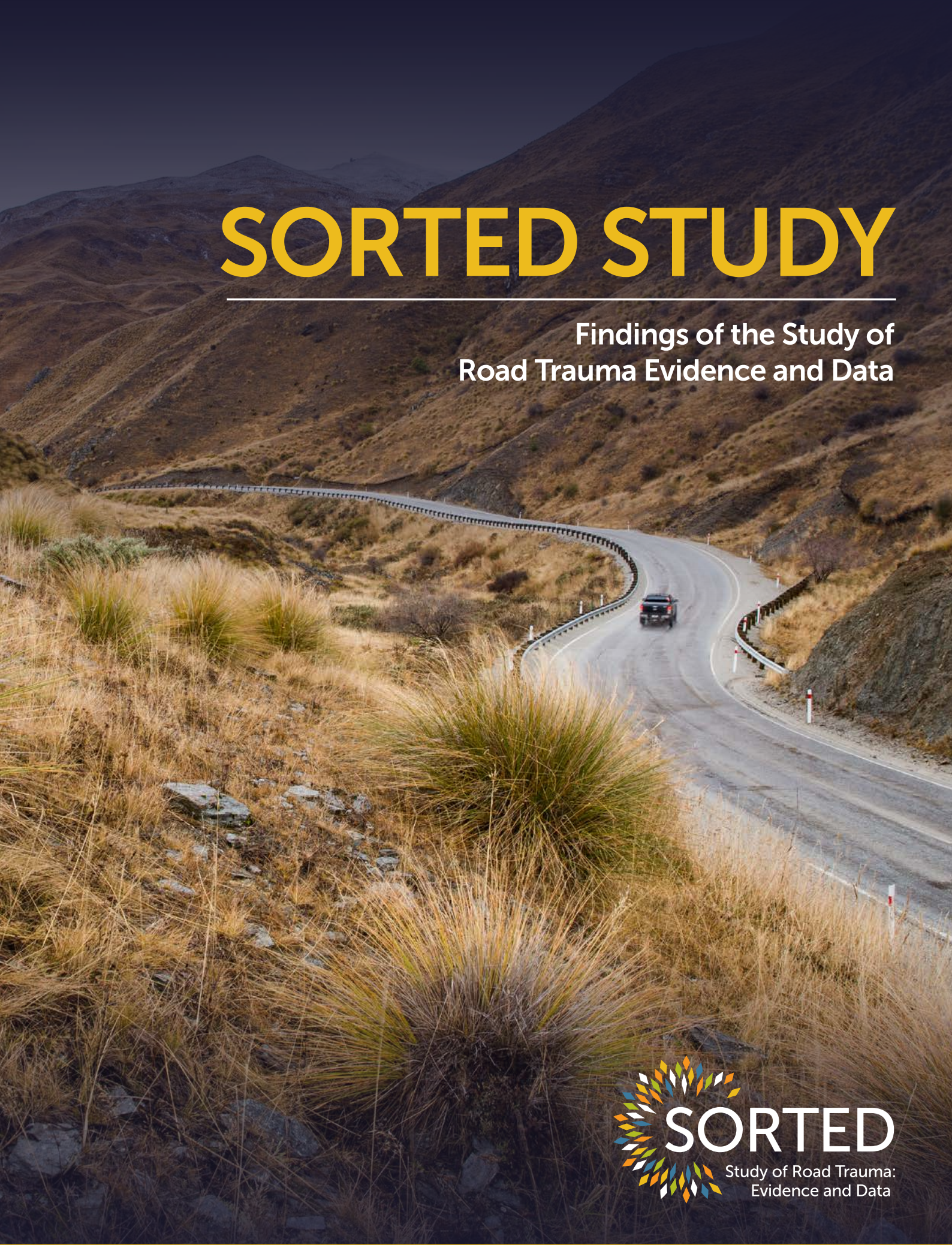

SORTED STUDY

Findings of the Study of Road Trauma Evidence and Data

SORTED
Study of Road Trauma: Evidence and Data

2017/18-2018/19

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Foreword

It is with great pleasure that we present the inaugural report of the SORTED study. The study describes the patterns of injury for everyone who has been injured on New Zealand roads over a two-year period. By combining transport and health data, the study team has produced unique information on road trauma which is not captured through current data sources, yet is enormously useful in showing who is injured, where, and how.

Acknowledgement is given to all those who have worked hard to build safer roads, provide care for the injured, and collect data which is used extensively in this study. Accurate and timely data is essential for improving road safety and this report goes some way to providing that data.

Simon Kingham, Sponsor
Chief Science Advisor
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National Programme Director
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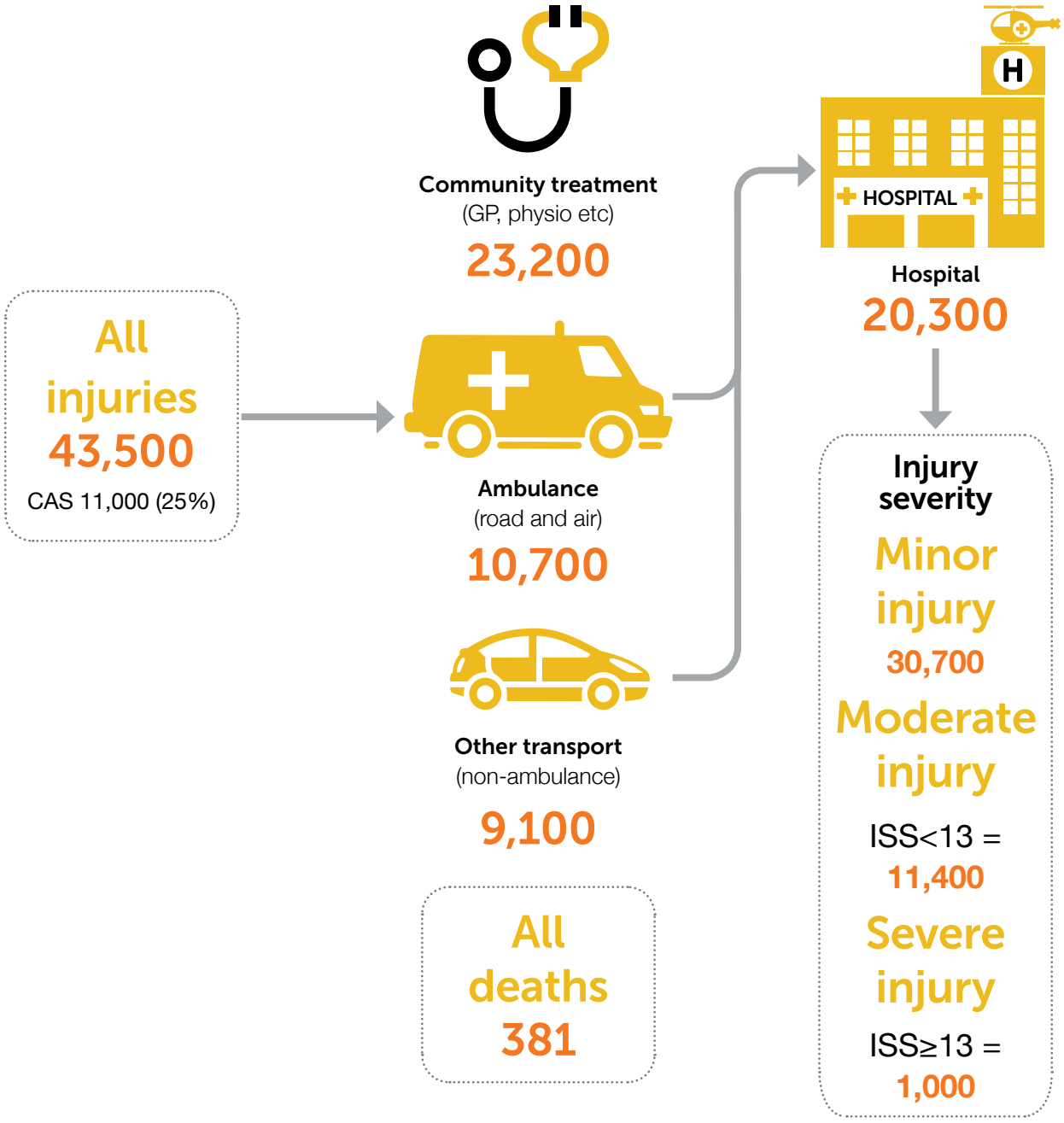
Executive Summary

The Study of Road Trauma Evidence and Data (SORTED) began after the completion of a proof of concept on transport-related injuries that occur on New Zealand roads. The intent of the study is to provide accurate and comprehensive data for 2017/18 - 2018/19 that supports efforts to reduce the burden of road trauma.

Journey of injured people

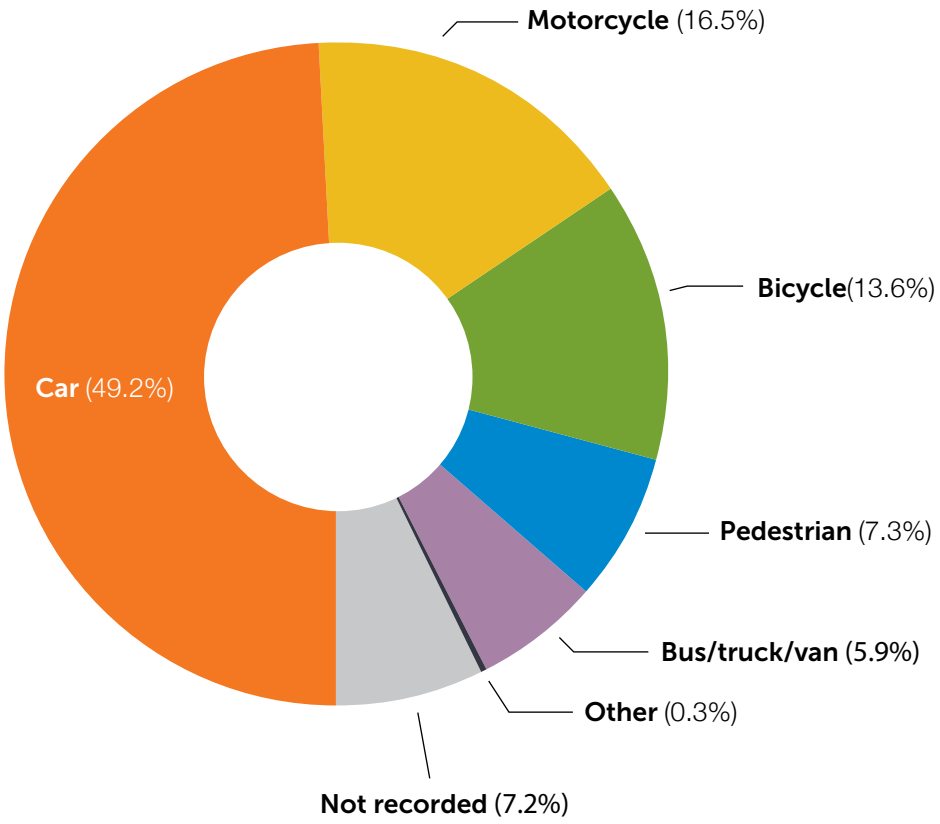
The following diagram shows the average annual burden of injury. Numbers are rounded to the nearest 100, except for numbers of deaths, which are reported exactly.



Overall, 26% of all people injured on our roads are classified as having a moderate or serious injury, or as deaths.

Findings of SORTED

Hospitalised injuries hospitilised injuries by mode of transport



- **Māori road trauma is:**
  - 70% higher burden of serious injury than non-Māori
  - associated especially with car and motorcycle injuries
  - statistically higher in Northland DHB
- **Proportion of injuries that were serious enough to require hospitalisation and were investigated by Police**
  - 19% bicycle
  - 38% motorcycle
  - >50% for other modes of transport.
- **18% of those injured in 2017/18 and 2018/19 had a subsequent road-related injury within the next 24 months after the first recorded injury in SORTED.**
- **$1.03 billion cost for ambulance services, hospital care and ACC costs for everyone injured in 2018/19.**

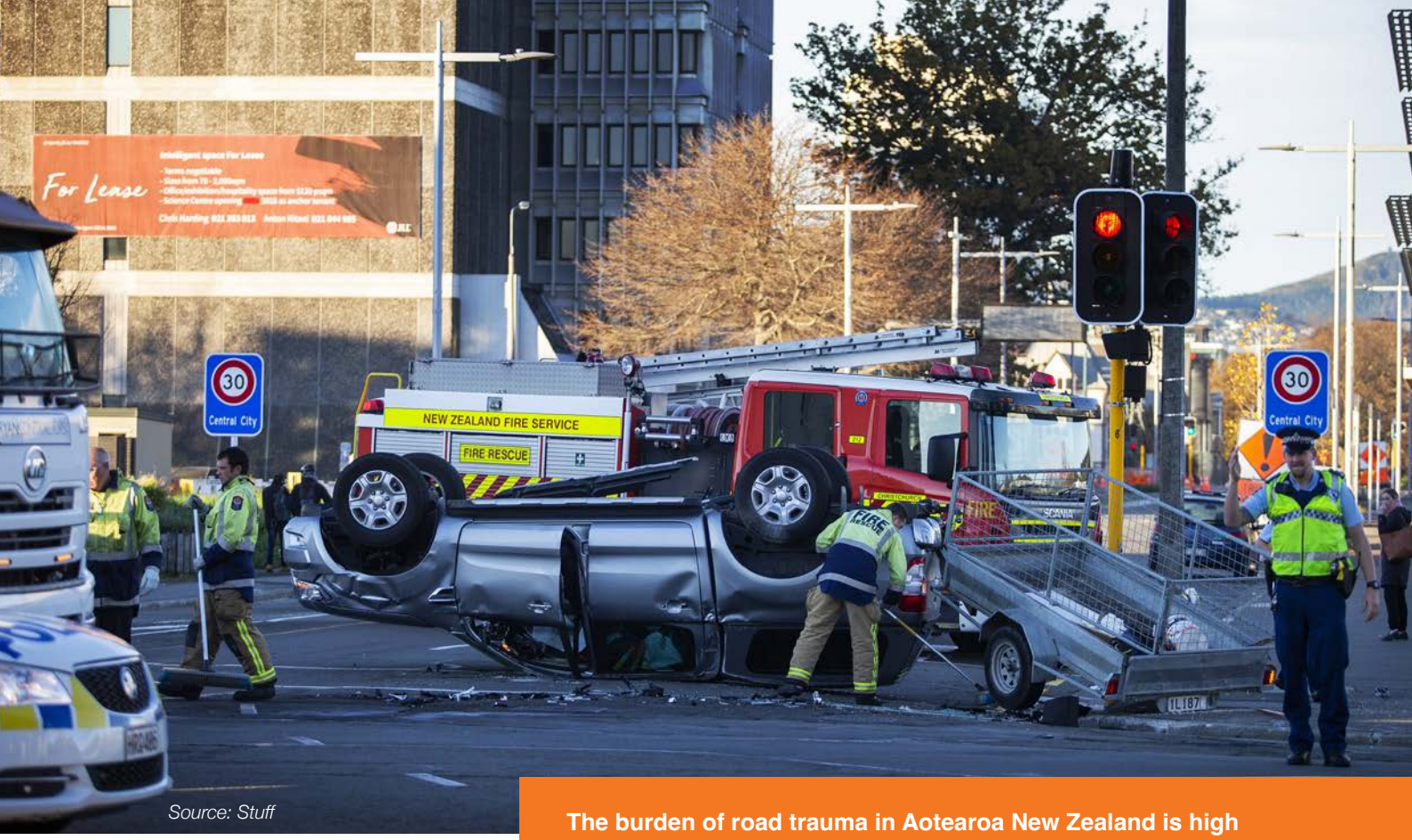
The SORTED methodology shows that linking data across multiple health and transport data sets is both feasible and a useful source of information on road trauma. While reporting on road deaths has been extensive historically, gaps in our understanding of injuries on our roads remain. Reducing death and serious injury is a goal of the Road to Zero strategy; to achieve it, we need a complete picture of injury on New Zealand roads.

The study covers the two-year period for the financial years 2018/19 and 2019/20. Future work using the same methodology would allow for analysis of longitudinal trends. Trends in transport modes are changing as people adopt other sustainable and active forms of transport such as public transport and e-scooters. It follows that injury patterns are also likely to change and should be analysed over time.

The collaboration between the agencies has been a key success of SORTED and includes reaching an agreement on common definitions and terminology. Contributions from all agencies have helped shape the use of data and analytics and have led to the achievement of more than any one agency could achieve on its own. Accurate and comprehensive information is essential for quality improvement and to make evidence-based decisions to improve road safety. This report goes some way to providing the basis of this information.

Recommendations

1. Implement SORTED as an annual exercise.
2. Make improvements to enhance sustainability and depth of analysis, including by:
    - establishing cross-agency executive oversight
    - resourcing at appropriate levels and with the required expertise to fully utilise the data set and produce and publish the results
    - focusing on priority areas of research such as Māori road trauma, geographic information system (GIS) mapping, and transport modes such as motorcycling, cycling and pedestrians.
3. Establish an inter-government entity to analyse the SORTED data set as well as to fulfil other functions such as leading transport research in line with international jurisdictions. The entity should be led by the transport agencies, and include the spectrum of health agencies, acknowledging the usefulness of the health data to inform road injury.
4. The Ministry of Health undertakes work to improve coding and reporting of micromobility modes of transport.
5. The agencies involved in SORTED undertake work to standardise and implement compatible classifications such as mode of transport and categories of injury severity.
6. Include SORTED in the Road to Zero action plan to support future efforts to reduce serious road injury.



Source: Stuff

The burden of road trauma in Aotearoa New Zealand is high and costly, and good data is essential to reducing this burden.

Introduction

This report on the findings of the Study of Road Trauma Evidence and Data (SORTED) is based on two years of data from 2017/18 to 2018/19. This timeframe does not include the COVID-19 pandemic.

The purpose of starting SORTED was to provide a comprehensive view of everyone injured on New Zealand roads. While deaths on roads are extensively investigated and reported, we get information about those who are injured and survive from proxy data. The SORTED proof of concept undertaken in 2017 showed significant gaps remain in current information that transport agencies use. These gaps include undercounting of cycling, motorcycling and pedestrian injuries. The introduction of electronic data sets to the ambulance services and new health collections in recent years presents an opportunity to fill some of these gaps.

An accurate picture of serious injuries is necessary to support the Road to Zero strategy. SORTED involves matching individuals across seven health and transport data sets. This provides useful information on the patterns of injury, who is being injured and, of particular note, the characteristics of injured people such as ethnicity, age and deprivation.

The burden of road trauma in Aotearoa New Zealand is high and costly, and good data is essential to reducing this burden.

Background

A proof of concept was undertaken in 2018 to determine the feasibility of linking across multiple data collections. Five agencies and six national datasets were involved. The key findings of the proof of concept indicated:

- excellent match rates (higher than 90 percent) between data sets
- collaboration between agencies achieved more than any single agency could achieve
- agreement on definitions and terminology
- gaps in current data.
- The participating agencies agreed to continue SORTED in subsequent years.

Methodology

Study group

The SORTED study group was re-established following the proof of concept and expanded to include more agencies. The nine agencies now involved are:

- Accident Compensation Corporation (ACC)
- Manatū Hauora Ministry of Health
- St John Ambulance
- Wellington Free Ambulance
- National Trauma Network
- Waka Kotahi New Zealand Transport Agency
- Te Manatū Waka Ministry of Transport
- New Zealand Police
- Health Quality & Safety Commission.

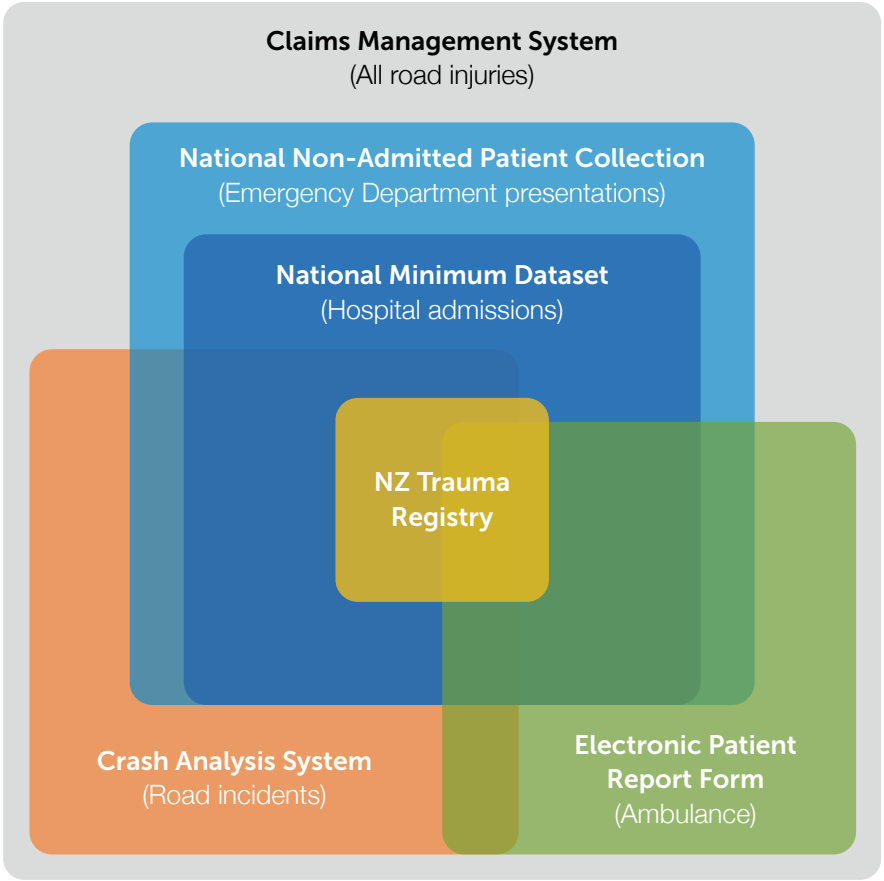
See Appendix A for members of the study group.

Data sources

Two years of data from the 2017/18 and 2018/19 financial years were extracted from seven collections to identify individuals with an injury (or Police assessment) with an appropriate road traffic crash code.

Figure 1 shows the custodian of each data set that contributes to SORTED. It is to scale, representing the relative size of the data sets and how they overlap.

Figure 1: Interaction between the seven data sets and the size of their contribution to SORTED



The seven data sets used in SORTED are:

1. **Crash Analysis System (CAS):** consisting of road injuries that are assessed by Police
2. **ACC claims data:** filtered to identify all claims associated with a road-related injury. As ACC provides universal cover, the claims information has the most complete source of information
3. **Electronic Patient Report Form (ePRF) database** used by St John Ambulance and Wellington Free Ambulance, which contains pre-hospital information collected by ambulance personnel
4. **National Trauma Registry (NTR):** which contains information on the most seriously injured patients. Importantly, the NTR uses the Injury Severity Score (ISS) to differentiate moderate from serious injury

Ministry of Health National Collections:

5. **National Health Index (NHI):** which is a unique identifier all health services use to identify individuals across multiple data sets. Importantly, it allows us to introduce new information based on the characteristics of where an individual lives
6. **National Non-Admitted Patient Collection (NNPAC):** which identifies patients who present to a hospital emergency department and are discharged within three hours of treatment
7. **National Minimum Dataset (NMDS):** which contains information about all patients admitted to public hospitals. The coding of all admitted patients held in this data set enables us to identify which patients fall within the SORTED inclusion criteria.

Each data source has its strengths and limitations. The study group carefully assessed which data source is the most appropriate and complete for each specific analysis, and for this reason the source varies in the results. This report describes the key data sources for each analysis.

Table 1: SORTED categories for severity of injury

Category	Definition
Minor injury	**Patient is either:** • not transported to hospital, has an injury requiring some form of treatment – eg, they self-present to a general practitioner, accident and emergency clinic or physiotherapy provider, or • transported to hospital and discharged from emergency department within three hours.
Moderate injury	Patient is taken to hospital and admitted, and does not have an ISS score of 13 or greater.
Serious injury	Patient is taken to hospital and admitted, and has an ISS score of 13 or greater.*
Died	Patient dies due to injuries sustained due to road traffic crash, either at the scene or en route to hospital, or within 30 days of admission to hospital (either in hospital or after discharge).

*The Injury Severity Score (ISS) is an objective scoring system of anatomical injury and is applied to all patients admitted to hospital with a serious injury. The higher the score, the greater the threat to life. It is used in trauma systems internationally and means that performance and outcomes benchmarks match like with like. SORTED uses ISS to differentiate severe from moderate injury and is an improvement on other metrics such as length of hospital admission.

Study design and analysis

The core data set is all ACC claims for an injury that occurred on a road/street. All other data sets are matched with ACC data independently. These matched data sets are combined with the 'core' data set to provide a combined view of all related data by area (where available). The SORTED data set contains ACC data for all cases plus other data that matches with the ACC event from: CAS, the ambulance ePRF, National Collections and the National Trauma Registry.

This approach has limitations as there may not be full coverage for all cases. However, the match rates of 90% (where applicable) provide a good degree of confidence in the accuracy of the data.

The National Collections, and particularly the NMDS and NHI data sets, are also used extensively as they hold detailed and accurate information on a range of data including the characteristics of where someone lives, deprivation and ethnicity. The maps showing the district health boards are found in Appendix B.

Inconsistency of coding mode of transport presented a challenge. For this reason, it has been necessary to map to larger groupings, such as 'bus/truck/van', when it is not possible to consistently break down the mode further into more specific modes in all data sets.

Data analysis is performed in SAS, and SAS Data Management Studio is used for some of the data matching. The combined data is consolidated in Excel as a Pivot table for ease of reporting.

For geospatial mapping of all injuries, the study has merged the CAS and ePRF data sets and removed duplicates. The ePRF geocodes extend the locations in the CAS data set by approximately 30%. The ePRF includes some locations where the ambulance picks up a patient from an accident and emergency clinic and does not reflect the specific location of injury. Geocoding is analysed in R Shiny.

Ethics, approvals and data security

The Health and Disability Ethics Committee extended the previous ethics approval for the proof of concept for SORTED (Health and Disability Ethics Committee Reference: 18/NTB/69). The conditions for approval include:

- removing all unique identifiers after making the data linkage
- holding the data on a secure, non-networked server physically located at ACC and managed under ACC information security policies and procedures.

Each agency has approved the sharing of data for SORTED. All conditions have been complied with throughout the study.

Caveats

Some ambulance data is normalised to address gaps in collection that resulted from industrial action by St John Ambulance staff during the study period. Similarly, normalisation of the early study period of Wellington Free Ambulance has been necessary as electronic data collection did not start until March 2018.

The study has identified ACC data as the 'master' data set. As a result, if an individual is not on the ACC claims management system, then they are not included in the study even if the other data sources indicate they had a road trauma. **Missing or unmatched data may introduce bias** to the results but this report does not address this issue.

This report **does not include the denominator for the estimated numbers of people using different modes of transport.** For more information on the denominators from the New Zealand Household Survey, go to the **Ministry of Transport website**.

Micromobility refers to a range of small, lightweight modes of transport that are operated by users and generally do not exceed 25km/hr. Modes include e-scooters, e-skateboards, e-bikes and various new transport innovations. Shared micromobility businesses have expanded in recent years and are now in most of our major urban centres.

Coding of micromobility as a mode of transport varies across data sets. T*he International Statistical Classification of Diseases and Related Health Problems* (ICD-10-AM, 11th edition) used in the hospitalisation data set (NMDS) has over 1,500 transport-related codes. However, for micromobility modes in some circumstances, it is unclear if the injured person was hit by micromobility when they were on a pedestrian conveyance. If the rider of the micromobility suffers an injury following a fall or the micromobility hits a stationary object, these would not be classified as transport related and therefore are not included in the SORTED study.

The variable coding for micromobility is a key limitation in understanding the injuries associated with this mode of transport. Data-mining the free-text fields in the ACC and NMDS datasets may be a reasonable interim solution as these fields should describe if the injury involved a powered scooter (e-scooter) and other details such as if the patient was the scooter rider or not.

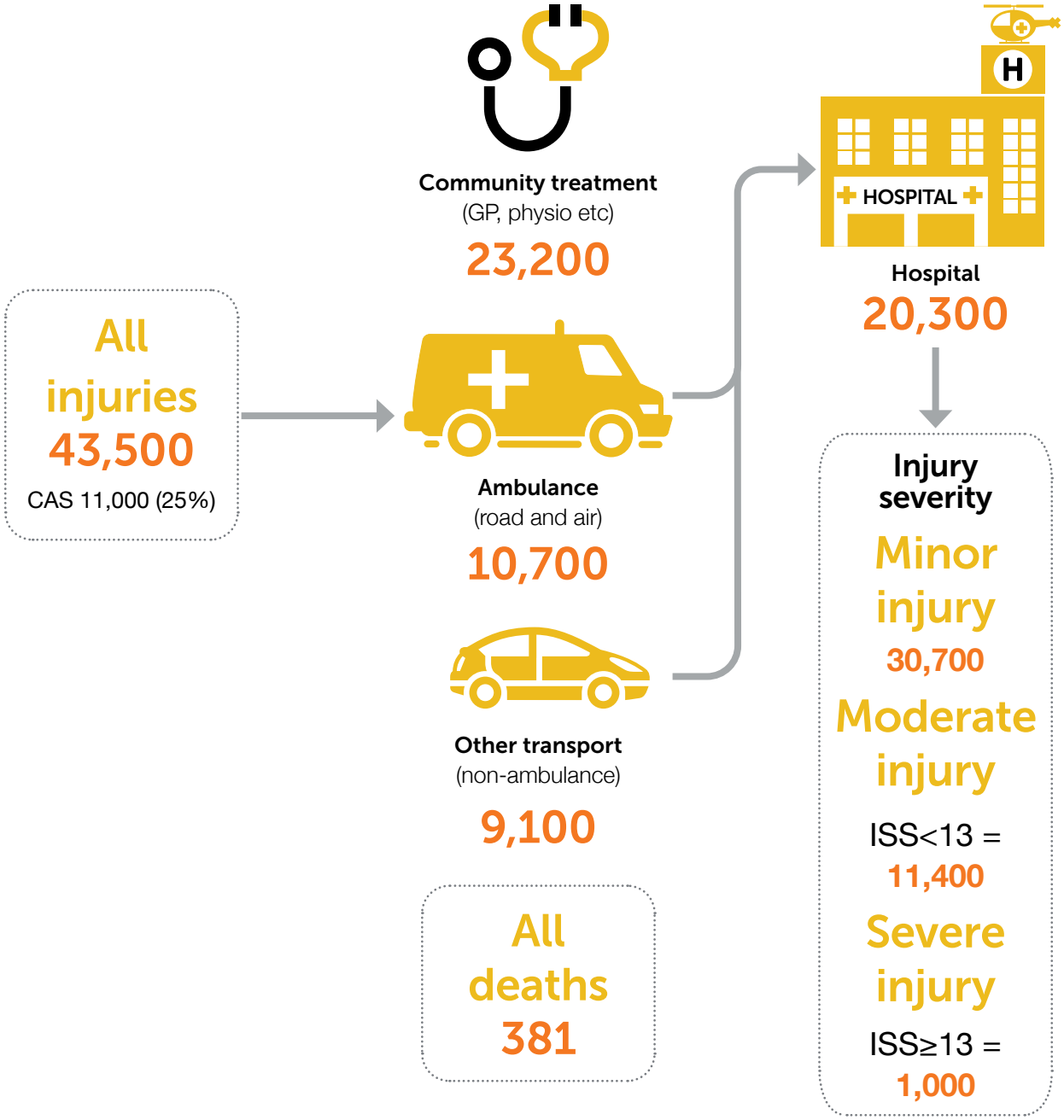
For the NMDS coding standards and guidance that apply in these circumstances, see Appendix C.

Results

Journey of injured people

Figure 2 represents the flow of patients among various services related to road injury. As the flow is not linear, patients move through services in multiple overlapping permutations so the figure shows only the major flows for simplicity.

Figure 2: Flow of patients among services related to road injury, 2018/19



Overall, 26% of all road injuries are classified as moderate or serious injury, or as deaths.

Deaths on roads are investigated and reported on in detail. For more information on road deaths, go to **www.transport.govt.nz/statistics-and-insights/safety-road-deaths.**

Mode of transport

Car is the most common mode of injury-related transport, followed by motorcycle and bicycle (Table 2).

Table 2: Hospitalised patients by mode of transport, 2017/18 and 2018/19

Mode of transport	2017/2018	2018/2019	Total	% of total
Car	5,353	5,592	10,945	49.2%
Motorcycle	1,750	1,875	3,625	16.5%
Bicycle	1,391	1,546	2,937	13.6%
Pedestrian	798	826	1,624	7.3%
Bus/truck/van	592	668	1,260	5.9%
Other	52	33	85	0.3%
Not recorded	755	818	1,573	7.2%
Total	10,691	11,358	22,049	100%

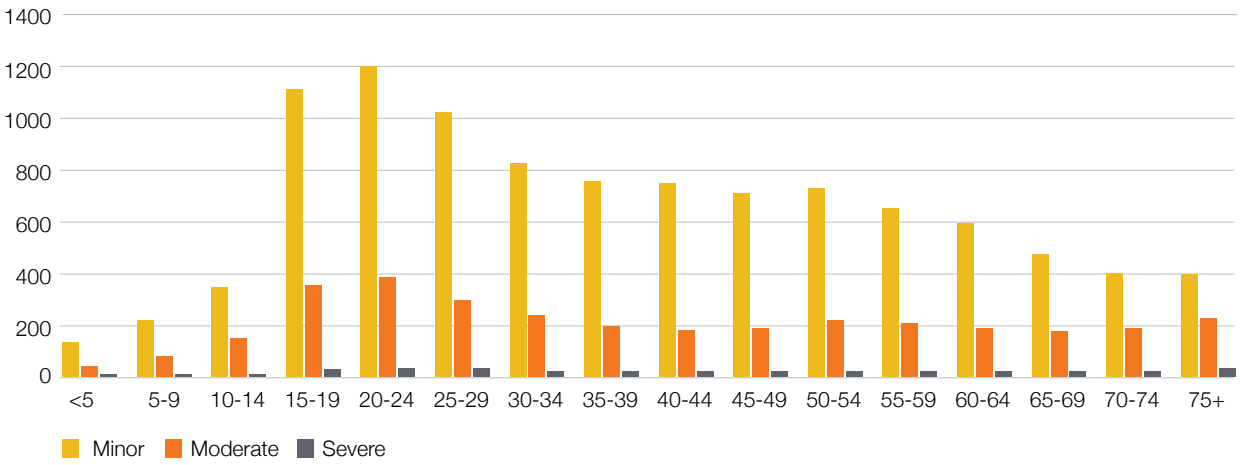
Data source: ACC, NMDS

Demographics

Age

Age is an important determinant for road trauma as young people become more mobile. For all injuries, a sharp increase in the rate of injuries starts at 15 years and continues through to 30 years, before it gradually declines. The pattern for serious injury has the same 15–30 years peak; however, it also shows two further peaks at 50–60 years and 75+ years (Figure 3).

Figure 3: Rate of road injury by age band, 2018/19 per 100,000 population

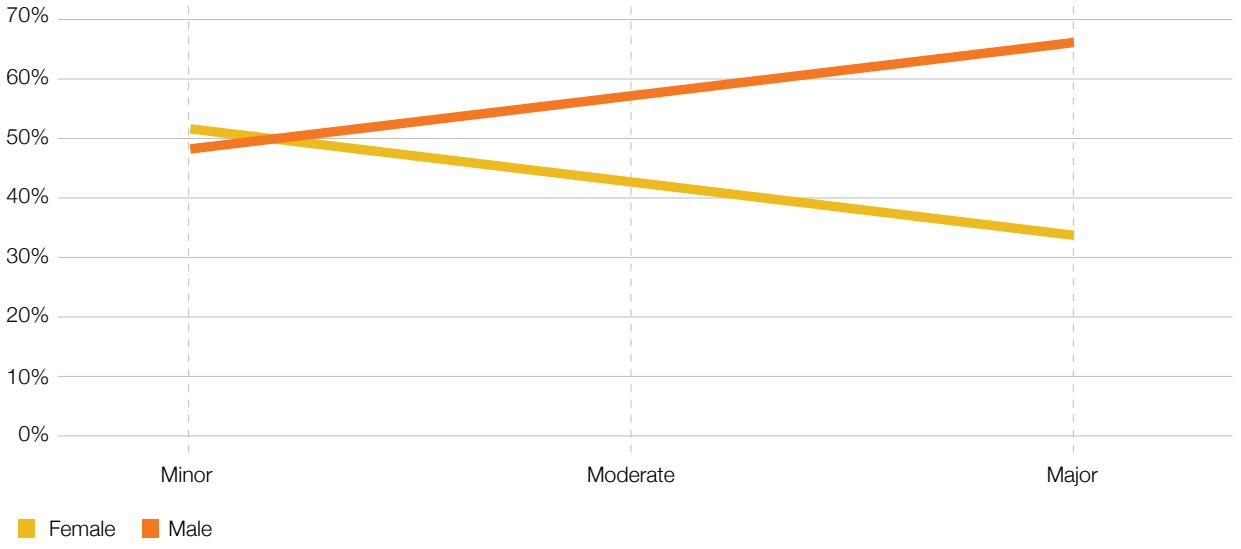


Data source: ACC, NMDS, National Trauma Registry

Sex

Females have a slightly higher proportion of minor injuries than males. For moderate and serious injuries, however, that pattern reverses: males have a greater proportion of both these categories of injury than females (Figure 4).

Figure 4: Road injury by sex and severity of injury, 2018/19



Data source: ACC, NMDS, National Trauma Registry

Motorcycle and cycle injuries are more common in males than females

Table 3: Hospitalised patients by mode of transport and sex, 2018/19

Mode of transport	Female	Male	Total	% Male
Car	2,752	2,840	5,592	51%
Motorcycle	303	1,572	1,875	84%
Bicycle	434	1,112	1,546	72%
Pedestrian	368	458	826	55%
Bus/truck/van	201	467	668	70%
Other	205	478	683	70%
Not recorded	611	207	818	25%
Total	4,673	6,685	11,358	59%

Data source: NMDS

Source: Stuff

Ethnicity

Health data is used to calculate ethnicity data as it comes from the most accurate and recent source.

For all injuries, Māori have a higher burden of road injury compared with non-Māori. That disparity widens as the severity of injury increases. The rate of serious injury in Māori is 30.2 per 100,000 population, which is nearly double the rate of 17.2 per 100,000 for the total population (Table 4).

Table 4: Rate of injury per 100,000 population by ethnicity, standardised for age, 2017/18–2018/19

Age-standardised rate				
	Total	Minor	Moderate	Serious
Māori	948.1	667.4	250.6	30.2
Pacific	689.4	517.5	160.7	11.2
Asian	549.9	453.0	88.1	8.8
Other	994.8	786.0	191.9	17.0
Total	880.7	682.0	181.5	17.2

Data source: ACC, NMDS, NTR, Stats NZ 2019 population projections for the Ministry of Health (2021)

A number of reasons may help to explain the difference between Māori and non-Māori rates. Socioeconomic status, rurality and modes of transport may all influence injury rates in Māori. The results indicate further work is needed to understand patterns of road trauma in Māori.

Rates of Māori injury also vary by district health board (DHB) region compared with the rate for the usual resident population in total. The rate of injury for Māori is significantly higher than the national average in Northland DHB, and significantly lower in Capital & Coast, Taranaki, MidCentral and Hutt Valley DHBs (Table 5).

Table 5: Rate of all road trauma by ethnicity per 100,000 population and DHB of domicile, 2017/18–2018/19

DHB	Māori	Non-Māori
Auckland	1,006	809 *
Bay of Plenty	941	899
Canterbury	1,007	911 *
Capital & Coast	738 *	628 *
Counties Manukau	934	855
Hawke's Bay	1,022	924 *
Hutt Valley	712 *	695 *
Lakes	907	884
MidCentral	844	900
Nelson Marlborough	945	817
Northland	1,213 *	985 *
South Canterbury	923	785
Southern	953	820
Tairāwhiti	956	1,004 *
Taranaki	834	883
Waikato	970	959 *
Wairarapa	1,003	844
Waitematā	904	878
West Coast	1,143	906
Whanganui	935	862
National	952	855

*an asterisk indicates a statistically significant difference between the DHB's rate and the national rate, with Bonferroni correction for multiple comparisons.

Source: ACC data set, which records 10% fewer Māori than the more accurate NMDS. While this analysis uses data over two years, the numbers are relatively small for Māori. This can be resolved in the future by including more data.

Car and motorcycle modes of transport account for 73% of Māori injuries. Pacific peoples have the highest proportion of car-related injuries of any ethnic group, while European and other groups have the highest proportion of motorcycle and cycle injuries (Table 6).

Waka Kotahi recently published the 'Māori Road Safety Outcomes Report' which provides more detail on the burden of road trauma on Māori and signals areas where further work is needed.

Table 6: Percentage of hospitalised injuries by mode of transport and ethnicity, 2018/19

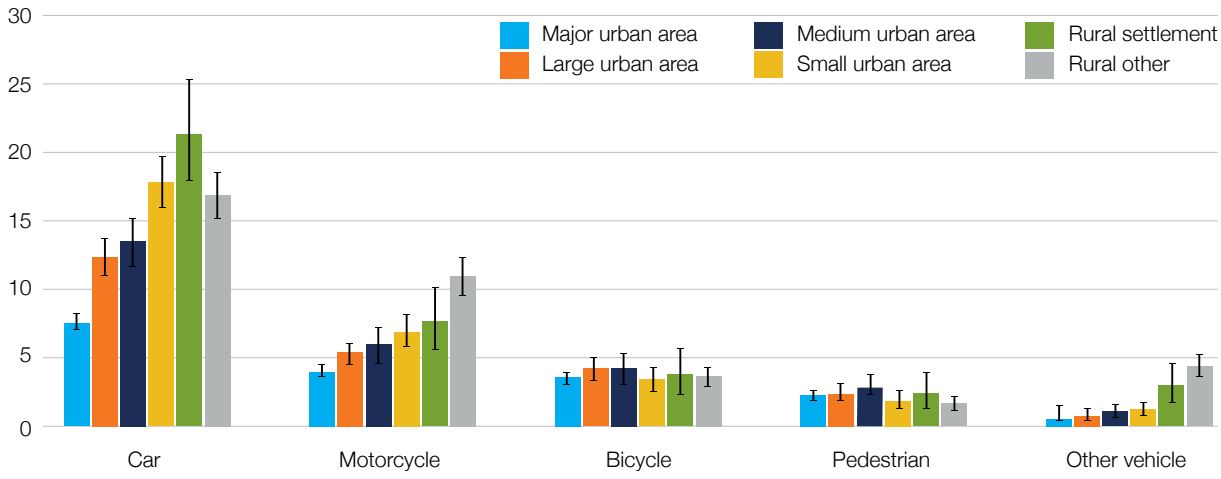
Mode of transport	Māori	Pacific people	Asian	European/ other	Total Number (%)
			Number (%)		
Car	1,451 (57)	431 (67)	519 (61)	3,191 (44)	5,592 (49)
Motorcycle	416 (16)	55 (9)	83 (10)	1,321 (18)	1,875 (17)
Bicycle	191 (7)	40 (6)	76 (9)	1,239 (17)	1,546 (14)
Pedestrian	214 (8)	72 (11)	109 (13)	431 (6)	826 (7)
Bus/truck/van	180 (7)	37 (6)	48 (6)	403 (6)	668 (6)
Other	11 (0)	1 (0)	-	21 (0)	33 (0)
Not recorded	91 (4)	10 (2)	21 (2)	696 (10)	818 (7)
Total	**2,554 (100)**	**646 (100)**	**856 (100)**	**7,302 (100)**	**11,358 (100)**

Source: ACC, NMDS

Urban and rural road trauma

Urban and rural trauma relates to the communities in which people live, rather than where the injury takes place. The following analysis is based solely on National Trauma Registry data for the most seriously injured and covers four years.

Figure 5: Serious injury by urban/rural domicile per 100,000, 2017/18–2020/21



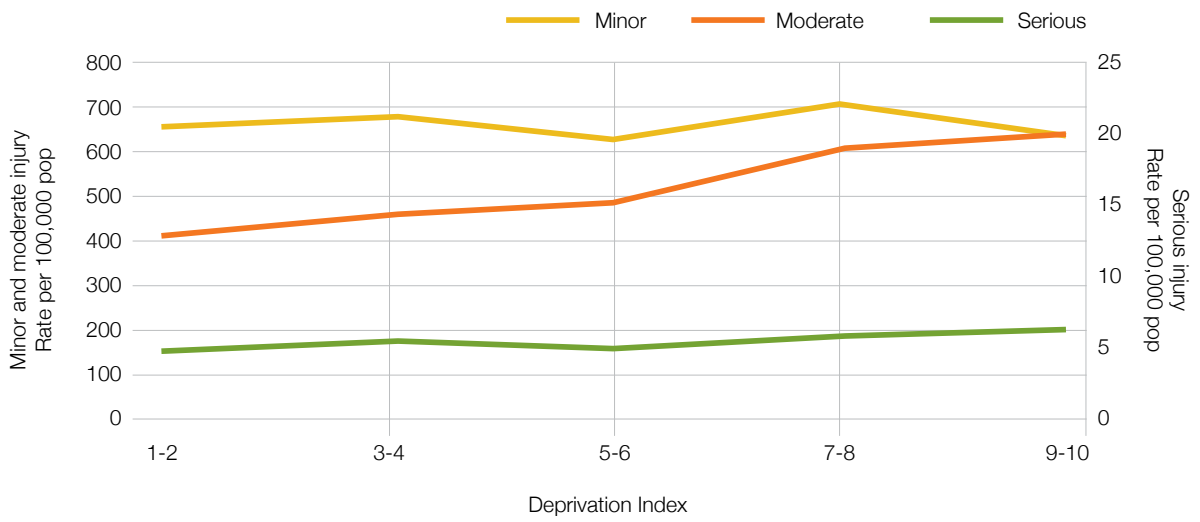
Source: NTR and may include off-road trauma

People who live rurally have notably higher rates of car, motorcycle and 'other' injuries than their urban counterparts. In contrast, for cyclist and pedestrian injuries, there is no obvious difference between those living in urban and rural areas.

Socioeconomic deprivation

Socioeconomic deprivation is measured by the census data on the area where the injured person lives and has been standardised for age. The analysis is based on deprivation deciles, which means the population is divided into 10 equal parts on a 1–10 scale. A value of 1 represents the wealthiest areas and a value of 10 the most deprived areas.

Figure 6: Rate of injury severity by deprivation decile, age-standardised, 2018/19



Data source: ACC, NMDS, NTR, Statistics NZ and University of Otago

While the rates for minor injuries are similar across wealthy and deprived areas, the rate of moderate injuries for people who live in more deprived areas is slightly higher than the rate for those in wealthier areas. This disparity becomes notably wider for those with serious injuries as the rate of injury steadily increases from deciles 1–2 (12.8 per 100,000 population) to deciles 9–10 (20.3 per 100,000). This means that people who live in the most deprived areas of the country also have the greatest burden of serious injury.

Cost

The financial cost of road trauma is based on direct costs associated with ambulance services (road and air), hospital care and ACC costs (whole of lifetime estimated cost). Costing is applied to the most appropriate category of injury. The analysis does not include other social costs associated with death and disability adjusted life years.

Table 7: Cost by severity of injury for transport injuries that occurred in 2018/19

$		Minor	Moderate	Serious	Total
Ambulance	Road	–	7,402,702	822,522	**8,225,224**
	Air	–	–	1,409,175	**1,409,175**
Non admitted		10,328,442	–	–	**10,328,442**
Hospitalisation		–	41,932,036	26,770,464	**68,702,500**
ACC		170,844,781	261,118,371	507,090,443	**939,053,595**
Total		**181,173,223**	**310,453,109**	**536,092,603**	**1,027,718,936**
Average cost per person		5,695	29,868	518,465	23,767

Data source: Ambulance, National Ambulance Sector Office air ambulance data, NNPAC, NMDS, ACC (estimated total claims liability)

The main contribution to cost comes from the ACC lifetime costs (Table 7), which account for 91% of the total cost. The increase in severity of injury is consistent with the increase in cost, to the extent that serious injury accounts for over half the cost (53%) while it is only 2% of the caseload (Table 8).

Table 8: Comparison of severity of injury and cost for transport injuries that occurred in 2018/19

	Caseload	Cost
Minor	74%	18%
Moderate	24%	30%
Serious	2%	52%
Total	**100%**	**100%**

The direct costs for everyone who was injured on the road in 2018/19 amounted to just over $1 billion.

Police investigations of hospitalised road injuries

The proportion of injuries that were serious enough to require hospitalisation and were investigated by Police varied by mode of transport.

Table 9: Police investigations by mode of transport, 2018-19

Mode	Hospitalised
Car	56%
Motorcycle	38%
Bicycle	19%
Pedestrian	62%
Bus/Truck/ Van/other	97%
Unknown	0%
Total	**47%**

Repeat injury events

This analysis explores whether people who were injured in 2017/18 or 2018/19 in the SORTED data set had another ACC road-related claim in the subsequent two years after the first injury was recorded in SORTED.

The majority of people in the SORTED data set (82%) have only a single claim. The remaining 18% have repeat injury events in the 24 months following the first injury that appears in this SORTED data set. Of the total of all people with claims, over the 24-month period, 17.5% have between two and four claims, and 0.5% have five or more claims.

The mean age for people who have five or more claims ranges from 30–33 years, compared with a range of 38–40 years for those who have fewer than five claims.

Geography

Some interesting patterns emerge based on the DHB region that the injured person lives in. When the injury rates are compared with the size of the usual resident population, there are six DHBs whose residents have more road trauma than other DHBs. The greatest difference is for Northland, Taranaki, Hawke's Bay and West Coast DHBs, followed by Waikato and Tairāwhiti (Table 10).

Table 10: Rate of injury by DHB of domicile, 2018/19

	DHB of domicile		
	All hospitalised	**Rate per 100,000**	**Ratio**
Auckland	960	198	0.8
Counties Manukau	1,072	190	0.8
Northland	585	310	1.3
Waitemata	1,276	208	0.9
Bay of Plenty	649	257	1.1
Lakes	274	239	1.0
Tairāwhiti	143	290	1.2
Taranaki	381	310	1.3
Waikato	1,196	281	1.2
Capital & Coast	492	156	0.6
Hawke's Bay	530	305	1.3
Hutt Valley	271	175	0.7
MidCentral	478	261	1.1
Wairarapa	115	242	1.0
Whanganui	167	247	1.0
Canterbury	1151	203	0.8
Nelson Marlborough	386	246	1.0
South Canterbury	131	214	0.9
Southern	660	195	0.8
West Coast	100	307	1.3

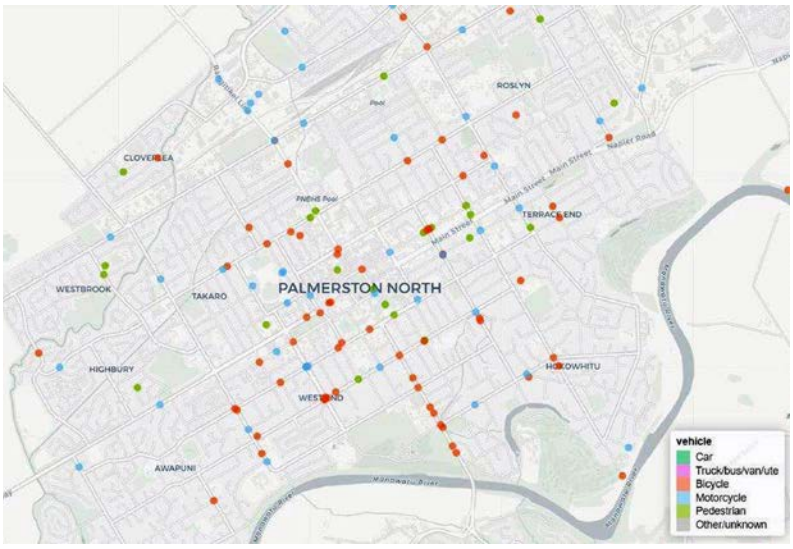
Data source: ACC, NMDS

These results suggest that in these six DHBs, the road injury rate is higher than expected for their population. Further work to understand why may be of benefit.

Appendix D shows the injury rates by DHB which provided care and is influenced by referral patterns to services.

The other approach to a geographic analysis is to use geographic information system (GIS) mapping of injuries. Police and the transport agencies currently undertake GIS mapping using CAS data; however, as CAS does not collect data on all road injuries and has a particularly low coverage for cycling injuries, we have supplemented the CAS data with ambulance data. With duplicates removed, the mapping shows the specific areas where injuries occurred and the mode of transport involved. The mapping tool is available to authorised users.

Palmerston North



Conclusion and recommendations

The SORTED results for 2017/18 and 2018/19 are consistent with the findings from the proof of concept, which provides confidence that the methodology and approach can be replicated.

The study shows that road injury is not evenly distributed across New Zealand. Groups associated with a greater burden of road-related injury include Māori, the young (working age) and those who live rurally and in the most deprived areas. Characteristics related to where someone lives, such as in a deprived or rural area, may contribute just as much to road trauma as where they were injured. Trend analysis is limited at this stage but is likely to be increasingly important given the changing transport trends toward more active forms of transport.

The findings in this paper provide an accurate and comprehensive evidence base for injuries on our roads, and offers useful input in filling some of the gaps in current understanding. The findings in this report will contribute to reducing the burden of road trauma and the social and financial costs to the individual injured, their whānau and Aotearoa New Zealand society.

Recommendations

Based on the findings of this report, we make the following recommendations.

1. Implement SORTED as an annual exercise.
2. Make improvements to enhance sustainability and depth of analysis, including by:
    - establishing cross-agency executive oversight
    - resourcing at appropriate levels and with the required expertise to fully utilise the data set and produce and publish the results
    - focusing on priority areas of research such as Māori road trauma, GIS mapping and transport modes such as motorcycling, cycling and pedestrians.
3. Establish an inter-government entity to analyse the SORTED data set as well as to fulfil other functions, such as leading road safety research. The entity should be led by the transport agencies, and include the spectrum of health agencies, acknowledging the usefulness of the health data to inform road injury.
4. The Ministry of Health undertakes work to improve coding and reporting of micromobility modes of transport.
5. The agencies involved in SORTED undertake work to standardise and implement compatible classifications such as mode of transport and categories of injury severity.
6. Include SORTED in the Road to Zero action plan to support future efforts to reduce serious road injury.

Glossary

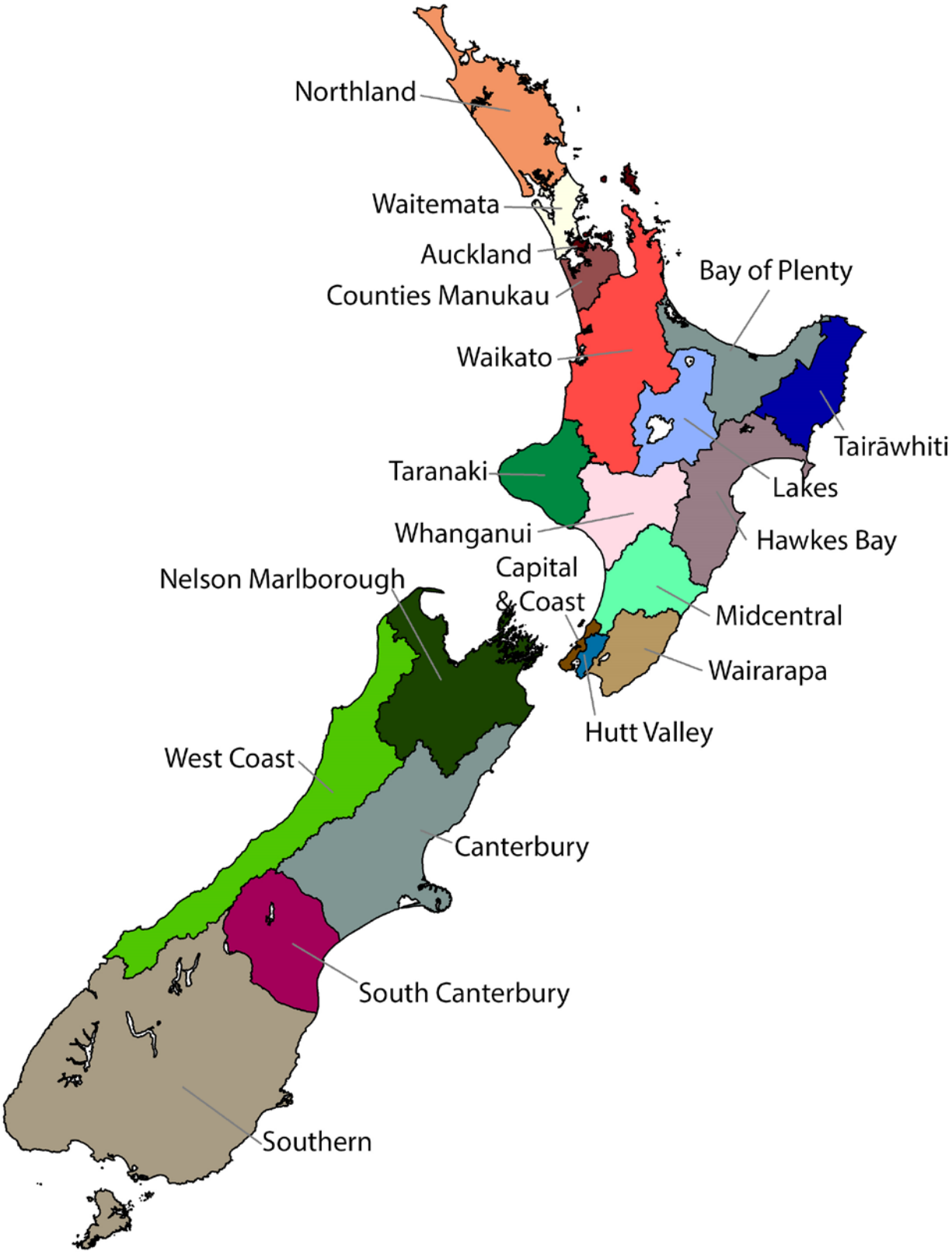
ACC	Accident Compensation Corporation
CAS	Crash Analysis System
DHB	district health board
ePRF	electronic Patient Report Form
GIS	geographic information system
ICD-10-AM	*International Statistical Classification of Diseases and Related Health Problems. Tenth Revision, Australian Modification. 11th edition*
ISS	Injury Severity Scale
NHI	National Health Index
NMDS	National Minimum Dataset
NNPAC	National Non-Admitted Patient Collection
NTR	National Trauma Registry

Appendix A: Members of the SORTED working group

ORGANISATION	NAME	TITLE
Waka Kotahi New Zealand Transport Agency	Paul Graham	Principal Scientist
National Trauma Network	Ian Civil	National Clinical Director
	Siobhan Isles	National Programme Director
Accident Compensation Corporation	Zeeman van der Merwe	Information Consultant ACC
	Tania Helms	Senior Prevention Intelligence Advisor
Ministry of Health	Angela Pidd	Manager Data Management National Collections, Data and Digital
	Chris Lewis	Senior Information Analyst, Data and Digital
Ambulance sector	Andy Swain	Medical Director, Wellington Free Ambulance
	Adam Stevenson	Intensive Care Paramedic, Wellington Free Ambulance
	Bridget Dicker	Head of Clinical Audit & Research, St John Ambulance
	Verity Todd	St John Clinical Research Fellow, St John Ambulance
Ministry of Transport	Joanne Leung	Chief Economist, Manager Domain Strategy, Economics and Evaluation
	Kane Swift	Senior Economist
New Zealand Police	Nils van Lamoen	Manager, Research and Evaluation
Health Quality & Safety Commission	Paul McBride	Senior Data Analyst
	Arie Bates-Herman	Data Analyst

Appendix B: Maps of the boundaries of territorial authorities and district health boards

The following maps show how the geographical boundaries differ between territorial authorities and DHBs.



Appendix C: NMDS coding rules for micromobility injuries

Collisions involving e-scooters
The three codes V0004, V0014, V0094 are assigned for pedestrian collisions involving powered scooters.

- Either or both parties can be on the pedestrian conveyance.
- Fifth character only identifies the mode of pedestrian conveyance used by the counterpart (the other party involved) at the time of the incident.

Example:

Patient admitted with fractured rib. While crossing the road, the patient fell after being struck by a person on a scooter (powered).

External cause code assigned is: V00.14 Pedestrian injured in collision with pedestrian conveyance, traffic incident, scooter, powered.

V00 = Pedestrian injured in collision with pedestrian conveyance

.1 = traffic incident

4 = scooter powered

Falls involving scooters
Falls involving powered or nonpowered scooters are classified as a fall W02 Fall involving ice-skates, skis, roller-skates, skateboards and other pedestrian conveyances.

Example:

Patient admitted with a distal fracture of the radius and ulna. Patient was riding an e-scooter and was injured in a fall.

External cause code assigned is: W02.9 Fall involving other and unspecified pedestrian conveyance.

Code W02.9 is not exclusive to just falls from scooters; the code can be assigned to falls from other pedestrian conveyance, for example, shopping trolley, mobility scooter and sandboard.

Appendix D: DHB of domicile patterns

Table 11: Hospitalised road trauma by DHB of domicile, 2018/19

		Subsets		
DHB of domicile	All transport #	Motorcycle #	Cycle #	Pedestrian #
Auckland	993	161	212	155
Bay of Plenty	673	145	79	37
Canterbury	1,111	173	193	79
Capital and Coast	500	82	127	56
Counties Manukau	1,109	184	101	102
Hawke's Bay	534	89	62	42
Hutt	284	46	37	22
Lakes	269	45	24	18
MidCentral	463	68	31	29
Nelson Marlborough	388	71	93	17
Northland	601	108	37	27
South Canterbury	123	19	18	4
Southern	671	91	98	46
Tairāwhiti	129	17	12	6
Taranaki	397	57	42	21
Waikato	1,168	189	133	78
Wairarapa	114	21	8	6
Waitematā	1,304	242	177	71
West Coast	94	17	11	9
Whanganui	165	28	18	1
Unknown/other	268	22	33	–
TOTAL	**11,358**	**1,875**	**1,546**	**826**

Appendix E: DHB of service patterns

Table 12: Hospitalised road trauma by DHB of service, 2018/19

DHB of Service	All transport #	Motorcycle #	Cycle #	Pedestrian #
Auckland	1,350	218	238	107
Bay of Plenty	616	122	77	42
Canterbury	1,118	175	196	77
Capital and Coast	552	84	129	47
Counties Manukau	1,068	198	106	112
Hawke's Bay	523	89	65	39
Hutt	237	39	34	23
Lakes	298	50	28	18
MidCentral	471	67	31	31
Nelson Marlborough	422	79	96	16
Northland	610	108	41	33
South Canterbury	138	22	17	4
Southern	706	104	105	45
Tairāwhiti	139	21	11	8
Taranaki	376	53	42	19
Waikato	1,377	219	149	68
Wairarapa	89	14	7	7
Waitematā	928	158	133	106
West Coast	98	23	11	1
Whanganui	169	27	17	10
Unknown/other	73	5	13	13
TOTAL	**11,358**	**1,875**	**1,546**	**826**

SORTED

Study of Road Trauma:
Evidence and Data

MINISTRY OF HEALTH
MANATŪ HAUORA

St John

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NZ TRANSPORT AGENCY

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Kopu Taurangi Hauora o Aotearoa

TE MANATŪ WAKA
MINISTRY OF TRANSPORT

WELLINGTON FREE AMBULANCE
kia ora te tangata

Te Hononga Whētuki ā-Motu
National Trauma Network